IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (IPB)

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SPACE TRANSPORTATION SYSTEMS - LESSON LEARNED FROM PAST DEEP SPACE MISSIONS

Abstract

This decade has seen historical worldwide involvement in the space sector. The number of commercial companies building spacecraft is at its highest, and the number of humans going to space is rapidly increasing every month. With its innate curiosity to explore our cosmos, humanity plans to venture further than ever before. Although we have been able to send rovers and other functionally smart spacecraft to the edge of our solar system, human spaceflight beyond LEO comes with added difficulties that we have yet to fully resolve. This undertaking requires a foundational understanding of the requirements for Deep Space Transportation Systems. That includes designing spacecraft that can accommodate efficient propulsion systems for long duration space travel, as well as choosing materials capable of protecting all living beings aboard the vehicle from galactic cosmic rays and solar radiation. Studying existing technologies and recognising where the complexities lie will help in the allocation of resources to tackle the most pressing of issues. Before being able to develop solutions, we must first understand existing scientific achievements that have supported deep space missions to date. This study will review technological advancements in the field, as well as critically assess which open questions are most crucial to deal with. This begins with defining the phases of interplanetary deep space mission operations, consolidating state-of-the-art protective materials for extreme environments, assessing current energy/power generation systems, and finally understanding which propulsion systems could be most efficient for this endeavour. These technologies will be summarised in a table format, to allow for ease of assessment by future researchers. This will include information about the stages of development for each technology, and whether or not it has been tested. This could help resurface forgotten systems that were thought to be out of bounds at the time,

but could now be of great use if integrated with recent technological advancements. Finally, the outcome of this study is to define research questions in each of these areas, in order to effectively develop solutions for future deep space missions. This study is performed by the Deep Space Initiative (DSI); a non-profit company for which the goal is to increase accessibility and opportunity for space research, and its main focus is to help enable deep space exploration for all Humankind.