National Aeronautics and Space Administration

Sounding Rocket Mission Fact Sheet

Mission: Auroral Waves Excited by Substorm Onset Magnetic Events (AWESOME)
Mission Number(s): 52.010 UE
Principal Investigator: Dr. Conde/University of Alaska Fairbanks
Launch Date: March 24, 2025 - window open
Launch site: Poker Flat Research Range, AK

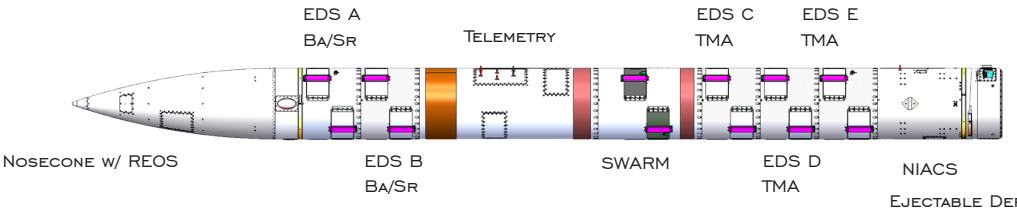
Description

The purpose of the Auroral Waves Excited by Substorm Onset Magnetic Events (AWESOME) experiment is to study the density, wind, and composition perturbations that occur in Earth's high latitude thermosphere in response to impulsive local forcing during auroral substorms.

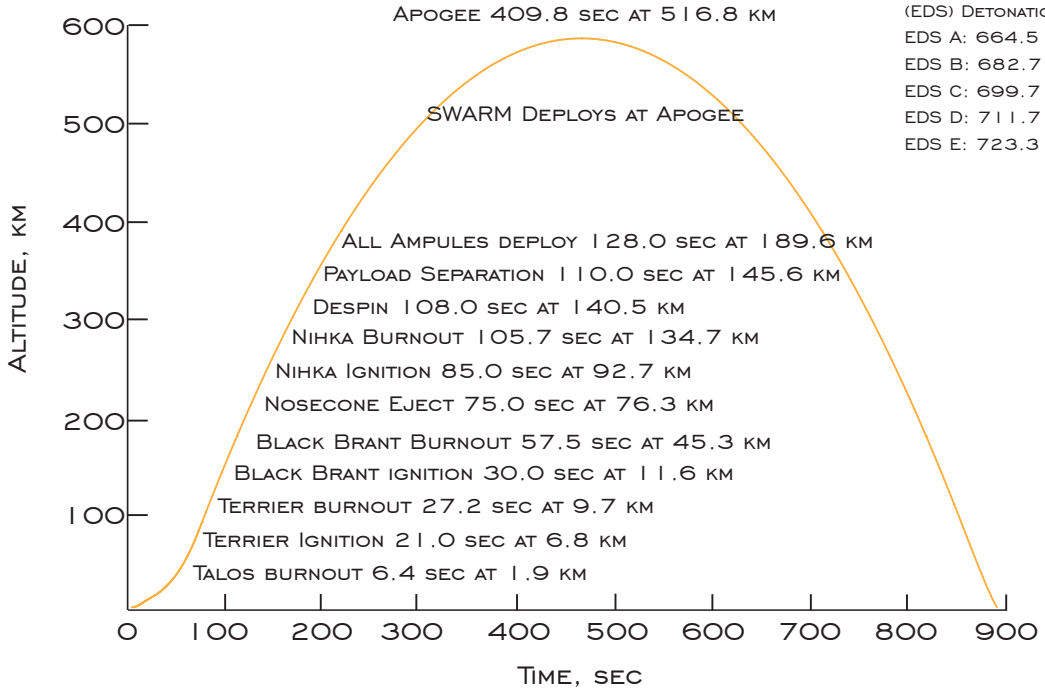
Acoustic gravity waves generated by auroral substorms typically have wavelengths ranging from tens to hundreds of kilometers and frequencies in the millihertz (mHz) range. AGWs are detected using ground-based instruments, such as radars, but in-situ measurements of effects of the waves on the thermosphere and ionosphere have not yet been performed. AWESOME will specifically study the influence of these waves on the measurable parameters in the thermosphere, i.e. density, wind, and composition.

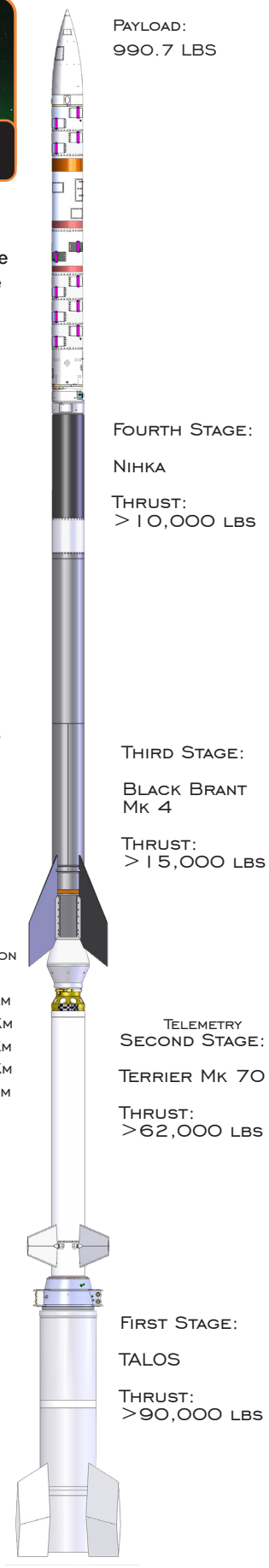
The AWESOME mission incorporates three sounding rockets to conduct a study of AGWs and their impact on the thermospheric properties. The first rocket is a two-stage Terrier-Improved Malemute and will be launched within 30-minutes of the onset of a substorm. The second rocket, also a Terrier-Improved Malemute, and the third rocket, a four-stage Black Brant XII-A (Talos-Terrier-Black Brant-Nihka) will be launched 1-2 hours after the first. A separate fact sheet is provided for the Terrier-Improved Malemute launches.

The Black Brant XII-A rocket carries a payload to an altitude of almost 600 km. This payload includes 20 sub-payloads dispersing vapor trails. Eight ejectable ampules consist of a mixture of Barium and Strontium, and twelve include TMA. All ampules are deployed at the same time, but the vapor trails are dispersed at different times and altitudes. Additionally, four sub-payloads with ionization gauges are deployed at apogee. Using deployable sub-payloads allows multi-point spatially separated measurements, and the ejectable systems were developed for that purpose.



Ejectable Deployment Section (EDS) Detonation:
EDS A: 664.5 Sec 250.1 Km
EDS B: 682.7 Sec 210.1 Km
EDS C: 699.7 Sec 170.0 Km
EDS D: 711.7 Sec 140.1 Km
EDS E: 723.3 Sec 110.0 Km





National Aeronautics and Space Administration

Sounding Rocket Mission Fact Sheet

Mission: Auroral Waves Excited by Substorm Onset Magnetic Events (AWESOME)
Mission Number(s): 46.034 & 46.035 UE
Principal Investigator: Dr. Conde/University of Alaska Fairbanks
Launch Date: March 24, 2025 - window open
Launch site: Poker Flat Research Range, AK

Description

The purpose of the Auroral Waves Excited by Substorm Onset Magnetic Events (AWESOME) experiment is to study the density, wind, and composition perturbations that occur in Earth's high latitude thermosphere in response to impulsive local forcing during auroral substorms.

Acoustic gravity waves generated by auroral substorms typically have wavelengths ranging from tens to hundreds of kilometers and frequencies in the millihertz (mHz) range. AGWs are detected using ground-based instruments, such as radars, but in-situ measurements of effects of the waves on the thermosphere and ionosphere have not yet been performed. AWESOME will specifically study the influence of these waves on the measurable parameters in the thermosphere, i.e. density, wind, and composition.

The AWESOME mission incorporates three sounding rockets to conduct a study of AGWs and their impact on the thermospheric properties. The first rocket is a two-stage Terrier-Improved Malemute and will be launched within 30-minutes of the onset of a substorm. The second rocket, also a Terrier-Improved Malemute, and the third rocket, a four-stage Black Brant XII-A (Talos-Terrier-Black Brant-Nihka) will be launched 1-2 hours after the first. A separate fact sheet is provided for the Black Brant XII-A launch.

Identical payloads are carried on the Terrier-Improved Malemutes and include ionization gauges and magnetometers. The ionization gauges are deployed from the main payload using small rocket propelled ejectable sub-payloads. Trimethylaluminum (TMA) vapor tracers are dispersed from the main payload to study neutral winds at altitudes of 80 – 175 km. The first launch takes measurements of conditions at the onset of the magnetic storm, and the second measures changes that have occurred since the first launch.