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EVALUATION OF CURRENTLY AND NEAR-TERM AVAILABLE HEAVY LAUNCH SYSTEMS WITH RESPECT TO INTERPLANETARY MANNED MISSIONS

Abstract

In the context of the Mars Society International Student Design Competition heavy and medium launch systems as well as their respective upper stages have been evaluated. The overall goal was to identify a combination of systems that would allow for the launch of the required habitat mass as well as its trans-mars-injection (TMI) with as little cost and complexity as possible. This makes the use of heavy launchers mandatory to keep the number of required starts at a minimum. Main factors in the evaluation were technology readiness, cost and the capability of fulfilling the tight schedule until TMI in 2018. Moreover, the possibility of modifications to the respective launch systems to make them more suitable for the mission has been investigated. A big issue is the lack of reliable detailed information about the launch systems themselves. Moreover, currently there is only one manned space launch system available and published information and schedules for future heavy launch systems cannot be trusted entirely. Technological problems ensue from fuel boil-off during the assembly of the habitat and TMI-Structure in orbit, required docking maneuvers and structural strength of existing docking ports. A launch and assembly layout has been developed that tackles all of these current issues and ensures that the required launch systems are realistically available.