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Author: Mr. Zheng Tao
AirSpace Innovation, United States

ENABLING ON-DEMAND LAUNCHES AND REENTRIES

Abstract

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For over a decade, the Department of Defense (DoD) and Defense Advanced Research Projects Agency's (DARPA's) Tactical Technology Office (TTO) have been working to develop a "responsive space" or "rapid launch" capability to enable rapid and flexible space launch and reentry (L/R) missions with 24 hours or less notice using small to medium launch/reentry vehicles termed "On-Demand Launches and Reentries" (ODLAR). DARPA's investments from 2013-2020 in programs like Airborne Launch Assist Space Access, Experimental Spaceplane, and DARPA Launch Challenge have shown that industry launch/reentry vehicle designs and technologies can achieve ODLAR missions. However, integration with the National Airspace System (NAS) remains a significant challenge.

The NAS, controlled by the Federal Aviation Administration, supports a diverse range of users, including civil air transportation and government. DoD space missions must comply with FAA rules and processes, which currently do not sustainably support high-cadence ODLAR missions due to manually intensive processes designed for mission with much lower cadence, and a lack of electronic data exchange within the FAA and with stakeholders. From 2022-2023, DARPA funded AirSpace Innovation (ASI) to identify the NAS integration challenges for ODLAR missions, and to develop a roadmap with potential solutions to address them.

The project objectives were to 1) assess ODLAR desires and current air traffic management operations during L/R missions, 2) develop a vision for on-demand launch and reentry and its high-level architecture, 3) identify potential solutions to enable ODLAR, and 4) create a high-level implementation roadmap. Stakeholder engagement sessions with industry, DoD, and FAA revealed that current FAA processes prevent routine and sustainable ODLAR missions. The FAA's inability to support high-cadence missions and reliance on manually intensive processes are key challenges. The project proposed a comprehensive workflow and solutions, including pre-approved mission templates, electronic filing and management of space mission plans, and real-time airspace management tools such as Real-Time Hazard Area Generation The ODLAR project concluded that achieving routine and sustainable ODLAR missions requires significant changes to FAA processes and systems, as well as sustained DoD-FAA collaboration. The proposed solutions and roadmap provide a clear path towards enabling rapid and flexible space missions, improving national security, and ensuring the resilience of space-based capabilities.