

Cupid's Arrow: An Innovative Nanosat Mass Spectrometer to Sample Venus' Upper Atmosphere

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In NASA's Discovery 2014 AO, the opportunity to propose a Technology Demonstration Opportunity (TDO) to enhance the primary mission was specified. For the Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy (VERITAS) mission, we elected to include the Cupid's Arrow nanosat TDO to sample and measure the gas abundances, and key isotopic ratios in Venus's upper atmosphere.

This presentation will provide a basic overview of the VERITAS mission, with a focus on the Cupid's Arrow concept including a description of the mission, spacecraft design, and JPL's quadrupole ion trap mass spectrometer (QITMS) instrument specifications and design. In previous planetary entry probe mission designs, particularly at Venus, engineers were focused on entry and descent. A landed probe was also proposed for the New Frontier SAGE mission. For Cupid's Arrow, the nanosat is designed to skim through the upper atmosphere, just below the homopause, in order to sample the atmosphere, perform the analysis, and then exit the atmosphere to transmit its data to the orbiting VERITAS spacecraft.

Cupid's Arrow is a compelling addition to the VERITAS geology mission. A key missing link in our understanding of Venus' atmospheric evolution is the noble gas abundances and stable isotopic ratios. Not since Pioneer Venus have these measurements been made in the Venus atmosphere and never in the upper atmosphere, just below the homopause, to the degree of accuracy that will be accomplished by VERITAS' Cupid's Arrow nanosat.