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Up, up and away: Future legal regimes for long-term presence in space (2)

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LEGAL UNCERTAINTIES RELATED TO ADDITIVE MANUFACTURING IN SPACE

Abstract

Additive manufacturing (AM), also referred to as three-dimensional printing, is a set of layer-by-layer processes for producing 3D objects directly from a digital model. Since its inception a few decades ago, the AM industry has grown to almost $3 billion as of 2012, and is poised to grow to more than $6.5 billion by 2019. While the field has great promise for terrestrial applications, its promise in space – reduced dependence on materials transported from earth and the ability to "live off the land" - has the potential to radically transform the space enterprise. There are a number of studies underway, both supported by the government and the private sector, that examine the technical feasibility and application of AM in outer space. Most recently, the U.S. National Academy of Science (NAS) established an ad-hoc committee to explore the implications of space-based AM technologies for space operations and the manufacture of space hardware. The NAS study focus is on technological and institutional issues not legal ones, even though legal questions such as those related to use of in situ resources (e.g., lunar regolith on the surface of the moon) for manufacturing may arise when AM is used in outer space. This paper identifies and provides an assessment of critical legal questions and lacuna involving AM in outer space, including ownership and transfers thereof, liability, in-situ exploitation, registration, and jurisdiction and control. Thereafter, it explores the question of regulating AM in outer space in current and future legal regimes.