The SMART Mission and its Science Objectives

J. L. Burch
Southwest Research Institute
San Antonio, TX

The Magnetospheric Multiscale (MMS) mission will perform a definitive study of magnetic reconnection in space and will test critical hypotheses about reconnection derived from the latest theories and spacecraft measurements. MMS will deploy four identical spacecraft in a tetrahedral configuration with adjustable spacings from 10 to 1000 km. The SMART (Solving Magnetospheric Acceleration, Reconnection, and Turbulence) payloads are optimized to make the required high-time-resolution measurements of plasmas, electric fields, and magnetic fields while providing important supporting measurements of energetic particles and ion compositon. The SMART plasma composition instrument is a new design that for the first time will solve the problem of identifying minor ions within regions of high proton fluxes. SMART will solve known difficulties associated with low-energy plasma and electric-field measurements by including a flight-proven charge neutralization device. The accuracy of the electric-field measurements will be further optimized by the inclusion of an electron-drift electric-field detector, which is immune to the plasma sheath effects that typically bedevil double-probe detectors. A three-phase low-inclination orbit strategy will probe the most likely reconnection sites on both the dayside magnetopause and in the magnetotail. A burst-mode data system will allow data at the highest possible time resolution (in the ms range) to be acquired in regions displaying dynamic behavior. Data from the three mission phases will be assimilated into continuously refined reconnection models in a way that will lead to fundamental advances in our understanding of reconnection.