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SLS BLOCK 1B EVOLUTION: TECHNOLOGIES AND PERFORMANCE

Abstract

Human exploration beyond low earth orbit (BEO) has been a long-term goal of the United States and the international community since the end of the Apollo program. The current administration has further emphasized the BEO mission with Space Policy Directive 1 directing NASA to return to the Moon followed by crewed missions to Mars. To achieve this goal, NASA has been developing the Orion crew capsule and Space Launch System (SLS) as key elements in the architecture designed to advance human spaceflight from our current capability in low earth orbit to eventually landing humans on Mars.

The SLS Block 1B vehicle consists of a liquid oxygen/liquid hydrogen powered core with two strap-on solid rocket boosters, and a liquid oxygen/liquid hydrogen powered Exploration Upper Stage (EUS), designed and built by Boeing. Evolutions in the design of those components will further increase the capability of SLS to complete its defined missions.

The EUS is the next evolution in the development of the SLS, prepared for a multimission role with accommodations for mission modification kits and variable propellant loading capability. The EUS is a 300,000 lb. stage to be powered by four RL10C3 engines. With increased propellant and engine power, the EUS increases the capability of SLS compared to the Block 1 vehicle and is more optimized for the performance of the core and booster stages.

The current SLS Boosters are built by Northrop Grumman and are improvements to the Reusable/Redesigned Solid Rockets Motors (RSRM) designed and built for the Space Shuttle. Northrop Grumman is currently studying Booster Obsolescence and Life Extension (BOLE) of the SLS Boosters. The study is looking to replace obsolete materials, and include technologies to improve the manufacture and performance of the boosters, with upgrades to the propellant and liner system.

This paper will discuss the on-going efforts on BOLE and EUS. It will discuss the upgraded technologies that have been studied, as well as the changes to performance.