

THE TSS-1R ELECTRODYNAMIC TETHER EXPERIMENT: SCIENTIFIC AND TECHNOLOGICAL RESULTS

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The bi-national, US-Italian, Tethered Satellite System (TSS) program was designed to provide a unique opportunity to explore certain space plasma-electrodynamic processes and the orbital mechanics of a gravity-gradient stabilized system of two satellites linked by a long conducting tether. The second flight, TSS-1R, was launched February 22, 1996 on STS-75 and satellite deployment began at MET 3/00:27. A unique data set was obtained over the next five hours, as the tether was deployed to a length of 19695 meters, which has allowed significant science to be accomplished. This presentation will focus on electrodynamic processes generated by the tether--in particular, the collection of electrical current from the ionospheric plasma. Of particular significance is an apparent transition of the physics of current collection when the potential of the collecting body becomes greater than the ram energy of the ionospheric atomic oxygen ions. Previous theoretical models of current collection were electrostatic--assuming that the orbital motion of the system, which is highly subsonic with respect to electron thermal motion, was unimportant. This may still be acceptable for the case of relatively slow-moving sounding rockets. However, the TSS-1R results show that motion relative to the plasma must be accounted for in orbiting systems.

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2. D08
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4. Projection or other equipment: a CD on the TSS program that could be shown off-line
5. Oral
6. Have you applied for financial support? No