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NASA's Space Launch System Advanced Booster Development

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Abstract

The National Aeronautics and Space Administration's (NASA's) Space Launch System (SLS) Program, managed at the Marshall Space Flight Center, is making progress toward delivering a new capability for human space flight and scientific missions beyond Earth orbit. NASA is executing this development within flat budgetary guidelines by using existing engines assets and heritage technology to ready an initial 70 metric ton (t) lift capability for launch in 2017, and then employing a block upgrade approach to evolve a 130-t capability after 2021. A key component of the SLS acquisition plan is a three-phased approach for the first-stage boosters. The first phase is to expedite the 70-t configuration by completing development of the Space Shuttle heritage 5-segment solid rocket boosters (SRBs) for the initial flights of SLS. Since no existing boosters can meet the performance requirements for the 130-t class SLS, the next phases of the strategy focus on the eventual development of advanced boosters with an expected thrust class potentially double the current 5-segment solid rocket booster capability of 3.88 million pounds of thrust each. The second phase in the booster acquisition plan is the Advanced Booster Engineering Demonstration and/or Risk Reduction (ABEDRR) effort, for which contracts were awarded beginning in 2012 after a full and open competition, with a stated intent to reduce risks leading to an affordable advanced booster. NASA has awarded ABEDRR contracts to four industry teams, which are looking into new options for liquid-fuel booster engines, solid-fuel-motor propellants, and composite booster structures. Demonstrations and/or risk reduction efforts were required to be related to a proposed booster concept directly applicable to fielding an advanced booster. This paper will discuss the status of this acquisition strategy and its results toward readying both the 70 t and 130 t configurations of SLS. The third and final phase will be a full and open competition for Design, Development, Test, and Evaluation (DDT&E) of the advanced boosters. These new boosters will enable the flexible path approach to deep space exploration, opening up vast opportunities for human missions to near-Earth asteroids and Mars. This evolved capability will offer large volume for science missions and payloads, will be modular and flexible, and will be right-sized for mission requirements.