Paper ID: 34249
student

SPACE SYSTEMS SYMPOSIUM (D1)
Hosted Payloads - Concepts, Techniques and Challenges, Missions and Applications (7)

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THE XCUBE CONCEPT: EXTENDING THE CUBESAT STANDARD FROM NANO-SATS TO HOSTED EXPERIMENTS

Abstract

During the past decade, the CubeSat standard has led to tremendous improvements in how we develop space projects. Adoption of the standard has reduced the cost of space missions, and has allowed a large new community of people to get involved in space-related studies.

NASA Ames Research Center's XCube concept aims to use the CubeSat form factor as a standard for airborne payloads. Through standardization, the payloads will be compatible with a large range of host vehicles such as UAVs, balloons, research aircraft and suborbital launch vehicles. Each host has a specifically designed carrier that ensures its compatibility with XCube experiments. The carrier is designed to create friendly accommodation for the XCubes and ensure their operation by providing them with power, data interface, and possibly outside air source interface.

Because they are destined for stand-alone operation in space, CubeSats must carry the subsystems required to operate independently – including an RF communications system, battery power system, possibly an attitude determination and control system (ADCS) or other systems unique to the requirements. XCube payloads, much like hosted payloads on larger satellites, can take advantage of the systems present on the host vehicle to reduce complexity, cost, and development time. By leveraging the CubeSat standard, XCube payload developers benefit from the large ecosystem of commercial products developed to support the CubeSat community, as well as the associated body of knowledge built up by CubeSat developers.

XCube offers a straightforward path for developers to transition instruments from airborne or suborbital testing, to integration in a CubeSat satellite mission. This allows scientists and engineers to shake out low-TRL concepts and technologies through low-cost testing, resulting in rapid maturation and risk-reduction to achieve a spaceworthy system.

In order to demonstrate the possibilities of XCube for airborne science, a Host prototype has been developed. This host is designed to fit NASA Ames' SIERRA Aircraft. In the meantime an XCube payload prototype has been developed in order to qualify the integration of XCube into the host and start building knowledge and feedback on XCube manufacturing and operation.

This presentation describes the XCube concept, use cases for several host vehicles, and the ongoing development of the first XCube payload prototype at ESTACA.