

The Mars Science Laboratory Entry Descent and Landing Mode Commander

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The Mars Science Laboratory (MSL) is the next NASA rover mission to Mars. It will be launched in November of 2011 and arrive in Mars in August of 2012. Its Entry Descent and Landing (EDL) phase is one of the most critical phases of the mission. It uses a highly complex system to land the vehicle safely within the desired landing region.

The EDL system has three main components:

- i) a timeline engine to prepare and coordinate all the events,
- ii) a Navigation Mode Commander to manage the estimation of the vehicle position and orientation from the Descent Inertial Measurements Units and the Terrain Descent Sensor (radar), and
- iii) an EDL Mode Commander to reconfigure the vehicle and guide-and-control the vehicle to a safe landing.

This paper will describe this last component. The EDL Mode Commander is the executive that orchestrates the hardware reconfigurations (balance mass ejections, heatshield and backshell jettisons, parachute opening) and the Guidance Navigation & Control functions (position and attitude estimation, entry guidance, RCS attitude control until powered descent starts, powered descent guidance, powered descent position and attitude control). We will describe the EDL modes of operation, the vehicle reconfigurations, the GN&C functions performed at each mode, and the navigational and temporal triggers used to transition between modes.

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