

AeroSpaceLab Lunar Orbiter Mission

The goal of the following mission is to comprehensively study the lunar energetic particle environment. The project was proposed by AeroSpaceLab, a company that has developed and flown multiple satellite platforms. Two payloads are proposed to achieve the scientific goals:

Scientific instruments are to be chosen by the student team. The focus of the instruments should be on the detection of high energy particles in the lunar environment. Examples of these particles are Galactic Cosmic Rays or Solar electric particles.

When these particles hit the lunar surface secondary particles are generated. This radiation includes neutrons, gamma rays and electrons. Investigating these particles may additionally yield information about the lunar surface. For this type of investigation being closer to the lunar surface is more valuable in terms of the quality of the data. This may be considered in the choice of the orbit for the mission.

Accompanying the power, mass, data and telecommunication needs of the payloads is a major part of the project.

The launcher for the mission shall be a European rocket. The price of the launch should be kept as low as possible for the selected mass of the spacecraft. Several different scenarios to reach lunar orbit can be investigated. Those include a direct transfer, deployment to geostationary transfer orbit and boosting the rest or even a deployment to LEO with a subsequent orbit raising.

Another major part of this project is the selection of the orbit around the moon. The data that is generated by the payloads is more valuable when collected closer to the surface. The ideal distance of the instruments is 100 km above the surface. Additional considerations for the choice of the orbit are the amount of fuel needed to achieve the orbit as well as the fuel needed for station keeping once the orbit is reached.

For communication with earth the proposed Moonlight communication constellation may be used. The network of satellites is specifically planned to enable lunar space missions to use less powerful antennae by acting as relay satellites to send data to earth.

The total mission duration shall be at least 3 years. The mission will help explaining the physics behind solar electric particles and galactic cosmic rays. Additionally, it will help to monitor space weather and based on the interaction of the particles with the lunar surface can also be used to study the lunar geology.