The Evolution of U.S. National Policy for Addressing the Threat of Space Debris

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Overview

• Part I: Evolution of space debris policy
  – Changes in awareness and understanding of threat
  – Space debris in US national space policy
  – Implementation

• Part II: Models of change in public policy
  – Punctuated equilibrium
  – Multiple streams

• Part III: Future suggestions
  – Lack of bureaucratic champion for space sustainability
  – Fix via on-going discussions on space traffic management?
Evolution of space debris threat

• 1960s
  – Need to better understand space environmental threats to human spaceflight missions
  – Biggest concern is natural space debris (micrometeoroids)

• 1970s
  – Explosions begin creating more human-generated space debris
  – Kessler & Cour-Palais warn human-generated space debris may eventually become bigger threat than natural space debris

• 1980s
  – More explosions, Space Station Freedom, and military ASAT testing create high-level awareness of space debris
  – Need to minimize creation of space debris from human activities in space
Evolution of space debris threat (con’t)

- 1990s
  - Need guidelines to minimize the creation of space debris through on-orbit activities
  - Adoption of national & international mitigation guidelines can slow growth
- 2000s
  - Chinese ASAT test and Iridium-Cosmos collision undo progress from mitigation guidelines
  - Need to develop collision warning & avoidance measures
- 2010s
  - Post-mission disposal (PMD) not enough, needs to be combined with remediation (ADR)
  - Emergence of cubesats and megasatellations requires high compliance with PMD and ADR
## Space debris in US National Space Policy

<table>
<thead>
<tr>
<th>Year</th>
<th>President</th>
<th>Policy Directive</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>Ronald Reagan</td>
<td>Minimize creation of space debris in tests, experiments, and systems</td>
<td>✅</td>
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<tr>
<td>1989</td>
<td>George HW Bush</td>
<td>+ Encourage other countries to adopt space debris minimization policies</td>
<td>✅</td>
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<tr>
<td>1996</td>
<td>Bill Clinton</td>
<td>++ Develop design guidelines for space debris minimization, and take a leadership role in promoting international adoption</td>
<td>✅</td>
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<tr>
<td>2006</td>
<td>George W Bush</td>
<td>+++ Follow national orbital debris mitigation standards, and incorporate into licensing of commercial satellites</td>
<td>✅</td>
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<tr>
<td>2010</td>
<td>Barack Obama</td>
<td>++++ Preserve the space environment, foster development of space collision warning measures, and research debris removal technology</td>
<td>✅️</td>
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Punctuated equilibrium model

Rate of policy change

Incremental change

Sharp change

Time

Iridium-Cosmos

NASA
DOD
NOAA

Executive agencies

Legislative committees

Narratives

Human spaceflight
Debris mitigation

Interest groups

Astronaut corps
Government satellite operators

Sustainability
Preserving the environment
Remediation

NASA
FAA/AST
DOD
NOAA

Executive agencies

Legislative committees

Narratives

Interest groups

Astronaut corps
Government satellite operators
Commercial operators
International

IAC 2016 Guadalajara, Mexico
September 26-30, 2016

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Multiple streams model

Problem (critical events, awareness)
Politics (coalition building, bargaining)
Solution (policy options, feasibility)

Space debris is probably here

Policy window
Way forward

• Major impediment to making further progress is the lack of a bureaucratic champion for space sustainability
  – If it’s everyone’s job, then it’s no one’s job

• Current policy discussions on space traffic management offer a chance to fix the situation
  – Assign responsibility for the space environment to an existing civil agency (NASA, FCC, NOAA, DOT/FAA?)
  – Merge existing authorities into a new agency (Coast Guard for Space?)

• Champion needs to focus on developing ADR capabilities
  – Competition between multiple commercial entities to develop capabilities, government(s) purchase services (e.g.NASA's Commercial Cargo & Crew?)
Thank You

Questions?

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