Proof of Concept Modeling of Venus Atmospheric Maneuverable Platform Utilizing Earth-Bound Modeling

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The focus of this study was to compare how a physical model of an aircraft that relies on both aerostatic and aerodynamic qualities in the structure to fly, based on the Northrop Grumman Venus Atmospheric Maneuverable Platform (VAMP), responds to flight in Earth's atmosphere. The hypothesis of the study is that while the aircraft's inflatable wing structure is filled with air, the plane will not exhibit characteristics of flight, but if the wings are filled with helium, then the aircraft will glide. Developing a physical model and testing the model on Earth can generate information to more accurately predict how a similarly designed aircraft would respond to flight in the atmosphere of Venus. The model was developed using Mylar balloons that inflate into scaled-down dimensions of the VAMP design, along with a Styrofoam fuselage to hold a deconstructed model helicopter motor and propeller to serve as the propulsion method. In totality, the experimentation exceeded most expectations in that the air-filled wing tests demonstrated some characteristics of flight. But during experimentation, it became immediately evident that the helium was positively impacting the way the plane flew above and beyond the air-filled model. The data supports the hypothesis, demonstrating that in tests of average flight time and flight speed, the helium-filled aircraft showed greater characteristics of flight and potential for long term sustained flight. It was also determined that a large inhibitor of long term sustained flight is that the motor was not sufficient in providing enough thrust to maintain the necessary speeds for flight. In the future, a similar model with a stronger propulsion system and improved aerodynamic qualities could help isolate more areas for improvement in the design.

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