Mission Analysis Challenges

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Abstract:

The talk “Mission Analysis Challenges” is a journey through the work done at the Mission Analysis Office of ESA/ESOC dedicated to the solution of some challenging tasks. It is structured in two parts, the first treating some issues related to the trajectory design of the BepiColombo mission, the second presenting the mission analysis of a feasibility study of a low-cost mission to Europa. A brief description of the European Space Operation Centre is also given.

BepiColombo is the ESA cornerstone mission to Mercury. The launch is planned for 2012, and after a journey of some 5 years the two probes (a Magnetospheric Orbiter and a Planetary Orbiter) will reach their target orbits. The interplanetary trajectory includes flybys at the Earth, Venus (twice) and Mercury (twice), as well as several thrust arcs provided by the solar electric propulsion module. Additionally, complex strategies will precede and follow the interplanetary transfer. The first involves a lunar flyby, which is optimised to leave the Earth’s attraction with the highest escape velocity in the most suitable direction. The one at the end of the transfer uses a gravity capture technique to increase the operational safety of the insertion in Mercury orbits.

The Jupiter moon Europa is of enormous scientific interest because it may possess a liquid ocean beneath the ice crust and submarine volcanic vents and therefore might also harbour life. The present results were obtained in the course of a study performed by the European Space Agency on the feasibility of a low-cost mission to this fascinating body. Two satellites shall be used. One is a radiation-hardened Europa orbiter. The second is a data relay spacecraft in a radiation-safe, high Jupiter orbit. The use of solar arrays is mandated.