



Executive Summary

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IMPACTS OF ANTI-ACCESS/AREA DENIAL MEASURES ON SPACE SYSTEMS: ISSUES AND IMPLICATIONS FOR ARMY AND JOINT FORCES

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In January 2012, former President Barack Obama and Secretary of Defense Leon Panetta published new strategic guidance for 21st century defense that emphasized the need for U.S. Armed Forces to project power in an operational environment that included adversary anti-access/area denial (A2/AD) activities. Further, the guidance explicitly called for the development of effective U.S. space assets with the resilience to operate effectively despite threats that seek to disrupt or destroy them. The 2018 *National Defense Strategy* and *National Space Strategy* both reaffirm the vital interests that the United States has in the domain of space.

The utilization of space-based capabilities is an established part of modern military operations. The first live test of a Chinese anti-satellite (ASAT) system in 2007 forever changed how the world operates in space. In one event, the People's Liberation Army (PLA) created over 2,000 pieces of debris that increased the number of manmade objects in space by 20 percent, which increased the likelihood of collisions by 37 percent. During the Cold War, the Soviet Union maintained ASAT capabilities that included direct ascent, co-orbital, and directed energy systems; many of these could be reconstituted by Russia. The technologies required for A2/AD of space satellites were proven and some were even operationalized decades ago, and it is reasonable to consider that future rivals may utilize such systems. In short, space operations are becoming inherently more hazardous and vulnerable to disruption, denial, or destruction.

This monograph explores what might happen if an adversary applied such measures to U.S. space systems and how this might affect Army and joint operations. To accomplish this goal, this research focuses on the central question: What are ways for the Army to assure the success of its space-dependent warfighting functions in an A2/AD environment

where space systems are degraded for significant periods of time? After providing some necessary background information on space systems, this monograph addresses this question in three parts. First, it analyzes the space capabilities of potential adversaries as well as the technologies required and the nations that possess such capabilities. Second, it explores the strategic implications of such attacks and their potential effects on elements of national power, and then it concentrates on operational effects if space systems were degraded or made unavailable to the Army and other joint warfighters. Third, it examines current measures that may mitigate the negative effects of adversary A2/AD activities as well as possible alternative space capabilities under development. Finally, it makes recommendations for U.S. defense leadership with regard to strategic and operational opportunities to enhance A2/AD mitigation activities and the effectiveness of U.S. space power writ large.

The vision of outer space as a vast and tranquil sea is but an illusion; space is an inherently hostile environment that has become congested, contested, and competitive among the nations—and this trend shows no sign of abatement. However, as with the land, sea, and air commons, the peaceful pursuit of economic, diplomatic, and informational ends in space often requires the support of a capable and restrained military space force. The continued preeminence of U.S. military space capabilities depends on deliberate efforts to ensure access to and freedom of movement within the space domain.

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