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IAF SPACE PROPULSION SYMPOSIUM (C4)
New Missions Enabled by New Propulsion Technology and Systems (6)

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3U NANOSATELLITE WITH ELECTRIC PROPULSION AS A MOON PROBE FOR A FLYBY MISSION

Abstract

From the advent of the space race, mankind has raised the standards of space technology through miniaturization and diversification. Nano-satellite technologies were first developed for low-cost experimentation purposes by University students. Currently, it is being explored for diverse applications in the space sector. Propulsion system is crucial to a successful space mission, as it takes the spacecraft to the farthest destination at the cost of least resources. Electric Propulsion is a type of propulsion where electricity and its effects are used to propel the spacecraft. As a renewable and clean form of energy, along with the successful implementation in many spacecrafts since 1962, it is a viable method which is to be optimized further. As the closest heavenly object to our planet, knowledge of the Moon is essential as it has crucial effects on our planet's gravity and could have potential untapped resources. Sending in nano-satellites as a precursor to more complex missions gives more useful data to make critical mission strategies. For successful observation and data collection about the Moon, performing a flyby mission using nano-satellites is a highly cost-effective option, especially when it uses renewable resources and propulsion. This can be accomplished using a highly effective satellite design, customized propulsion, attitude and altitude determination and control, communications, thermal control, data collection and processing, physical, electromagnetic and radiation shielding, power and sensor systems for optimum operation. Using a novel concept of propelling our satellite with modified reaction wheels, we can propagate it to the Moon through a series of trans-lunar orbits and any subsequent space operations optimized for the reaction wheel performance relying only on electric power. Coupled with a cost-effective mission architecture, this is a practically feasible endeavor subject to the availability of sufficient necessary resources.