Paper ID: 69829
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25th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Interactive Presentations - 25th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (IPB)

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CARAVAN – THE ENGINE BEHIND THE OASIS SOLAR SYSTEM ARCHITECTURE CARGO/CREW AUTONOMOUS RENDEZVOUS AND VELOCITY ADJUSTMENT/NAVIGATION

Abstract

The Crew/ Cargo Autonomous Rendezvous and Velocity Adjustment/Navigation (CARAVAN) system is the engine behind the exploration and industrialization of the solar system. For decades space visionaries have dreamed of achieving space-based highways driven by reusable propulsion systems. Industry, NASA and their international partners are taking the first steps to transform vision into reality as part of the Artemis campaign.

Pushing the boundaries of existing launch vehicle capabilities necessitates, for the first time, an orbital-based maneuvering system. CARAVAN and its accompanying architecture will deliver at least three times the payload previously available exploration missions. As launch vehicles continue to evolve, delivering larger payloads to Low Earth Orbit (LEO), CARAVAN will continue to ensure that spacecrafts focus remains the mission. As such, CARAVAN reduces the complexity of these spacecraft by eliminating propulsion elements. This value proposition also extends to the launch systems as well reducing both the cost and complexity by eliminating the need for a standard upper stage. Additionally, this architecture enables smaller launch vehicles to enter the commercial and government orbital markets expanding access to space and reducing cost through competition.

Here we detail the CARAVAN transfer module design and client interfaces as well as the Operations and Service Infrastructure for Space (OASIS) architectural design that will fuel humanities reach for the stars. The concept of operations including timelines for customer rendezvous and docking in LEO and delivery to the desired destination. As a sustained human lunar presence is established and the first men to Mars arrive alongside missions to the asteroids and outer planets behind these transformative endeavors will be CARAVAN.