Optimized Entry and Powered Descent Guidance for Precision Planetary Landing

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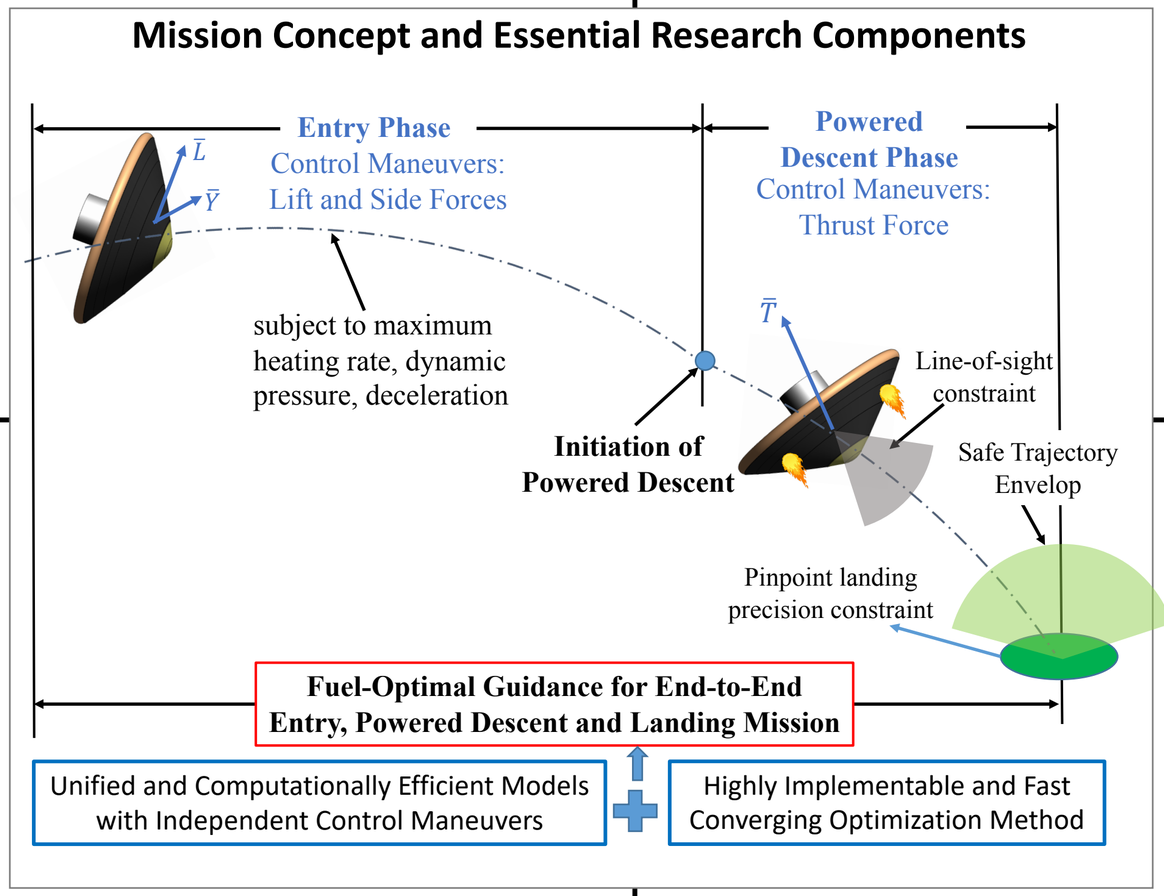
Research Objectives

- Develop advanced entry and powered descent guidance method for fuel-optimal and precise planetary landing
- Innovation: unified models incorporating direct force control and end-to-end complete onboard mission optimization
- Proposed research has high fidelity models, improved flexibility in optimization, and highly implementable algorithm
- Start with TRL 1 and will push to TRL 3 with simulation and experimental verification

Mission Concept and Essential Research Components



Approach

- Develop high fidelity and computationally efficient mission models, including 3DOF and 6DOF with independent control maneuvers
- Design a fast converging online optimization algorithm based on advanced computational techniques
- Conduct virtual simulation and experimental verification

Potential Impact

- The end-to-end mission planning strategy is applicable to multi-phase space missions with varying dynamics and/or constraints at each phase
- The modeling and mission optimization method can be easily adapted to solve the aerocapture problem that possesses the same dynamics as entry guidance
- The optimization method breaks a computational bottleneck and can be applied to a wide range of space-related trajectory optimization problems