IAF SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration including Ocean Worlds (5)

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PRELIMINARY MISSION DESIGN TO VENUS: EXPLORATION OUR SISTER PLANET USING ATMOSPHERIC GLIDER AND CUBESAT CONSTELLATION - AN ENGINEERING APPROACH

Abstract

Venus, often regarded as Earth's twin planet that went astray has had a long history of exploration. However, major scientific questions regarding its composition, geology and structure remain quite unanswered. Venus is much like Earth in its size and mass, the existing conditions on this planet are hostile. Venus is completely covered with clouds having high reflectivity, which makes the planet receive about 1.4 times lesser energy than Earth, despite being located closer to the Sun. A systematic strategy is used to cover real time inter-disciplinary activities for the design and development of a research mission to study Venus. The study of Venusian atmosphere is crucial so as to understand the evolution of the terrestrial planet and also compare it with the Exoplanet research. An atmospheric glider for Venus has been designed that will investigate the lower cloud regions and the surface during it's cruise, aerosol and volcanic activity (if any) using a complex set of instruments composed of hyperspectral spectrometers, Electric field sensor, Noble gas mass spectrometer, trace gas analyzer and optical microscope. Extensive post study analysis has been resulted in the domain of Computational Fluid Dynamics (CFD) analysis for some of the airfoils to be selected for the glider. COMSOL Multiphysics has been used as software tool to design and virtually prepare to operate at a flight altitude for the glider at 40Km in Venus above the surface using Venus International Reference Atmosphere(VIRA) profile and the results have been compared with Earth like atmospheric conditions. The glider is expected to last a few months sending valuable data to the CubeSat Constellation. The CubeSat constellation in the Venus orbit will enable with a global framework and has wide coverage of different regions at the same time increasing the sampling time and data. This constellation will help analyze the cause and influence of geological activity on the climate and clouds, study the polar turbulence and perform mapping multiple times in subsequent intervals. It will also help in studying the magnetosphere of Venus and the influence of solar radiations and Galactic Cosmic Rays with the help of it's on-board instruments with more precise measurements.