ELASTIC RESPONSE OF LIFTING TYPE REENTRY VEHICLES UNDER CLOSED LOOP CONTROL

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Abstract

Present paper discusses the modeling, dynamics and closed loop aeroservoelastic analysis of a typical lifting type reentry vehicle. A linear aeroservoelastic formulation for a lifting type reentry vehicle is presented, which is based on the reduced order modeling approach, using the principle of superposition. The aeroservoelastic problem is formulated in the time domain by converting frequency domain unsteady aerodynamic loads, using pure lag-pole based rational function approximation. Second order actuator and third order sensor models are included in the closed loop control architecture, that uses full state feedback pole placement technique (for level-1 flying qualities) to arrive at control gains. The study brings out the effect of closed loop command on the elastic response of a typical lifting type reentry vehicle.

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