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The EXCITE IOD/IOV Mission

The surge in small satellite and CubeSat deployments has led to a diversification of feasible missions, driving a shift from emphasizing simplicity and low-cost to prioritizing performance while maintaining cost-efficiency. Integration of small payloads and advancements in technology have enhanced CubeSat capabilities, enabling the development of high-performance platforms. EXCITE, a 16U CubeSat mission, will demonstrate five different technologies in the LEO environment, including propulsion systems, a reconfigurable antenna, and on-board processing capabilities. To maximize EXCITE's capabilities and accommodate diverse payloads for various mission scenarios, multiple optimization strategies have been implemented. This includes thorough orbit analysis to determine the most suitable orbit for mission objectives, considering factors such as beta angles and eclipse time. The use of a chemical thruster provides flexibility in mission design by allowing adjustments to orbital altitude and ground-track patterns. Additionally, careful scheduling of orbital maneuvers is crucial for maximizing access time to specific ground stations and optimizing data downlink opportunities. Managing complex interactions between design variables necessitates advanced optimization techniques like gradient-based algorithms. OpenMDAO offers a robust framework for tackling multidisciplinary design optimization problems efficiently, facilitating exploration of trade-offs between competing design objectives.

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