The Space Environment – Implications for Spacecraft Design

Introduction
- Importance of Space Environments & Effects for Spacecraft Design
  - History of SEE
- The Earth's Environment
  - Gravitational Field
  - Magnetic Field
  - Electromagnetic Environment
  - Thermal Environment
- The Solar Environment
  - The Solar Output
  - Solar Cycle

Vacuum Environment Effects
- The Vacuum Environment
- Vacuum Environment Effects
  - Solar UV Degradation
  - Molecular Contamination
  - Particulate Contamination
  - Contamination Control

Neutral Environment Effects
- The Neutral Environment
  - Basic Atmospheric Physics
- Neutral Environment Effects
  - Mechanical Interactions
    - Aerodynamic Drag
    - Sputtering
  - Chemical Interactions
    - Atomic Oxygen Erosion
    - Spacecraft Glow

Plasma Environment Effects
- The Plasma Environment
  - Basic Plasma Physics
  - Space Weather
- Plasma Environment Effects
  - Spacecraft Charging
    - Solving the Current Balance Equation in:
      - Low Earth Orbit
      - Auroral Orbits
      - Geosynchronous Orbits
  - Effects of Spacecraft Charging
    - Arc Discharging
      - Electrostatic Discharge
      - Dielectric Breakdown
    - Additional Concerns
      - Biasing of Spacecraft Potential
      - Re-attraction of Contamination

Radiation Environment Effects
- The Radiation Environment
  - Basic Radiation Physics
    - Stopping Charged Particles
    - Stopping Photons
    - Stopping Neutrons
  - Sources of Radiation
    - Trapped Radiation Belts
    - Solar Proton Events (SPEs)
    - Galactic Cosmic Rays (GCRs)
    - Hostile Radiation Environments
    - Nuclear Propulsion
- Radiation Environment Effects
  - Total Dose Effects
    - Solar Array Degradation, …
  - Single Event Effects
    - Upsets, Latchup, …
  - Dose Rate Effects

Micrometeoroid & Orbital Debris (MMOD) Environment Effects
- The Micrometeoroid Environment
- The Orbital Debris Environment
- Micrometeoroid & Orbital Debris Environment Effects
  - Hypervelocity Impact Damage

All sections will address:

- Validation and Dynamics of the Environment
- Design Examples to Illustrate Application of the Principles
- Design Guidelines to Ensure Spacecraft Survivability
- Standards and References

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