

Venus Atmospheric Maneuverable Platform (VAMP) Science Vehicle: A Lifting Entry/Atmospheric Flight (LEAF) System Concept for the Exploration of Venus

Dr. Ronald S Polidan, Polidan Science Systems and Technologies, LLC



Abstract

In 2013 a team of scientists and engineers from Northrop Grumman Aerospace Systems and L-Garde, Inc. developed an innovative mission concept for a long-lived, maneuverable platform to explore the Venus upper atmosphere. This capability is an implementation of a Lifting Entry/Atmospheric Flight (LEAF) system concept, and the Venus implementation is called the Venus Atmospheric Maneuverable Platform (VAMP). The VAMP concept utilizes an ultra-low ballistic coefficient ($< 50 \text{ Pa}$), semi-buoyant aircraft that deploys prior to entering the atmosphere of Venus, enters without an aeroshell, and provides a long-lived (months to a year) maneuverable vehicle capable of carrying science instruments to explore the Venus upper atmosphere.

This presentation will provide an overview of the LEAF architecture and the VAMP implementation, addressing the air vehicle design, entry profile, concept for operations, and atmospheric science measurements and operations. Strawman concepts for a pathfinder, intermediate-, and large-size VAMPs will be presented and discussed as well as key factors impacting the design and performance of VAMP. The interdependencies of these factors, and the way these characteristics affect both the vehicle operations and the science objectives and measurements will also be presented. The science case for exploration of the upper atmosphere of Venus with VAMP will be discussed in detail, including possible instrument packages and specific science measurements. Finally, the application of a LEAF vehicle to the exploration of Saturn's moon Titan will be briefly discussed and the current status of the VAMP concept development will be presented.