

Space Debris

AN OVERVIEW OF THE SPACE DEBRIS ISSUE

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INTRODUCTION

The amount of man-made debris in orbit is now sufficient to create a flux in some regions of low Earth orbit which exceeds the flux of natural meteoroids. The primary source for this debris is from the fragmentation, or disintegration, of spacecraft. Future debris can be expected to result from random collisions between orbiting objects. This debris will require additional shielding for some spacecraft, will contaminate some types of meteoroid experiments, and contaminate some types of astronomical observations. Steps are being taken to minimize the accumulation of future debris.

OUTLINE SUMMARY

Current NASA Involvement

- Characterizing the space environment.
- Examining implications for future use of space.
- Developing an agency technical plan.
- Developing agency policy.

Meteoroids vs. Orbital Debris

Meteoroids

- Part of interplanetary space, pass through Earth orbital space.
- Small amount of mass.
- Pass through at about 20 km/sec.

Orbital Debris

- "Permanently" in Earth orbital space.
- Large amount of mass.
- Sweep past one another at about 10 km/sec.

High Earth Orbit, Geosynchronous Region

Much more difficult to track and catalog objects.

Many "lost" satellites.

Explosions undetected.

Possibility of a large number of uncatalogued objects.

Magnitude 18 and fainter.

Angular velocities less than $0.004^{\circ}/\text{sec} = 15 \text{ arc-sec}/\text{sec}$.

In geosynchronous orbit ($\pm 15^{\circ}$ latitude).

Molniya payloads, orbital transfer rocket stages ($\pm 70^{\circ}$).

Actions currently being taken

Presidential directive on National Space Policy -- Feb 88.

"All" space sectors will seek to minimize the creation of space debris.

Established interagency working group.

ESA Orbital Debris Working Group

Ariane 3rd stage problem.

Exchange data.

Summary

Currently sufficient orbital debris exists to affect spacecraft design and astronomical observations.

Actions are being taken to minimize future debris.

Some growth in the future population of space debris is to be expected.

[Editors Note: For more details, see for example: "Artificial Space Debris," by N.L. Johnson and D.S. McKnight, Orbit Book Co., Malabar, Florida, 1987, 111 pps.]