

Mars Exploration (3)
Mars Exploration (4) (4)

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THE NASA SPACE LAUNCH SYSTEM (SLS) CAPABILITIES FOR THE 2033 CREWED MARS FLYBY MISSION

Abstract

The NASA Space Launch System (SLS) outstanding capabilities for launching heavy payloads in very large diameter faring's will enable a variety of Beyond Earth Orbit (BEO) exploration missions, including a number of exciting missions that could not otherwise be considered apart from the SLS. The Boeing Exploration Launch Systems division is currently developing the SLS Core Stage for the NASA Marshall Space Flight Center, and the Stage, after testing at the NASA Stennis Space Center is being prepared for its first launch this year. A second SLS Core Stage is presently in manufacture along with other elements needed for the second launch. In this paper, an overview will be given of the SLS production status, along with a summary description of the launcher. Also an update will be given of the SLS' large Exploration Upper Stage (EUS). the EUS, under development, is designed to optimize the SLS' powerful Core and Booster stages, and is the next step in the SLS' evolution to even higher capability. The SLS Block 1B configuration will allow the launch of the elements necessary to a 2033 crewed Mars flyby mission. Included in this paper will be conceptual overview of the flyby mission's trajectory, stages, operations and the large Exploration Crew Module (ECM) habitat. Planning calls for the ECM to be first flown in 2027 on a six month test mission to lunar vicinity. At the conclusion of which the ECM will be returned to the Lunar Gateway facility in a near rectilinear halo orbit (NRHO) and refitted for reuse in 2033. Descriptions of this mission will serve to highlight the robust capabilities provided by SLS and show how exciting BEO missions are enhanced or enabled by its heavy lift, high energy (C3) injection capability. This report will come from the Exploration Launch Systems Division of the Boeing company.