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

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AERODYNAMIC ANALYSIS OF AN AIRPLANE GLIDING ON MARS

Abstract

In the frame of planetary exploration, Mars has become one of the main interest for space companies across the globe, with being the most visited planet in the solar system. The race of the globe to colonize Mars is leading companies to develop new cost-effective technologies i.e. gliding airplanes for future missions. Yet, no airplanes has ever glided on Mars, however, few concept based ideas were proposed, whereas current studies investigates and examines the possibility to glide in a Martian atmosphere. Gliding airplanes could lead to cost reduction of future missions as they can be deployed from a CubeSat i.e. 3U.

The aim of this research is to analyze the aerodynamic performance by simulating an airplane gliding the Martian atmosphere through Computational Fluid Dynamics (CFD) simulations. The analysis will be performed to assess the flow-field environment around the gliding airplane in the Martian atmosphere considering the fact that the Mars has a lower gravity than Earth (less than 40%), thinner air at the surface (less than 1%), and the major component of Mars' air is CO2 gas which's denser than Earth's air for a given pressure. The study will address the aerodynamic performance of a gliding airplane that include lift, drag and pitching moment coefficients at varying angles of attack, altitudes and speed. The aerodynamic performance of the gliding airplane will be analyzed and compared with Earth's atmosphere for future validation.