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Author: Ms. Nujoud Merancy

National Aeronautics and Space Administration (NASA), United States, nujoud.merancy@nasa.gov

Mr. Michael Sarafin

National Aeronautics and Space Administration (NASA), United States, michael.l.sarafin@nasa.gov

Dr. Jennifer Gruber

National Aeronautics and Space Administration (NASA), United States, jennifer.r.gruber@nasa.gov

HUMAN LUNAR MISSION DESIGN: THEN & NOW

Abstract

As international space exploration nears a return to lunar missions, comparisons and questions with respect to past accomplishments are natural. Building on the success of the Apollo and Saturn V lunar missions during the mid 20th century, NASA has learned many valuable lessons. The general physics of going to the moon do not depend upon the decade; however, many specific differences arise in the mission design and vehicle constraints based stated goals and objectives.

This paper will build on the theme of the 70th International Astronautical Congress, titled “The Power of the Past, The Promise of the Future” to highlight mission design characteristics as compared between Apollo/Saturn and Orion/SLS. In particular, the potential lunar destinations are significant drivers in the resulting vehicle performance and constraints. Key system parameters will be compared to highlight differences between Apollo and Exploration missions that were essential drivers in their mission design. Launch opportunities and the potential future evolution of the current NASA plans have also been considerations in orbit selection and the resulting mission operation.

While at a glance, it appears the success of Apollo/Saturn missions should be ‘easy’ to replicate, this paper will highlight the additional challenges and techniques asked of Orion/SLS. These challenges include reusability, the scope of lunar surface access, and increased duration and crew complements for lunar surface missions. This paper will conclude with a summary of key characteristics inherent in the mission design characteristics.