National Aeronautics and Space Administration

Sounding Rockets Program Office Quarterly Newsletter

Rocket Report

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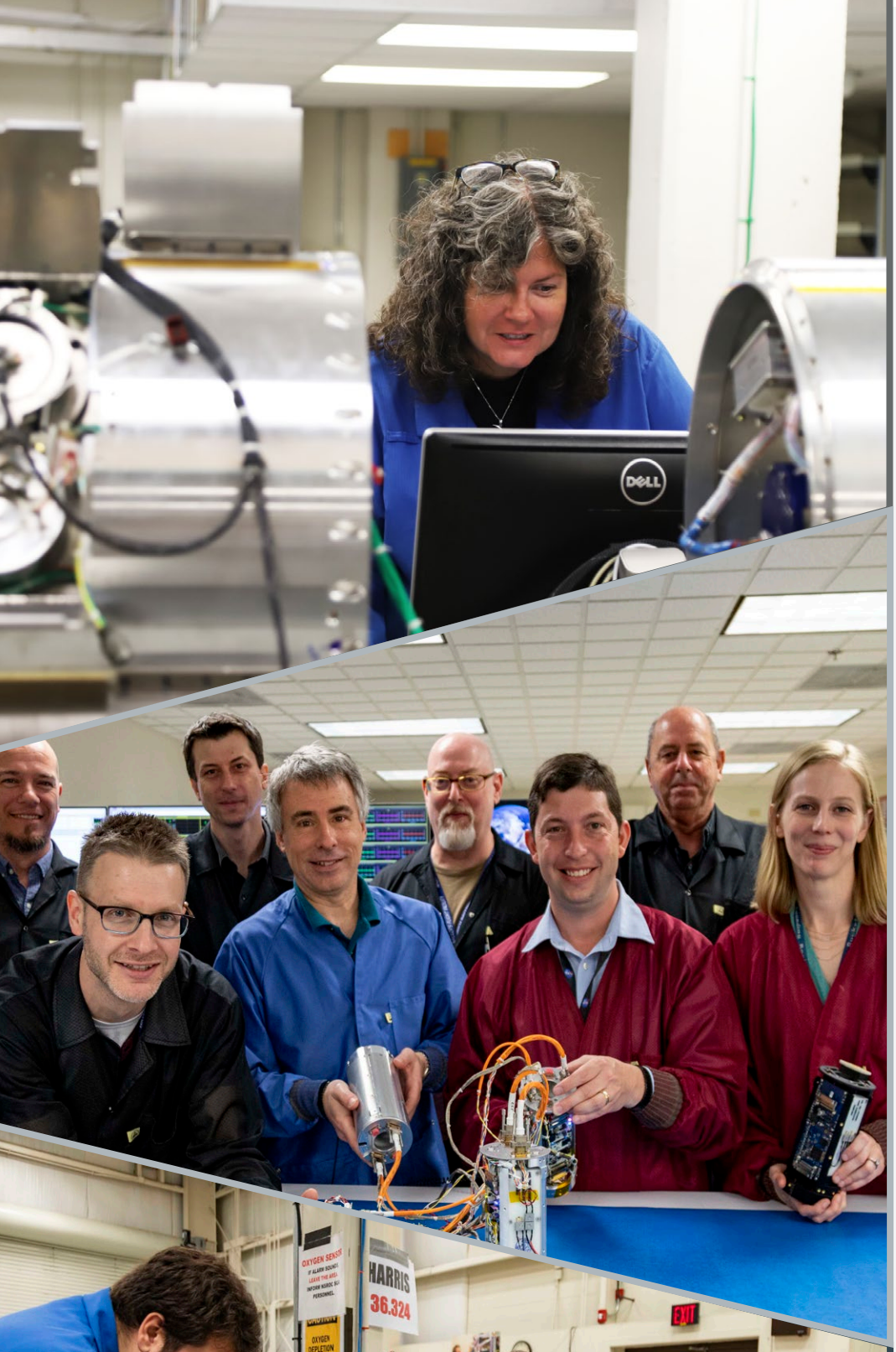
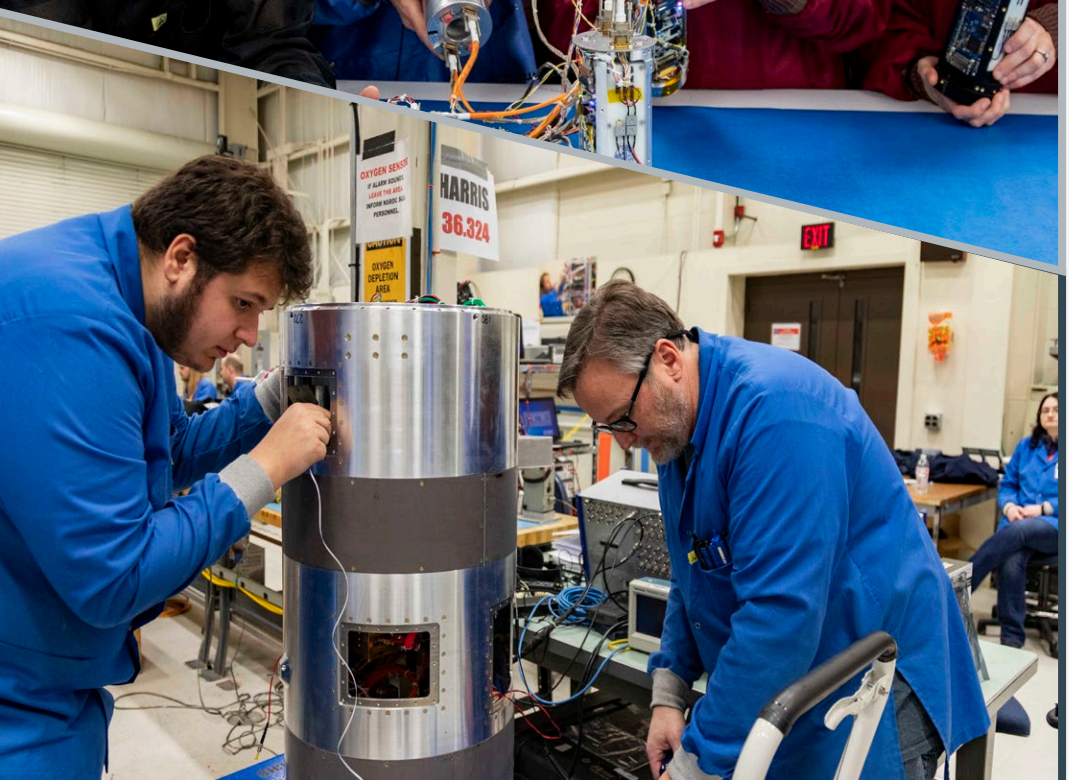




INSIDE

Cover photo:
36.368 UG DEUCE – Green team at White Sands Missile Range, NM.
Photo by: Visual Information Branch/ WSMR

Pictures taken prior to Covid–19.

36.368 UG Launch from White Sands Missile Range, NM on November 2, 2020.
Photo by: Visual Information Branch/WSMR

Missions Launched and other Mission Milestones

During the Covid–19 pandemic most of the Sounding Rockets Program Office (SRPO) and NASA Sounding Rocket Operations Contract (NSROC) staff have continued to telework to the greatest extent practical during the fourth quarter of 2020. Several mission re–start packages for future missions have been prepared, presented, and approved. By keeping our total footprint in F–10 to a minimum, electrical and mechanical manufacturing have been able to continue to work onsite to help keep mission hardware moving forward, and payload teams involved in approved missions have returned to limited onsite work necessary to complete mission integration and testing.

Other mission preparations, such as mission milestone meetings, have been performed as scheduled for future flights. Facility inspections have also been performed on a regular basis.

One mission, 36.368 UG Green – Dual–channel Extreme Ultraviolet Continuum Experiment was successfully launched from White Sands Missile Range, NM on November 2, 2020.

With this, our final newsletter for 2020, we wish you Happy Holidays!

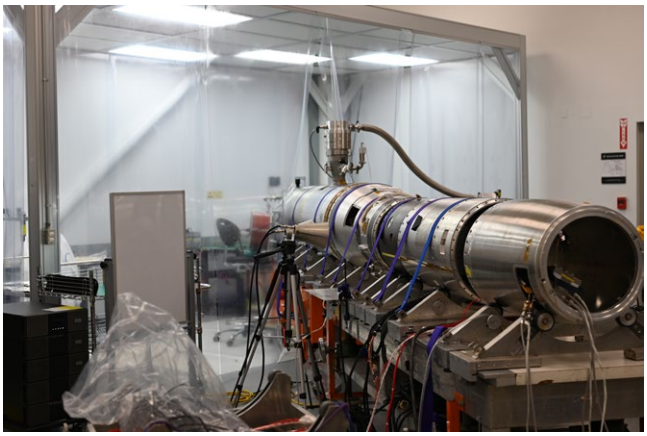
36.368 UG Green/University of Colorado - Dual-channel Extreme Ultraviolet Continuum Experiment (DEUCE) - launched November 2, 2020

This was the third flight of the DEUCE experiment with the goal of measuring how much ionizing photons B stars, such as the target star for this mission, ß canis major, produce.

DEUCE has two modes; a low resolution, high throughput mode operating from 650 – 890 Å, and a high resolution, low throughput channel from 650 – 1100 Å. The stellar brightness changes dramatically above 912 Å and below 912 Å and therefore the two modes are necessary. The change in intensity is unknown, and may range from 10/1 to 10,000/1. DEUCE will measure the flux of local, bright, hot stars that have very little intervening absorbing material in the interstellar medium. There are no preexisting measurements of the flux of these types of stars in the critical 700 – 900 Å regime, and the fundamental objective of DEUCE is to understand how bright these types of stars are in the 700 – 900 Å regime.

This was also a test flight for a new variant of the NASA ETD designed Autonomous Rocket Tracker (ART). For this mission two trackers were integrated into the nosecone and bolted to the skin. ART relays GPS coordinates to a remote user via the Iridium satellite network, and enables tracking and locating vehicle and payload parts after impact. This was the third flight for ART and the first of this configuration.

Recovery operations at WSMR. Photos by: Visual Information Branch/WSMR



DEUCE payload during integration at WSMR. Photo by: Ahmed Ghalib/NSROC

DEUCE launch. Photo by: Visual Information Branch/WSMR

Mission Milestone Meetings

46.027 DR Holden/USAF - Boundary Layer Turbulence 2 (BOLT 2)

A Design Review was held on October 13, 2020 for BOLT 2.

The BOLT 2 mission will measure boundary layer transition and turbulence on a low–curvature concave surface with a swept leading edge at high Mach numbers.

BOLT 2 is currently scheduled for launch from Wallops Island, VA in the fall of 2021.

36.369 GE Benna/NASA GSFC - DISSIPATION

A Mission Initiation Conference for this payload was held on November 16, 2020.

The DISSIPATION investigation will provide, for the first time, comprehensive and concurrent in situ measurements of the response of the thermosphere (changes in density, composition, temperature, and flow dynamics) to Joule heating in the auroral transition region.

DISSIPATION is currently scheduled for launch from Poker Flat Research Range, AK, in January 2023.

46.032 WT Hesh/Wallops Flight Facility - SubTEC-9

A Requirements Definition Meeting for SubTEC–9 was held on December 3, 2020.

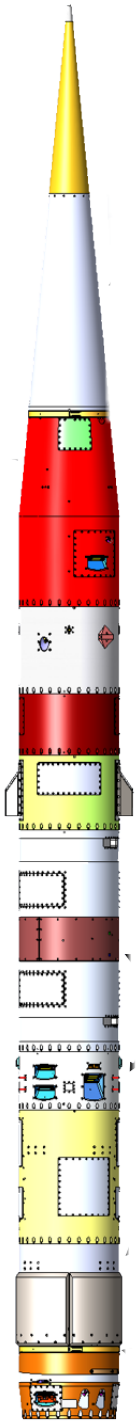
The SubTEC missions are dedicated technology development flights with experimentors from NASA and NSROC, as well as, outside organizations.

SubTEC–9 will carry 19 experiments, 11 developed by NSROC, 6 by NASA Engineering and Technology Directorate (ETD), and one each from NASA Goddard Space Flight Center, Greenbelt, and S12 Technologies.

The primary technologies to be tested include:

- Test both flight and ground components of a high data rate (~40 Mbps) C–band telemetry link.
- Test the Deploying and Retracting Tubular (DART) boom system with 360° cameras.
- Test the NASA ETD Wallops Integrated Star Tracker (WalST) in a relevant flight environment.

SubTEC–9 is currently scheduled to be launched in March 2022.



SubTEC–9 payload model. Credit:NSROC Mechanical Engineering

46.031 UE Kaeppler/Clemson University - Ion-Neutral during Active Aurora (INCAA)

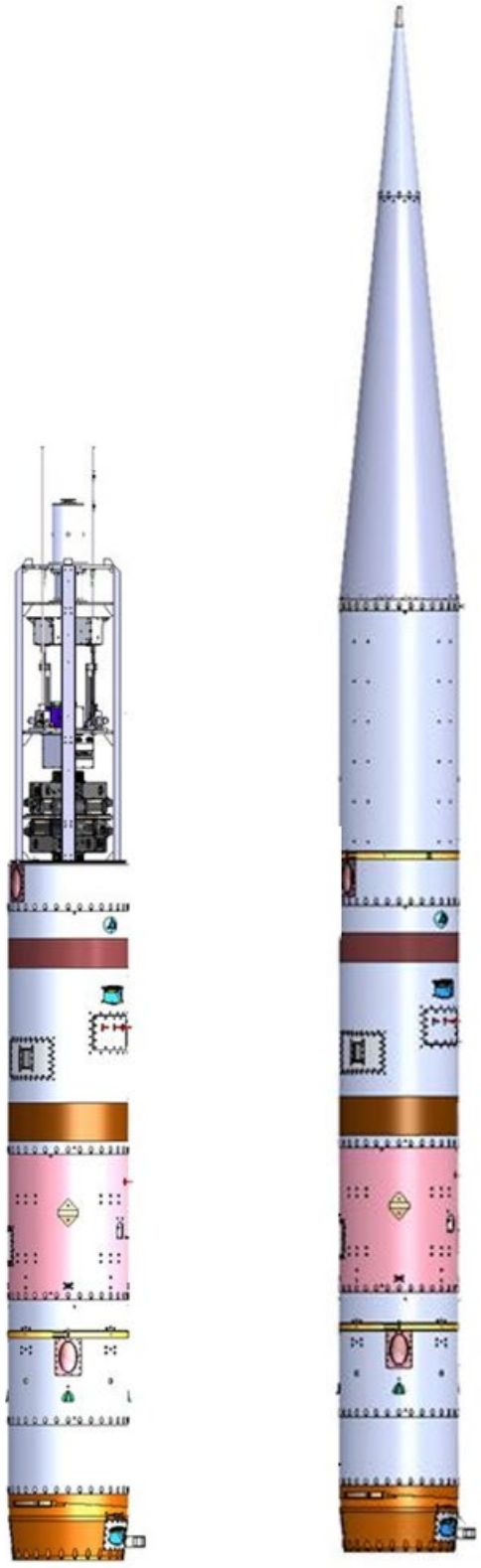
A Design Review for this payload was held on December 1, 2020. The INCAA mission includes two payloads, 36.360 and 46.031. A separate Design Review has been held for 36.360.

The science objective for the INCAA sounding rocket mission is to understand the interactions between the plasma and the neutral atmosphere during active aurora, and how this interaction affects energy deposition in the E–region ionosphere. The measurement strategy is to measure the ion demagnetization altitude and altitude resolved Joule heating rate. The mission will measure all terms in the ion momentum equation with altitude resolution of less than one kilometer, and will also use complimentary groundbased instrumentation from incoherent scatter radar and Fabry Perot interferometers to quantify the local ionospheric state parameters and regional neutral wind morphology, respectively. The objective is to understand a single event with many measurements and use this event as a representative case.

To accomplish these science objectives, the mission will use two sounding rocket payloads that will launch from Poker Flat Research Range, AK: an instrumented payload (46.031) that will contain a suite of plasma and neutral instrumentation and the vapor trail payload (36.360). The vapor trails include Barium, Strontium, and Trimethylaluminum (TMA). The plan is to launch both payloads within 10 minutes of each other.

The tentative launch window opens in April 2022 during the early morning local time, to capture dawn twilight conditions but to be as near to magnetic midnight as possible to launch into an active event.

In addition to ground–based imagers and magnetometers, FPI network and, to the extent possible, the Poker Flat Incoherent Scatter Radar (PFISR) to assist in the launch decision.



INCAA payload model.
Credit: NSROC Mechanical Engineering

Photo by Ahmed Ghalib/NSROC

36.368 UG DEUCE AT WSMR

Photos by Visual Information Branch/WSMR unless otherwise noted.

From the Archives: Supernova 1987A

Supernova 1987A was discovered on February 23, 1987 by Canadian astronomer, Ian Shelton, working at the Las Campanas Observatory in Chile. Images of the Large Magellanic Cloud, taken that night, revealed a very bright star that had not been seen before.

Data taken by the International Ultraviolet Explorer (IUE) satellite allowed astronomers to identify the star's location as Sanduleak –69° 202. Sanduleak was a blue supergiant about 20 times the mass of the sun, before exploding as a supernova.

Supernova 1987A is the closest supernova to have exploded in modern times, and the brightest since Johannes Kepler observed a supernova in 1604 in the Milky Way Galaxy; it is also the first supernova visible to the naked eye since 1885.

Many NASA and international observatories, ground based, airborne, and space based, were involved in gathering data on the Supernova 1987a, in several spectral wavelengths.

The sounding rocket observations focused on far ultraviolet and x–ray portions of the spectrum. All rockets were launched from Woomera, Australia.

The first three launches took place in November and December 1987. February and March 1988 saw three additional launches. Two payloads were refurbished in the field, at Woomera, between the flights in 1987 and 1988. All payloads were launched with two–stage Terrier–Black Brant rockets. The Principal Investigators were: Dr. Garmier/Penn State, Dr. Cash, University of Colorado, Dr. Novick, Columbia University, and Dr. Serlemitsos, NASA GSFC.

Launch range ready for sounding rockets, Woomera, Australia (left) and rocket ready for launch (right).

Thirty years of observations of Supernova 1987A with spacebase observatories, such as, Chandra and Hubble Space Telescope, and the groundbased observatory Atacama Large Millimeter/submillimeter Array (ALMA), have yielded many discoveries.

The latest data from these telescopes indicate that SN 1987A has passed an important threshold. The supernova shock wave is moving beyond the dense ring of gas produced late in the life of the pre–supernova star when a fast outflow or wind from the star collided with a slower wind generated in an earlier red giant phase of the star's evolution. What lies beyond the ring is poorly known at present, and depends on the details of the evolution of the star when it was a red giant.

Sources: American Physical Society, NASA–Guenter R. Riegler and www.nasa.gov, Penn State–G. Garmire et. al.,

SCHEDULE

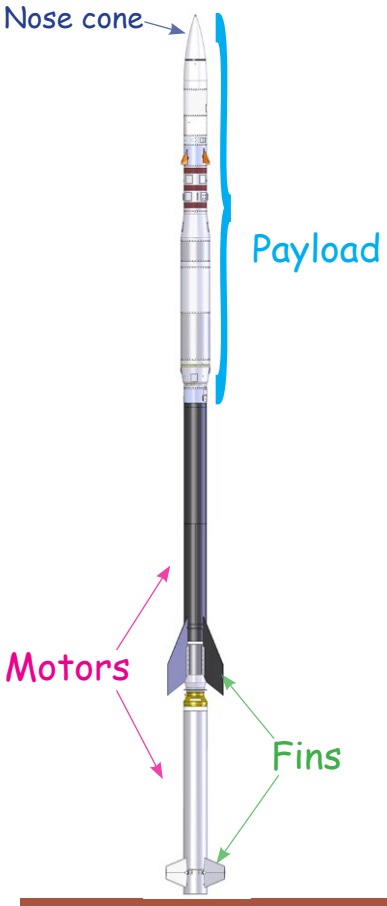
COVID-19 has affected our operational status and all near-term launch dates are preliminary.

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE
36.281 UG	UV/OPTICAL ASTROPHYSICS	ZEMCOV	RIT	CIBER–2	WS	3/18/2021
12.088 NR	TEST & SUPPORT	GILBERT	NESC	ABFT	WI	3/30/2021
52.007 UE	GEOSPACE SCIENCES	DELAMERE	UNIV OF ALASKA FAIRBANKS	KiNET–X	WI	3/31/2021

MISCELLANEA

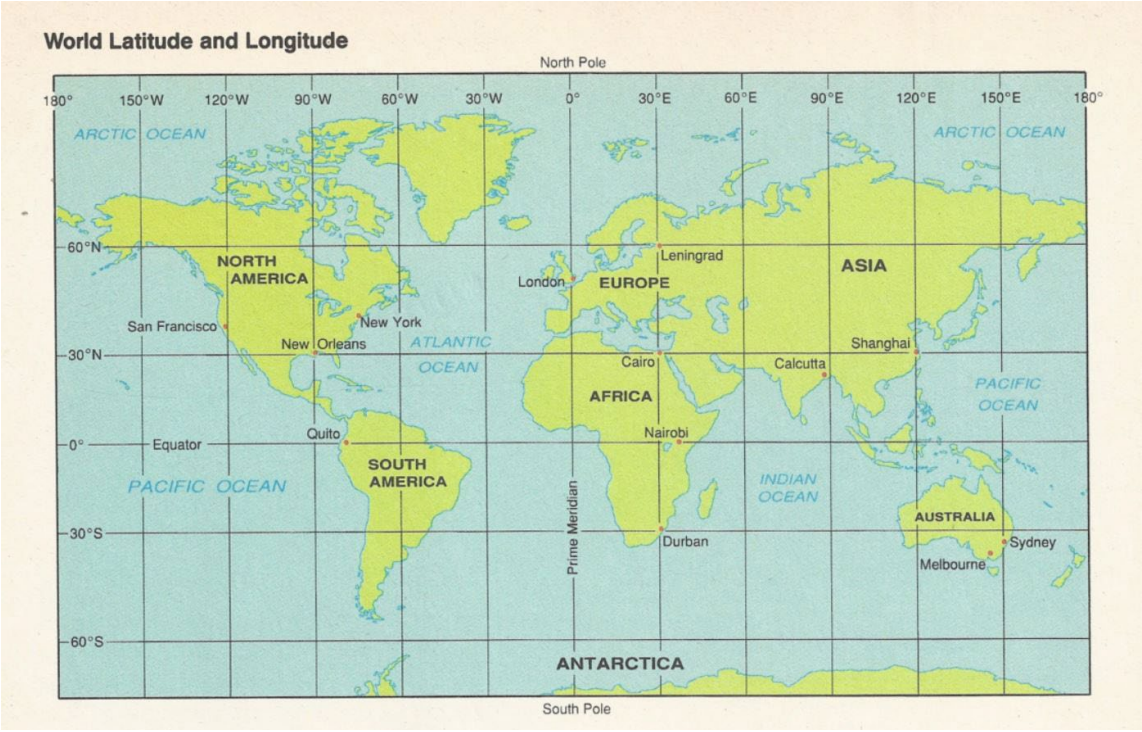
For students

Answers from previous newsletter.



This quarter we'll take a journey to launch a rocket. Your rocket team is all ready to go. Your payload has been assembled, it has been tested, and is packed up for shipping. The only problem is, your shipping address is given as coordinates 65 degrees North, and 147 degrees West*.

Can you find the location on the map?
And looking at the previous newsletter (3rd quarter answers); which launch range is located there?



*The precise coordinates in decimal degrees are 65.1256° N, 147.4919° W.