Orbital Debris

FACTSHEET

SECURE WORLD FOUNDATION

Promoting Cooperative Solutions for Space Security

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Introduction

Each year, more civil, commercial and military activities are conducted from space in order to take advantage of an unprecedented ability to send massive amounts of digitalized information over great distances, reaching every corner of the Earth. Satellite services have been integrated into the world economy to such an extent over the past decade that they are now essential in some way to daily activities throughout the Earth. A recent report showed that global revenue from government and commercial space activities reached an estimated $251 billion in 2007.[1]

The breadth and number of space services is beginning to overwhelm existing international agreements and arrangements for the use of space. These services are developing within a legal framework that has remained largely unchanged since the Outer Space Treaty was negotiated 40 years ago. So much has changed since then that the global community must become more active to secure what we have from losses.

In order to manage the international problems that will naturally develop as the space environment surrounding Earth becomes more crowded, work must begin on the creation of space resource management mechanisms to reduce the creation of new debris. Our continued ability to maintain a secure and safe space environment depends on it.

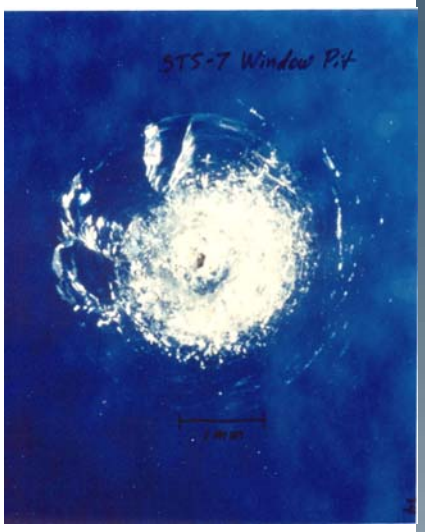
Approaches and Concerns

Currently, it is not possible to remove debris from space before orbits naturally decay for this junk to burn up in the Earth's atmosphere. Debris at high altitudes can stay in orbit for decades or even centuries, accumulating over time. Even very small particles of space debris can have a devastating effect on anything they hit because of their high relative impact velocities. While overall levels of space debris are somewhat manageable at this time, we face a looming problem with escalating amounts of debris. This scenario will sharply increase the probability of damaging collisions between space debris and operational spacecraft.

For an idea of how serious this can be, the debris shielding for the International Space Station (ISS) is designed to protect the station from debris only one millimeter to one centimeter in size. A hit in a critical area by larger objects would cause significant and serious damage.

Most space systems do not even have this level of shielding, and thus are highly vulnerable to loss of service from debris impacts. In time, as debris grows within popular orbits, debris fragments will begin colliding with each other more frequently, creating a cascade effect leading to increasing amounts of threatening debris.

Aside from collisions with other debris, and the creation of debris from launch operations, the continued testing or use of systems such as anti-satellite weapons would put critically important civil, commercial and military satellites at increased risk and could even impede our ability to use some orbital regions.



Orbital debris impact crater on one of Space Shuttle *Challenger*'s windows. **Source: NASA (STS-007).**

Work must begin soon on negotiating a managed approach that will support space security, i.e., the secure and sustainable access to space for all.

The UN Space Debris Mitigation Guidelines

The successful passage and implementation of voluntary international guidelines by the United Nations for the mitigation of space debris is a good first step.[2] Not only will the UN space debris guidelines set standards for the maintenance of the present space environment, but they will also demonstrate that cooperation in space is in the best interests of the entire global community. This could set the stage for negotiating further international guidelines on appropriate behavior in space.

The voluntary UN Space Debris Mitigation Guidelines, created by the Inter-Agency Space Debris Coordination Committee (IADC) will be implemented by the national mechanisms of individual nations.[2] In addition to ensuring that they are implemented fully on a national basis, it will be important for all space faring nations to view the guidelines as a start and not a finish.

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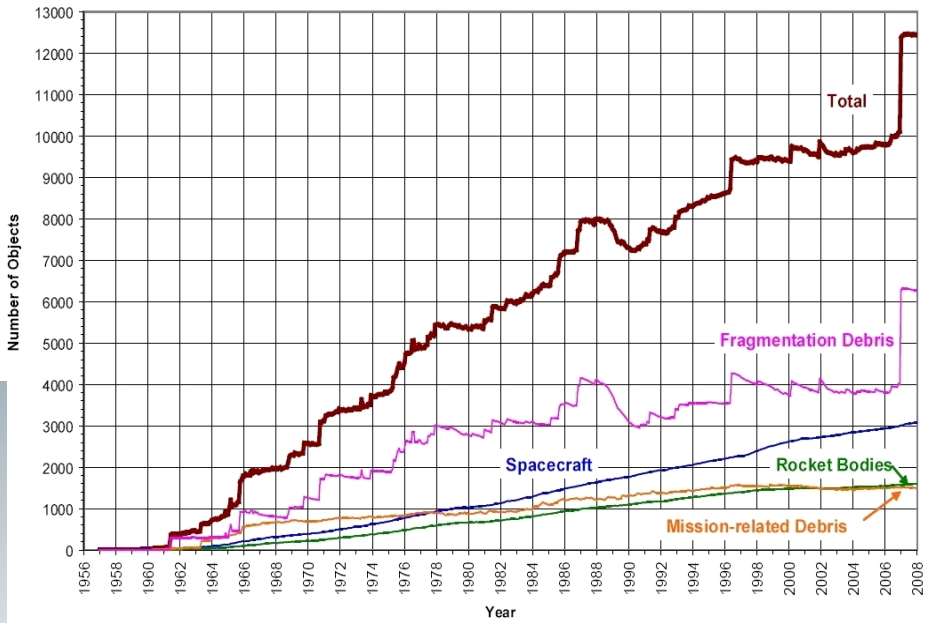
The Need for Effective Space Management

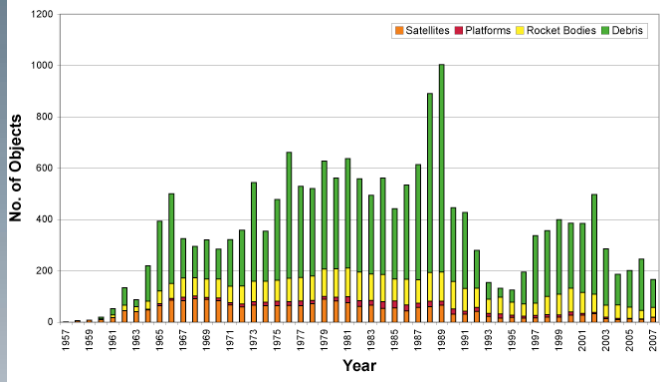
While no existing international agreements ban the deliberate creation of debris, consensus is building within the scientific and academic community on the need to develop tighter controls on orbital debris creation. The adoption of a debris mitigation resolution by the UN General Assembly will continue to be insufficient to fully protect the space environment.

Objects colliding with orbital speeds cause a "hypervelocity" impact, which breaks an object into a cloud of small pieces, each with a different speed and direction, causing the debris cloud to disperse around the original orbit.



Monthly Number of Objects in Earth Orbit by Object Type

This chart displays a summary of all objects in Earth orbit officially cataloged by the U.S. Space Surveillance Network. "Fragmentation Debris" includes satellite breakup debris and anomalous event debris, while "Mission-related Debris" includes all objects dispensed, separated, or released as part of the planned mission. Note the dramatic increase in fragmentation debris caused by the Chinese ASAT test conducted in January 2007. **Source: NASA *Orbital Debris Quarterly News*, Volume 12, Issue 1, page 12.**



Re-Entered Artificial Objects

This figure shows the number of tracked objects, objects roughly larger than a basketball, that reentered for the years 1957 to 2006. Payloads (satellites), platforms (used to support a payload while it is being placed into orbit), and rocket bodies (like the Delta) are of most interest because of their large size. There are approximately 100 to 200 reentries of large objects each year. **Source: The Aerospace Corporation, The Center for Orbital and Reentry Debris Studies.**

Recommendations

In recognition of the orbital debris problem, the Secure World Foundation proposes the following actions be taken:

1. All space faring nations must be encouraged to pass national legislation to implement the orbital debris guidelines and to report their status at the annual COPUOS meeting.
2. COPUOS, the IADC and the commercial space industry should work together to strengthen space debris mitigation norms now in place to enable new technologies to be incorporated into an international approach to mitigate space debris.
3. The passage of UN Debris Mitigation Guidelines should be followed by continued review and negotiations to achieve a stronger regime.
4. A conference should be convened to discuss necessary next steps, including discussion of whether the present allocation of responsibilities for military and civil space is complete, is appropriately assigned within the UN system, and recognizes the many overlapping areas that have evolved with the advent of dual-use space systems (like rockets which can double as missiles). Debris guidelines can then be leveraged to support the beginning of work on space traffic management.

These recommendations can help to stabilize and continue the benefits of services from space, and in doing so, promote universal access to the global benefits of space systems.

Footnotes

1: *The Space Report 2008: The Authoritative Guide to Global Space Activity*, issued by the Space Foundation (April 2008), pp. 6.

2: *Report on the Committee on the Peaceful Uses of Outer Space (2007)*. General Assembly 62nd Session supplement #20 (A/62/20), pp. 17.

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