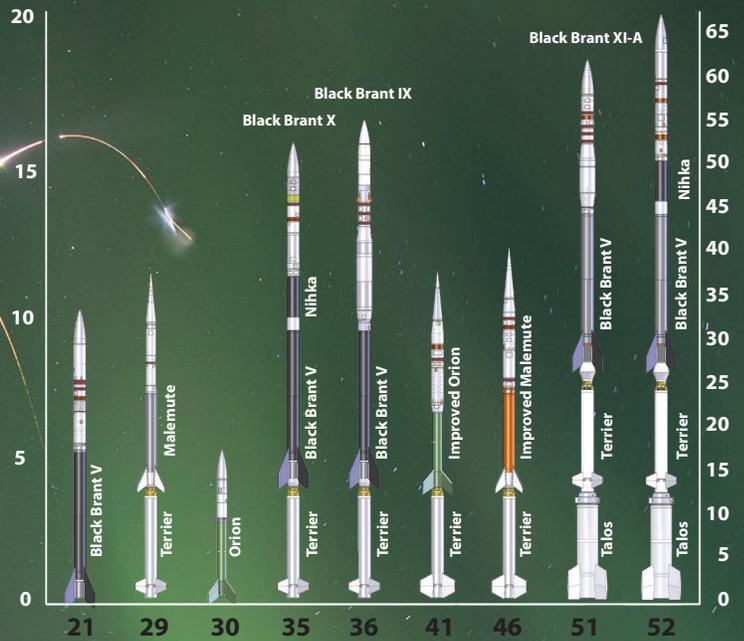
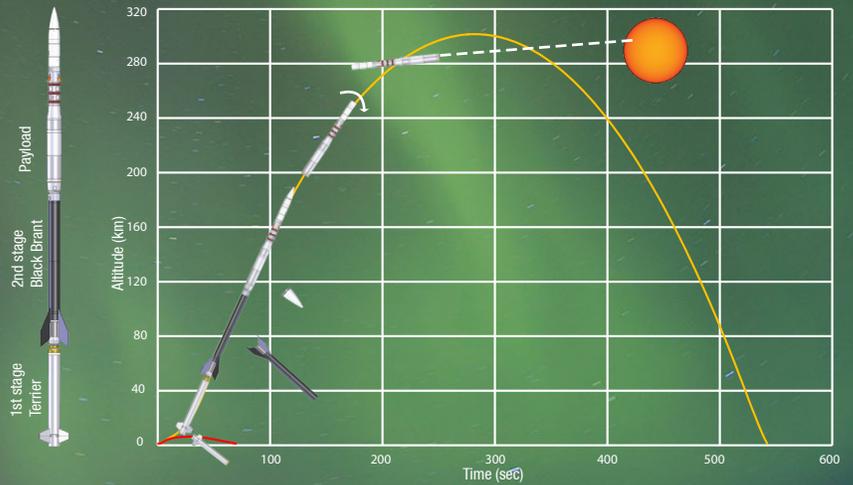




Sounding Rocket Configurations

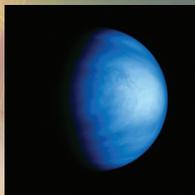


Sample Trajectory

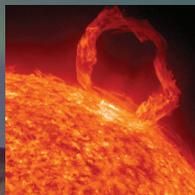


This trajectory profile, for a two stage Black Brant IX sounding rocket carrying a solar telescope payload, shows altitude in kilometers vs. time in seconds. When the fuel in each stage of the vehicle is expended, the empty casing is dropped from the stack and the next stage is ignited. As the payload reaches the desired altitude, the Attitude Control System (ACS) aligns the instrument with the science target, in this example the Sun, and data collection starts. The data is transmitted to a ground station and recorded for later analysis by the researchers. All parts re-enter the atmosphere and land downrange from the launch site. Some payloads are equipped with parachutes and are recovered and reused.

Science and Technology



Planetary Science



Solar Physics



Technology Development



Geospace Science



Astrophysics

To take a sounding means to take a measurement. Instruments on board sounding rockets take measurements in the atmosphere and in space. Sounding rockets carry experiments to altitudes between 50 and 1,500 km and fly in nearly parabolic trajectories, re-entering the atmosphere downrange from the launch site.

Science missions focus on geospace research, solar physics, astrophysics, and atmospheric studies. Auroral studies are often conducted with instruments that measure electron densities and structures in plasma. These missions are flown from launch sites in the arctic. Telescopes launched with sounding rockets are used for planetary, solar, and astrophysics studies.

New technologies for future satellite missions are tested with sounding rockets, allowing scientists to verify functionality of instruments prior to committing to a multiyear space mission.

Sounding rockets are used for carrying and releasing re-entry test vehicles. The instrumented re-entry body transmits data on dynamic pressure, orientation, velocity, and other characteristics of the flight. This research helps answer questions about landing probes on other celestial bodies, such as Mars or perhaps moons orbiting other planets in our solar system.



Sounding Rocket Launch Sites

The hands-on approach to instrument design, integration, and flight, as well as the short mission life-cycle, provides opportunities for the next generation of space scientists and engineers. Students are often involved through participation in the science missions or through dedicated education missions supported by NASA.

Approximately 20 missions from sites worldwide are launched annually. Mobile operations enable scientists to conduct research from strategic vantage points. Frequently used launch sites are located in Alaska, New Mexico, and Norway.

NASA uses multiple different sounding rocket configurations. The smallest is a single stage, or single rocket motor, Improved Orion and the largest is a four stage Black Brant XII-A. After a motor burns out, it is dropped from the stack, reducing the mass that the next stage has to lift. The next stage then ignites and carries the payload higher. This sequence of events is repeated until all the motors are expended. The payload separates from the final stage and science operations are conducted. When the experiment is completed, the payload re-enters the atmosphere. When recovery of the experiment is required, a parachute is deployed allowing a gentle landing. Flotation devices are used to keep experiments afloat when launches occur over water.

NASA's Sounding Rockets Program is managed by the Sounding Rockets Program Office located at NASA Goddard Space Flight Center's Wallops Flight Facility in Virginia.

