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Flow over a Ram-Air Parachute Canopy[1] ALI ESLAMBOLCHI, HAMID JOHARI, California State University, Northridge — The flow field over a full-scale, ram-air personnel parachute canopy was investigated numerically using a finite-volume flow solver coupled with the Spalart-Allmaras turbulence model. Ram-air parachute canopies resemble wings with arc-anhedral, surface protuberances, and an open leading edge for inflation. The rectangular planform canopy had an aspect ratio of 2.2 and was assumed to be rigid and impermeable. The chord-based Reynolds number was 3.2 million. Results indicate that the oncoming flow barely penetrates the canopy opening, and creates a large separation bubble below the lower lip of canopy. A thick boundary layer exists over the entire lower surface of the canopy. The flow over the upper surface of the canopy remains attached for an extended fraction of the chord. Lift increases linearly with angle of attack up to about 12 degrees. To assess the capability of lifting-line theory in predicting the forces on the canopy, the lift and drag data from a two-dimensional simulation of the canopy profile were extended using finite-wing expressions and compared with the forces from the present simulations. The finite-wing predicted lift and drag trends compare poorly against the full-span simulation, and the maximum lift-to-drag ratio is over-predicted by 36%.

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