

## JPL Mission Design Software: Current Efforts to Support Low-Cost Missions

### Abstract

Over the last several decades, engineers at the Jet Propulsion Laboratory have developed a collection of analytical tools to design missions to Earth orbit, the moon, sun, planets and various other bodies in our solar system, and beyond. Although many early tools were developed in an ad-hoc environment to support the immediate needs of specific projects, they began to represent a rich heritage of mission design experience and capability. Realizing this, the Multi-Mission Analysis Software Library (MASL) was created to collect existing software, identify core capabilities, and modify them as needed to remove mission specific features to support more general analysis. With support provided by JPL's Multi-Mission Operations Systems Office (MOSO) the MASL library grew and evolved to provide the foundation for most of the mission analysis software at JPL. This core capability, combined a more educated workforce, and advances in computer hardware and software have led to the current mission design environment.

Although the software developed to date represents an impressive capability, continued advances in industry and technology suggest the potential for tremendous improvements in efficiency, user interfaces, program interconnectivity, and the elimination of many intermediate tools and design iterations. Many examples of time and cost savings exist. Potential savings are not limited to the mission design process, however. Efforts are currently underway to integrate mission design functions into JPL's new Project Design Center (PDC). One initial goal of the PDC is to allow more rapid creation, evaluation, and refinement of mission concepts to reduce concept development time by an order of magnitude.

This paper summarizes ongoing efforts at JPL to support low-cost planetary missions, emphasizing the mission design process in an historical context. The status and goals of new developments are discussed, and specific examples of cost savings are provided.

The work described in this abstract was performed by the Jet Propulsion Laboratory, California Institute of Technology, under contract to the National Aeronautics and Space Administration.