An Innovative High Fidelity Multidisciplinary Computational Framework for Parachute Inflation Dynamics

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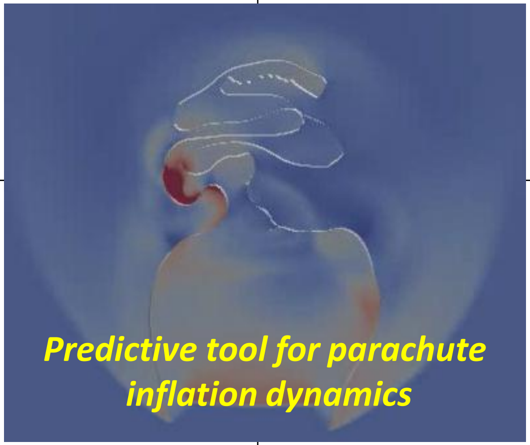
Research Objectives

To develop a predictive, high fidelity, multidisciplinary, computational model for parachute inflation dynamics and associated software featuring the following ***innovations:***

- Two-way coupled thermomechanical analysis
- Stochastic approach for analyzing the influence of the initial folded shape on performance

Anticipated computational tools and software will dramatically advance the SOA by offering the multiscale modeling of soft goods, and the high fidelity modeling of fluid-structure interactions while accounting for geometric porosity, massive self-contact, and a number of material and geometric nonlinearities



Approach

- Eulerian framework for fluid-structure
- Higher-order embedded boundary method for CFD (FIVER)
- RANS and LES with anisotropic adaptive mesh refinement
- Conservative algorithm for computing flow-induced loads
- Multiscale modeling of soft goods that accounts for frictional losses between yarns
- Two-way coupled thermomechanical analysis to capture the effect of the strain rate on temperature at supersonic speeds
- Efficient treatment of geometric and material porosity during inflation
- Stochastic approach for determining the influence of the initial folded shape on performance

Potential Impact

- Prediction of flutter and pulsation (panting) at supersonic speeds
- Prediction of drag
- Enhancement of the design and performance of supersonic parachutes
- Saving costs by reducing testing