

Challenging Space: Strategic S&T from LEO to Cislunar

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ABSTRACT

The space domain is fast becoming a congested and contested area of operations for the US Space Force and commercial industry. Increasing numbers of satellites and debris, challenging orbits from VLEO to cislunar, and multi-national operations will continue to challenge the SDA community as we move into the Second Space Age. We are in a second space age, where great power government competition has resumed and commercial exploitation of space is driving the advancement of technology and our policies. Our National Space Policy recognizes our dependence on space and the opportunities it provides. It is underpinned by principles of responsible behavior in the domain; a robust, innovative and competitive commercial sector; cooperation with like-minded nations as we set our sights on the moon and Mars; and a place to conduct economic, scientific, commercial, and national security activities free from interference from others. These principles require a whole of government approach that extends to the commercial sector. Anti-satellite tests and the sheer number of objects in orbit underpin the need to establish norms of behavior in the domain. The projected economic impact from and through the space domain continues to increase dramatically for the foreseeable future and the US Space Force's role to protect and defend that domain will grow in complexity. Just as in the maritime and overland trade routes, there are likely to be preferred routes to and from the Moon and asteroids as a function of energy (ΔV), traditionally known as lines of communications or commerce. Along these lines of communication can be economic activity, staging areas, safe harbors or resupply locations, or resource conversion into products. If maritime transit and support to remote scientific activities in Antarctica are a harbinger, then these economic opportunities may also have military missions for rescue services, salvage, navigation aids, and logistical support. The military could also benefit from civil and commercial development of these lines of communication. Space Domain Awareness is important for safe and secure transit of the domain. Many of these same growing pains have parallels to other historical events including the development of trans-Atlantic flights last century. Many of the AFRL and SSC technologies currently under development will be critical to solving the challenges and complexities of these new domains. AFRL is advancing the ball in this domain on multiple fronts. The first is conceptual. We have worked to help forecast and design how commerce and the need to defend it might evolve – and to define a technology pathway so that should US space forces ever need to protect commerce, we will not be caught flat footed. The Second is in naming and mapping. We have released a primer on Cislunar space to help educate strategists and planners about just how different and significant are the challenges of operating and maintaining vigilance beyond GEO. Most of Space Domain Awareness is focused on finding, tracking, identifying, and characterizing satellites and debris. Understanding the space weather environment and assessing those hazards is also an important component of Space Domain Awareness. Measurement data, in conjunction with anomaly assessment tools are critical to appropriate attribution in the space domain.

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