Paper ID: 98740
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IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems (4)

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SUPER HEAVY-LIFT LAUNCH TECHNOLOGIES AND THEIR IMPACT ON THE SPACE SECTOR

Abstract

This paper focuses on the of future space transportation that is enabled by super-heavy lift vehicles. Boosted by private and government individual investments and public-private partnerships, the commercial space market has grown considerably. Commercial space companies are pushing the envelope by developing space capabilities that could potentially add flexibility, resiliency, and reduction in costs to United States (US) space programs. The US Government (USG) invested in launch technology and fostered the creation of this industry; now, investments from private entities supplemented by USG space and launch programs are driving rapid innovation and speedy delivery of space assets. These investments have driven the development of "super heavy-lift" launch systems, which is defined in the US as the ability to lift more than 50 metric tons to Low Earth Orbit in a single launch and is now accessible to the commercial marketplace. This capability has been previously demonstrated by the Saturn V and Energia programs, but commercial payloads have been unable to take advantage of this capacity until Falcon Heavy reached operational capability in the late 2010s/early 2020s. Now, as novel super heavy-lift platforms are being developed, it is necessary to examine the maturity of the technologies necessary for their success in reliable, low-cost access to space. Additionally, the impact of these capabilities, including the shift in mindset for the design and usage of payloads on these vehicles, is analyzed to evaluate the new markets and research areas opened by super heavy-lift launch technologies. This paper also provides exemplars of how heavy-lift can be exploited so that unique capabilities can be delivered to space and enable unique missions constructs that were previously not possible. With the new emerging space ventures in the commercial market, the paper provides the future overall benefits of super heavy lift transportation systems and the missions these capabilities will enable for Earth-to-orbit transportation.