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CISLUNAR SPACE DOMAIN AWARENESS (SDA)

Abstract

The United States Space Force defines Space Domain Awareness (SDA) as “effective identification, characterization, and understanding of any factor associated with the space domain that could affect space operations and thereby impact the security, safety, economy or environment of our nation.” Practitioners of SDA use various forms of satellite and sensor technology to detect and identify both natural and manmade objects around the Earth. Cislunar SDA extends this mission to the cislunar region, which encompasses volume of space associated with the Moon’s orbit around the Earth. Cislunar space is an emerging domain for military, commercial and civil activity, and there is an interest in cislunar SDA capabilities to enable nations to monitor this activity. As in Earth-orbit SDA, cislunar SDA would have both a safety and a security mission. As cislunar activity ramps up, tracking activity in this region will ensure that no accidental collisions or interference occur. A prime example of a recent cislunar collision occurred in October 2020, when the Indian Space Research Organization’s Chandrayaan-2 came dangerously close to NASA’s Lunar Reconnaissance Orbiter but was able to perform a successful collision avoidance maneuver. Additionally, the United States may be interested in detecting and tracking any potential threats in this region and ensuring that officials have the capability to attribute any interference or attacks. Space Domain Awareness (also referred to as Space Situational Awareness) is a rapidly evolving sector, with numerous new technologies and actors contributing to SDA in Earth orbit. This paper identifies the key actors and developments in this sector, as well as the major policy issues that have emerged, and examines how these may apply to the newly emerging area of cislunar SDA. As cislunar SDA capabilities are still generally new to the discipline, there are a limited number of active stakeholders participating in cislunar space. The United States, through the Department of Defense and NASA, along with various private entities like Exoanalytic Solutions and Rhea Space Activity, lead the way in cislunar SDA developments. Examples of these works include the deep-space advanced radar concept program, also known as DARC and the Lunar Gateway. On the other hand, the Chinese National Space Administration, ROSCOSMOS, the European Space Agency, and JAXA all currently have SDA capabilities in Earth orbit, but mention little about expansion of surveillance into cislunar space. This paper also provides detail on the most prevalent discussions involving cislunar SDA focuses on whether surveillance developments in this domain are necessary and why. An overview of discussions concerning cooperation between civil and military entities, commercial and other private entities, and the potential for cooperation internationally will be also included.