Paper ID: 51485
oral

52nd IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (D5)
Space Environment and effects on space missions (3)

Author: Dr. Joseph Minow
National Aeronautics and Space Administration (NASA), United States

EXTREME AURORAL CHARGING IN HIGH INCLINATION, LOW-EARTH ORBITS

Abstract

Spacecraft operating in low Earth orbit (LEO) will continue to find a wide variety of applications for current and future space missions. LEO spacecraft uses include meteorology, Earth resource monitoring and remote sensing, geophysics and astrophysical sciences, communications, navigation, and many other scientific, commercial, and military applications. Many components of the natural and human-generated space environment are hazards to spacecraft operations. Spacecraft designers and operation teams must consider components of the ionizing radiation, plasma, atomic oxygen, satellite drag, vacuum, thermal, microgravity, micrometeoroid, and orbital debris environments in order to assure reliable on-orbit performance of a spacecraft over the full course of a spaceflight program. Spacecraft charging by energetic auroral electrons is a unique aspect of the LEO environment in high-inclination (polar) orbits. Extreme negative spacecraft frame potentials reported to date are typically in the range of a few thousand volts. Charging to this level can result in operational impacts to space missions or even lead to catastrophic failure of critical spacecraft systems. This presentation will describe how auroral charging is measured, the extent to which information is currently available to characterize the extremes in auroral charging that drives spacecraft design, and the implications of extreme auroral charging for future spacecraft mission design.