

15th Reinventing Space Conference, 24-26 October 2017, Glasgow, Scotland

NASA's Space Launch System: Enabling Exploration and Discovery

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As NASA's new Space Launch System (SLS) launch vehicle continues to mature toward its first flight and beyond, so too do the agency's plans for utilization of the rocket. Substantial progress has been made toward the production of the vehicle for the first flight of SLS – an initial “Block 1” configuration capable of delivering more than 70 metric tons (t) to Low Earth Orbit (LEO). That vehicle will be used for an uncrewed integrated test flight, propelling NASA's Orion spacecraft into lunar orbit before it returns safely to Earth. Flight hardware for that launch is being manufactured at facilities around the United States, and, in the case of Orion's service module, beyond. At the same time, production has already begun on the vehicle for the second SLS flight, a more powerful Block 1B configuration capable of delivering more than 105 t to LEO. This configuration will be used for crewed launches of Orion, sending astronauts farther into space than anyone has previously ventured. The 1B configuration will introduce an Exploration Upper Stage, capable of both ascent and in-space propulsion, as well as a Universal Stage Adapter – a payload bay allowing the flight of exploration hardware with Orion – and unprecedentedly large payload fairings that will enable currently impossible spacecraft and mission profiles on uncrewed launches. The Block 1B vehicle will also expand on the initial configuration's ability to deploy CubeSat secondary payloads, creating new opportunities for low-cost access to deep space. Development work is also underway on future upgrades to SLS, which will culminate in about a decade in the Block 2 configuration, capable of delivering 130 t to LEO via the addition of advanced boosters. As the first SLS draws closer to launch, NASA continues to refine plans for the human deep-space exploration it will enable. Planning currently focuses on use of the vehicle to assemble a Deep Space Gateway, which would comprise a habitat in the lunar vicinity allowing astronauts to gain experience living and working in deep space, a testbed for new systems and capabilities needed for exploration beyond, and a departure point for NASA and partners to send missions to other destinations. Assembly of the Gateway would be followed by a Deep Space Transport, which would be a vehicle capable of carrying astronauts farther into our solar system and eventually to Mars. This paper will give an overview of SLS' current status and its capabilities, and discuss current utilization planning.