

SPACE EXPLORATION SYMPOSIUM (A3)  
Solar System Exploration (5)

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ENABLING TECHNOLOGIES FOR FUTURE NEW FRONTIERS MISSION ATMOSPHERIC FLIGHT  
VEHICLES**Abstract**

The NASA science vision is to achieve a deep scientific understanding of our planet, other planets, and the universe beyond. Competitive programs such as Discovery, Scout, and New Frontiers are important mediums for solar system exploration, especially given the emphasis on more cost-efficient programs in the NASA budgets. The New Frontiers 4 mission that will be selected within the next decade will likely be one of five missions as projected by the 2013-2022 Planetary Science Decadal Survey: exploration of Venus, a Lunar sample return, asteroid sample return, comet sample return, or Saturn exploration. All of these mission concepts would involve atmospheric flight – either through the Venusian or Saturnian atmospheres to land a probe or aerobrake/aerocapture an orbiter, or return through Earth's atmosphere of an asteroid, comet, or Lunar sample.

Together, NASA's Langley Research Center and Ames Research Center have matured several technologies and atmospheric flight vehicle concepts that are applicable to New Frontiers class missions. This paper will explore possible flight vehicle concepts, technology maturation under development, and new technologies required to meet the atmospheric flight objectives of New Frontiers missions. Among these enabling technologies needed for planetary exploration are maturation of in-space propulsion systems; development of Thermal Protection System materials and structures that can withstand high heat loads of planetary entry; and improved Guidance, Navigation, and Control models of entry vehicles including entry probes, aerocapture, and autonomous aerobraking. Additionally, there may be manufacturing and integration issues applicable to multiple missions that must be addressed in order to ensure successful mission concepts.