

Title: Use of DES Modeling for Determining Launch Availability for SLS

Authors: Mike Watson, Eric Staton, Grant Cates, Ron Finn, Karen Altino, and Lee Burns

The National Aeronautics and Space Administration (NASA) is developing new capabilities for human and scientific exploration beyond Earth's orbit. This effort includes the Space Shuttle derived Space Launch System (SLS), the Multi-Purpose Crew Vehicle (MPCV) "Orion", and the Ground Systems Development and Operations (GSDO). There are several requirements and Technical Performance Measures (TPMs) that have been levied by the Exploration Systems Development (ESD) upon the SLS, MPCV, and GSDO Programs including an integrated Launch Availability (LA) TPM. The LA TPM is used to drive into the SLS, Orion and GSDO designs a high confidence of successfully launching exploration missions that have narrow Earth departure windows. The LA TPM takes into consideration the reliability of the overall system (SLS, Orion and GSDO), natural environments, likelihood of a failure, and the time required to recover from an anomaly. A challenge with the LA TPM is the interrelationships between SLS, Orion, GSDO and the natural environments during launch countdown and launch delays that makes it impossible to develop an analytical solution for calculating the integrated launch probability. This paper provides an overview of how Discrete Event Simulation (DES) modeling was used to develop the LA TPM, how it was allocated down to the individual programs, and how the LA analysis is being used to inform and drive the SLS, Orion, and GSDO designs to ensure adequate launch availability for future human exploration.