Abstract

Unguided reentry capsules are usually involved in ballistic entry. The final states (such as altitude and velocity of parachute activity) depend on initials parameters. Reentry trajectory parameters differently affect the thermal protection system (TPS), required deorbit propellant, and structural load. The purpose of this paper is to optimal design of deorbit parameters to minimize the thermal protection system mass and deorbit propellant mass using multidisciplinary design optimization technique. Genetic Algorithm (GA) is used to simultaneously optimize TPS discipline, propulsion discipline and trajectory in present of the all trajectory and configuration constraints. To do this, every discipline is mathematically modeled. A suitable framework of Multidisciplinary design optimization (MDO) is developed. Then, the reentry mission is optimized according to the each discipline. The results show that simultaneous optimization is more efficient in comparison with single discipline optimization such as TPS optimization or deorbit propulsion system (propulsion and propellant) optimization.
Multidisciplinary Design Optimization of a Deorbit Maneuver Considering Propulsion, TPS, and Trajectory


Index Terms

Computer Science
Artificial Intelligence
Keywords
Reentry Vehicle  Deorbit Maneuver  Optimization  MDO  Genetic Algorithm