

From Earth Missions to Deep Space Exploration (05)
International Plans and Concepts (4)

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EUROPAN SAMPLE RETRIEVAL SYSTEM

Abstract

The Department of Mechanical and Aerospace Engineering at California State University Long Beach requires the seniors to design and develop a system that relates to aerospace engineering. To fulfill this requirement, a sample return system was selected to be designed to travel to and from Europa. The main driver to obtain and return samples is to further enhance the exploration of the solar system to potentially discover life. As a result, this is a presentation of the conceptual design of a European Sample Retrieval System. The main purpose of the system is to successfully return to Earth a 100 gram sample of European surface material. During the conceptual design phase, some assumptions made were RTGs will be readily available and the spacecraft will be launched with an upper stage that will place it on an interplanetary path towards Jupiter. In order to determine V budgets, simple plane assumptions were made as well as neglecting planetary motion. Stemming from the preliminary mass and power budgets, the sample return system being designed includes five separate systems: Interplanetary System (IS), Landing System (LS), Ascension System (AS), Payload System (PS), and Re-Entry System (RES). The IS will be responsible for transporting the spacecraft system to and from Europa. The LS will take the PS and the AS to Europa's surface. The AS contains the instruments to place the sample into the PS and will also return the PS to the IS in preparation for re-entry to Earth. The RES safely delivers the sample to Earth, withstanding atmospheric re-entry. The IS will employ an electric engine and a nuclear power system. The AS will contain an RTG system that will power the LS, PS and AS. Both the AS and LS will utilize chemical propulsion systems. Upon re-entry to Earth's atmosphere, a parachute will be deployed to slow the RES to an impact velocity suitable for the landing of an undamaged sample.