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THE DEVELOPMENT OF FUTURE SPACE STATIONS FROM UPPER STAGES

Abstract

NanoRacks and a team of industry leaders to design and build the next space stations to support low Earth orbit space activity. The concept, named Outpost, is based on the wet station architecture, where launch vehicle upper stages are reused after launch through in-space processing. Cryogenic upper stages are highly-capable spacecraft, designed to provide large pressurized volumes and are the structural foundation for new Outpost infrastructure in orbit after the launch in order to create both crewed and uncrewed, robotic platforms. Through NASA's public-private partnership model, the Outpost team successfully completed a feasibility study of the process to turn upper stages into functional habitats. The Outpost team has since continued to refine the architecture and the develop the individual technologies needed to modify and outfit the stage for habitation and payload hosting on orbit. These capabilities include robotic cutting, sealing, and assembly, low-profile deployable shielding, insulation, and photovoltaic arrays, distribution of data, power, heat, and air, attitude control, orbit maintenance, docking of visiting vehicles, ground processing, operations, and outfit-ting able to be installed within the upper stage. In addition, the team is preparing for a range of full-scale ground tests of these capabilities as NanoRacks moves toward the first flight demonstrations. Future Outposts will provide access to space for commercial, educational, and national and interna-tional space programs, allowing NanoRacks to continue building the low Earth orbit ecosystem. This paper will discuss the technical details of the Outpost system and the plan for it's development over the coming years.