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X2000 Systems and Technologies for Missions to the Outer Planets
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The Advanced Deep Space System Development Program (ADSSDP) is managed at the Jet Propulsion Laboratory for the National Aeronautics and Space Administration (NASA) and is also called X2000. X2000 is organized to create “cores” of advanced flight and ground systems for the exploration of the outer planets and beyond; cores are the engineering elements of flight and ground systems. Mission specific elements such as instruments will be developed by another team. Each X2000 delivery gets its requirements from a set of planned missions, or “mission customers”; customers set requirements and participate on X2000 design teams. To this end, the X2000 program will start and spin-off projects to meet the needs of unique sets of mission customers.

The X2000 first delivery project will meet the needs of missions to Mars (in support of the Mars sample return), the Sun (closest approach is at 4 solar radii), Europa (looking for a liquid ocean), a comet (and possible sample return), and Pluto followed by a trip into the Kuiper belt. This set of missions leads to some outstanding requirements:

1. Long-life (12-14 years for a mission to the Kuiper belt).
2. Total Ionizing Dose (TID) of 4 Mrad (for a Europa Orbiter--after only 30 days in orbit).
3. Average power consumption less than or equal to 150 Watts.
4. Autonomous operations that result in an extreme reduction in operations costs.
5. Large scale software re-use must be enabled.

These requirements shape the nature of the X2000 first delivery. The technologies needed to meet these requirements cover a broad spectrum and revolutionize the designs of flight and ground systems JPL and NASA will fly to the outer planets.

This paper describes the X2000 first delivery and its technologies following a brief overview of the program.