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23rd IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems (2A)

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ISAM APPLIED: MODULAR SPACECRAFT SYSTEMS ENABLE PAYLOAD REUSE POST-LAUNCH

Abstract

Advances in Small Satellite technology combined with the availability of low-cost rideshares to Low-Earth Orbit (LEO) have led to an increasing number of space missions. However, the underlying technology for small payload missions has been relatively constant over the past two decades: CubeSat form factor platforms for free-flying missions in LEO. Arkisys is working to change this, and allow a wider variety of payloads to reach LEO which don't have a free-flying requirement. This platform is called "The Port", and is an autonomous long-duration orbital platform for hosted payloads in LEO. Over the past two decades, technologies related to In Space Assembly and Manufacturing (ISAM) have progressed at a rapid pace, enabling new modular space robotic systems to become a reality. Arkisys has created a robotic platform for long-duration payload hosting in LEO and has demonstrated this capability in ground testing at our facility. By using modular robotic integration schemes, it is possible to add new payloads to a spacecraft while its already in orbit, opening up the possibility for payload reuse and recycling. Combined with decreased launch costs, this enables testing of new technologies in space, and access to space, at a much lower cost than was previously thought possible. Many payloads that are sent to space don't have strict requirements on their location in orbit, nor do they need to spend the time and resources to worry about how they will be generating their power and maintaining communications with the ground. Arkisys offers an answer to the question of "what if a payload could be plugged into a station in orbit?". This removes the need to include support equipment, such as power and ADACS on each mission, and instead reserve the entire volume of the CubeSat for a payload! This paper puts forward the results obtained from our simulations and hardware testing for in-space robotic assembly and integration of payloads. This data supports the usage of long-duration orbital platforms to serve short- and medium-term missions to LEO and offload some of the existing payload backlog from traditional rideshare and ISS-type missions.