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FLEXIBLE AND MODULAR ARCHITECTURE FOR THE LUNAR GATEWAY

Abstract

Introduction: Sierra Nevada Corporation (SNC) is developing a Deep Space Gateway (DSG) architecture design under NASA's Next Space Technologies for Exploration Partnerships-2 (NextSTEP-2) Habitat Systems contract. SNC's design relies on SNC's systems integration and Environmental Control and Life Support Systems (ECLSS) capabilities from work on NASA's Commercial Resupply Services 2 (CRS2) program and on a long heritage of flight-proven satellites. The core team consists of SNC's Space Systems, Aerojet Rocketdyne and ILC Dover. SNC DSG Architecture Overview: The SNC DSG consists of four major elements constructed using three unique platforms: the Power and Propulsion Element (PPE), which consists of one Solar Electric Propulsion Module (SEPM) and one pressurized Logistics and Control Module (LCM), the Large Inflatable Fabric Environment (LIFE), and the Extended Logistics and Control Element (ELCM). Each platform is designed to maximize modularity and interoperability. All platforms are compatible with both the Space Launch System (SLS) co-manifested payload capability and the Evolved Expendable Launch Vehicle (EELV) standard 5-meter payload fairing.

PPE. The PPE is a 50 kW-class vehicle that incorporates four 12.5 kW Advanced Electric Propulsion System Hall-effect thrusters, a chemical propulsion system, avionics, guidance, navigation and control, and communications to achieve its primary mission of providing electrical power generation, propulsion, and communications for the DSG. The DSG uses two PPEs to provide additional power, propulsion and communications systems. This provides redundancy and can be used to support powered payloads, visiting vehicles and construction of the Deep Space Transport (DST) for long duration human exploration missions. **LIFE**. The LIFE is an inflatable structure that provides the main habitable volume for crew living, working and storage space. Including its central core, the internal volume of the LIFE houses ECLSS hard-ware, powered payloads, and crew accommodations such as sleep stations, a galley, work stations, exercise equipment and medical care facilities. **ELCM**. The ELCM is a multi-purpose structure which serves the logistics function to deliver cargo, hardware, and consumables to the DSG. The ELCM will be used as a pressurized vessel that provides additional habitable volume, contains IDSS compatible ports for visiting vehicles, and an airlock for extravehicular activity. This paper will discuss the details of SNC's lead-ing-edge concepts for deep space travel.