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Author: Mr. Siddhesh Naik
India, siddhesh@sirana.in

MARAV - CONCEPTUAL DESIGN OF SOLAR POWERED MARTIAN AERIAL VEHICLE

Abstract

Mars has been the focus of interplanetary missions over the last decade, with four countries launching eight different exploratory missions. Orbiters like Mangalyaan and Mars Reconnaissance Orbiter (MRO) have covered large areas of martian surface and provided medium resolution images for scientific exploration. Rovers and Landers like Opportunity and Curiosity have enabled in-situ experiments which provide biological and geochemical insights about martian surface. However, the rovers have limited range providing localized information. There is a need for system that can provide high-resolution imagery coupled with wider coverage and endurance.

The research presented in this paper covers the preliminary design of a solar powered martian aerial vehicle. Advancements in high energy density battery technology and autonomous flight makes continuous flight over martian surface possible. This paper describes the overall sizing process of the aerial vehicle along-with energy balance accounting for diurnal variation in radiant solar energy. MarAV will be carried in aero-shell which will protect the aerial vehicle from intense heat during reentry.