19th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Access to Space for Small Satellite Missions (5)

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THE X-37B ORBITAL TEST VEHICLE AS A TECHNOLOGY DEVELOPMENT AND MATURATION PLATFORM FOR PRIMARY AND SECONDARY EXPERIMENTS

Abstract

The X-37B reusable space system is a proven capability which can accommodate various small satellites and experimental payloads. The X-37B has successfully demonstrated a fault tolerant architecture through a complete launch, recovery, and refurbishment cycle. Platform development risks have already been retired so focus can be directed to instrument, sensor, and experiment development. As a returnable system, the X-37B provides multiple launch opportunities over its mission life. The X-37B is launched on an Atlas V into inclined orbits between 28 and 57 degrees, at altitudes between 205 km and 925 km (110 and 500 nmi), and can stay on-station for more than 270 days.

This paper describes several ride-share and auxiliary experiment configurations to provide access to space for small satellite missions using the X-37B platform. The Atlas V configured to launch the X-37B has significant excess throw weight, enabling ride-share opportunities both in the payload bay and attached external to the platform on an adapter ring. Experiments which require services such as power, thermal control, data handling, and GPS can be mounted to the dedicated mission bench in the payload bay. The "Plug-n-Play" (PNP) nature of the mission bench allows experiment integration, up to 227 kg (500 lbm), in parallel with vehicle processing. We describe the PNP interfaces and processes for experiment integration with the X-37B mission bench. An added benefit of using the mission bench is the ability to operate in low earth orbit, return in a 1.5g environment, and recover experiments post-landing. Return of experiments with post flight inspections creates the environment for evolutionary product improvements, retirement of development risk, repurposing, and re-flight on future missions.

Experiments that are too large to fit in the payload bay or require operation independent of the X-37B can be mounted to an attached adapter ring for ride-share insertion. We illustrate how a secondary payload adapter can be mounted on the aft end of the X-37B platform to provide multiple ports for experiment integration. Adapter ring experiments can be dispensed for free-flying operations and do not return with the X-37B platform. The X-37B offers a cost effective path to improve Technology Readiness Levels (TRL) on shortened timelines and mitigate risk while providing reliable access to space for auxiliary experiments and ride-share satellites.