

FSI MODELING OF RINGSAIL PARACHUTES WITH DISREEFING AND MODIFIED GEOMETRIC POROSITY

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Fluid–structure interaction (FSI) modeling of ringsail parachutes poses several computational challenges. These include the geometric porosity created by the construction of the canopy from "rings" and "sails" with hundreds of "ring gaps" and "sail slits," in the case of parachute clusters the contact between the parachutes, and "disreefing" from one stage to another when the parachute is used in multiple stages. The Team for Advanced Flow Simulation and Modeling (T*AFSM) has been addressing these challenges with the Stabilized Space–Time FSI (SSTFSI) technique [1], which serves as the core method, and special techniques [1–6]. The special techniques for the geometric complexities of the rings and sails is the Homogenized Modeling of Geometric Porosity (HMGP) [2–4]. The Surface-Edge-Node Contact Tracking (SENCT) technique [1] is a contact algorithm that prevents the structural surfaces from coming closer than a minimum distance. The SENCT-FG [6] is now an essential technology in the parachute cluster computations carried out by the T*AFSM. As an additional challenge, the canopy design might have some of its panels and sails removed. In FSI computations with such "modified geometric porosity," the flow through the "windows" created by the removal of the panels and the wider gaps created by the removal of the sails cannot be accurately modeled with the HMGP and needs to be resolved. In this presentation we focus on parachute disreefing [7], including the disreefing of parachute clusters (see Figure 1), and parachutes with modified geometric porosity [7] (see Figure 2).

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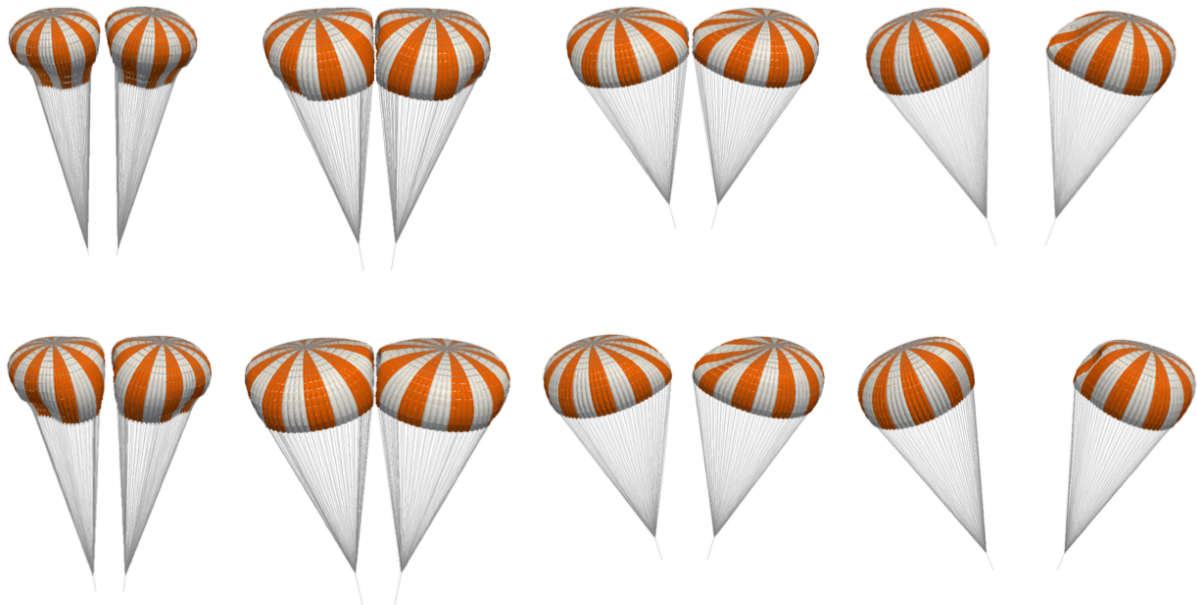


Figure 1. Disreefing of a 2-parachute cluster (see [7]).

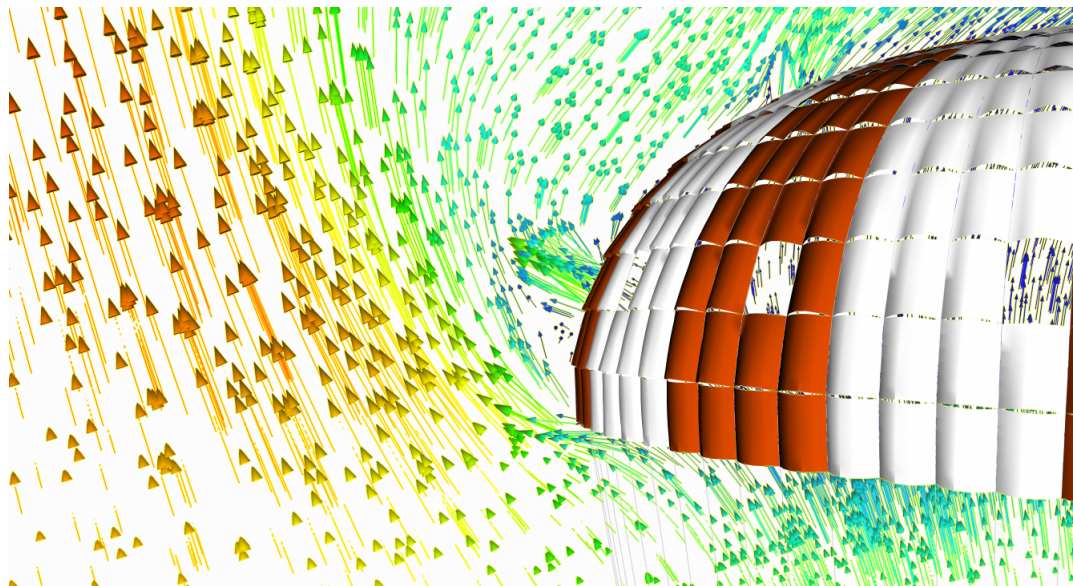


Figure 2. Flow field around a ringsail parachute with modified geometric porosity (see [7]).