SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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RAPID DEPLOYMENT OF SPACE CAPABILITIES: TOOLS FOR ACCELERATING INNOVATION IN EXISTING AND DEVELOPING SYSTEMS

Abstract

Space technologies provide immeasurable human benefit: connecting societies, enhancing safety and supporting commerce. Unfortunately, the slow speed of technology insertion in many space systems delays and dilutes the full potential of these systems. Slow technology adoption timeframes due to lengthy space hardware qualification testing and a risk-averse posture due to high launch costs is understandable, but the end result is new and promising space technologies remain on the ground. If this slow pace of technology insertion continues, space services will not keep pace with the rapidly expanding demands of the market, particularly in the areas of mobile telephony, smart phones, navigation services, mobile computing, and military applications. We believe innovative approaches are available to accelerate the deployment of promising technology in ways that benefit both existing satellite service providers and new technology-driven ventures.

This paper addresses two fundamental approaches to overcome the barriers that slow technology adoption, rapid prototyping and shared deployment. Rapid prototyping reduces technology risks and the need for long qualification tests while creating innovative demonstrators that set the stage for future commercial needs. We present a model for rapid prototyping emphasizing iterative development, harnessing ideas from the next generation of space engineers, and merging the agility of internet service development with the harsh constraints of the space environment. We discuss how these elements of the "innovation engine" expand the capacity of the organization to invent new missions and services.

The notion of shared deployment explores the mutual benefits offered by hosted secondary payloads and ride share satellites. In some markets, launch slots are full well into the future, limiting opportunities to deploy new capabilities. We show how shared manifests allow for earlier introduction of new services without impacting existing systems in production. In fact, secondary payloads offer several benefits to the host, including additional revenue streams, diversified customer base, and offset launch costs.

Finally, we put the concepts together, through a variety of advanced technologies and hosting strategies. As space systems become increasingly complex, we need new engineering tools and methods to deliver capabilities faster. We introduce a tailored systems engineering framework to integrate hosted missions. The keys to streamlining mission integration include reusing and extending patterns for architectures, designs and operations. We show how system modeling and reference architectures enable rapid integration with available components and standard interfaces. These methods and processes result in quicker transition of new technologies from ground demonstrations to on-orbit missions.