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Flow Structure along a Delta Wing with Straight and Sinusoidally-Shaped Leading-Edges TUNC GORUNEY, DONALD ROCKWELL, Lehigh University — The time evolution of the three-dimensional flow patterns along a delta wing of moderate sweep angle is characterized using a technique of stereoscopic particle image velocimetry. The relationship between the three-dimensional flow structure above the surface of the wing and the near-surface topology has been established, at successive instants following termination of a pitch-up maneuver. In addition, the near-surface flow patterns are characterized for sinusoidally-shaped leading-edges having various values of amplitude and wavelength. Topological features of streamline patterns, in conjunction with patterns of surface-normal vorticity and velocity, are used to evaluate the effectiveness of this type of passive control. The dimensionless ratio of wavelength to amplitude λ/ϕ of the sinusoidally-shaped edge was found to be a predominant parameter. In essence, the near-surface flow structure is substantially altered for relatively small values of λ/ϕ, and the largest changes were obtained by keeping the wavelength λ/C small and the amplitude ϕ/C sufficiently large. These alterations involve either a decrease in the extent of three-dimensional separation or its elimination altogether.

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