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## ANALYSIS OF DYNAMIC CHARACTERISTICS AND RESEARCH ON COPING STRATEGY IN MARTIAN PARACHUTE DESCENT PHASE

### Abstract

There are atmosphere entry phase, parachute descent phase, powered descent phase, and landing phase in the Martian landing process. The parachute descent phase is one of the most important aspects that impacts on mission success. Many Martian landing missions failed in the phase. The parachute of the Martian descent probe must be mortared, inflated and deployed in the supersonic conditions due to the thin atmosphere and limited deceleration in the atmosphere entry phase. The heatshield is also separated from the descent probe in the parachute descent phase to obtain the relative distance and velocity to the Mars surface via the microwave radar. The dynamic characteristics (high mechanical loads, violent swing and special flow field in the heat shield separation process) are complex in the whole parachute descent phase. Many risks are faced such as the inertial measurement unit saturation, frequent jet damping, small margin of the structural strength, and re-contact after heat shield separation. At first the parachute descent difficulties of previous Martian landing missions are introduced in this paper. Then the analysis of dynamic characteristics in the parachute descent is carried out based on the simulation and the representative experiments. Finally the coping strategies of parachute ejection, heatshield separation, autonomous navigation and attitude control are proposed which can provide reference for the future Mars landing missions.