

SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

Author: Mr. Lucais Kwon
Defiant Labs, Canada

Mr. Stephen Wolski
Defiant Labs, Canada

Dr. Harish Bhaskar
Defiant Labs, Canada

Mr. Jeremy Chan-Hao Wang
Defiant Labs, Canada

INVESTIGATION OF UAV DESIGNS FOR USE ON FUTURE MISSIONS TO MARS

Abstract

With continued interest from governmental space agencies and corporations to conduct a manned mission to Mars, there has been great discussion in what experiments and studies they should conduct. Historically, exploration of Mars involved land-based rovers, which were slow to travel great distances, and as a result, slow to capture data. With the recent advancements in Unmanned Aerial Vehicles (UAVs), they may become a key component in the next manned missions to Mars. UAVs are less complex, and have potentially lower costs in comparison to traditional space technologies such as rovers or satellites. In current literature, there is little discussion on how an UAV would look like in Mars environment, which poses a number of challenges. Mars has a thinner atmosphere, extreme temperatures, and has lower gravity in comparison to Earth. This paper will explore various airframe and propulsion configurations of a UAV to explore Mars, conducting trade studies, and evaluating their performance and economic costs. UAV endurance, flight range, sensor capability, and operational logistics are considered for their impact on performance, cost and quality of data collected. Once an optimized configuration is selected, it will be compared to traditional rovers and satellites for their performance and cost. The result will determine if a feasible UAV configuration is available to replace rovers and/or satellites for future manned missions to Mars, and propose a UAV configuration that is optimized for Mars exploration.