

Interactive Presentations (IP)
Topic 5 - Interactive Presentations (5)

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AUTONOMOUS AERODYNAMIC REPEATING DIVER FOR VENUS ATMOSPHERIC RESEARCH
OF CLOUDS

Abstract

Past Venus missions did little to clarify the true complexity of Venus' Atmosphere because they were unable to collect and transmit data over a significant period of time. The AARDVARC mission will collect and relay atmospheric data from a wide range of latitudes throughout a Venusian year using a deployable and inflatable electrically powered aircraft at 65 to 45 km above the surface. The AARDVARC mission, Autonomous Aerodynamic Repeating Diver For Venus Atmospheric Research Of Clouds, is composed of three components - the Venus Orbiting Communication Satellite (VCOS), the Deployment Mechanism, and the Diving Atmospheric Research Aircraft (DARA). The Deployment Mechanism is deployed from the VOCS. The mechanism releases the inflatable airplane at 50 kilometers above the surface and then the Deployment Mechanism burns up in the lower atmosphere. DARA stabilizes its flight at 65 kilometers above the surface. DARA will avoid the thermal degradation experienced by past probes by loitering at a high altitude. At its cruising altitude of 65 kilometers the temperature is -43 C. During its dives, which occur once every 24 hours, it will encounter 15 minutes at 100 C. DARA will also remain at noon solar time for the duration of its mission. This allows for the maximum collection of solar energy while cruising. The inflatable structure also allows for a large surface area at low mass commensurate which lowers both launch vehicle constraints and aircraft power consumption. With an array size of 304 m², the power provided by the photovoltaic array integrated into the wing's upper surface is 155kW. Considering 20The attitude control of DARA is unique because of its inflatable design. DARA has four control modes - charging cruise, diving, data collection cruise, and rising. These modes are controlled by an Automatic Flight Control System and a Stability Augmentation System. The ADCS hardware consists of inflatable ailerons, various sensors and a propeller/motor. AARDVARC's strategy for exploring Venus allows a long mission duration and global data collection. This will provide consistent and comprehensive data that will allow scientists to gain a more complete understanding of Venus' atmosphere.