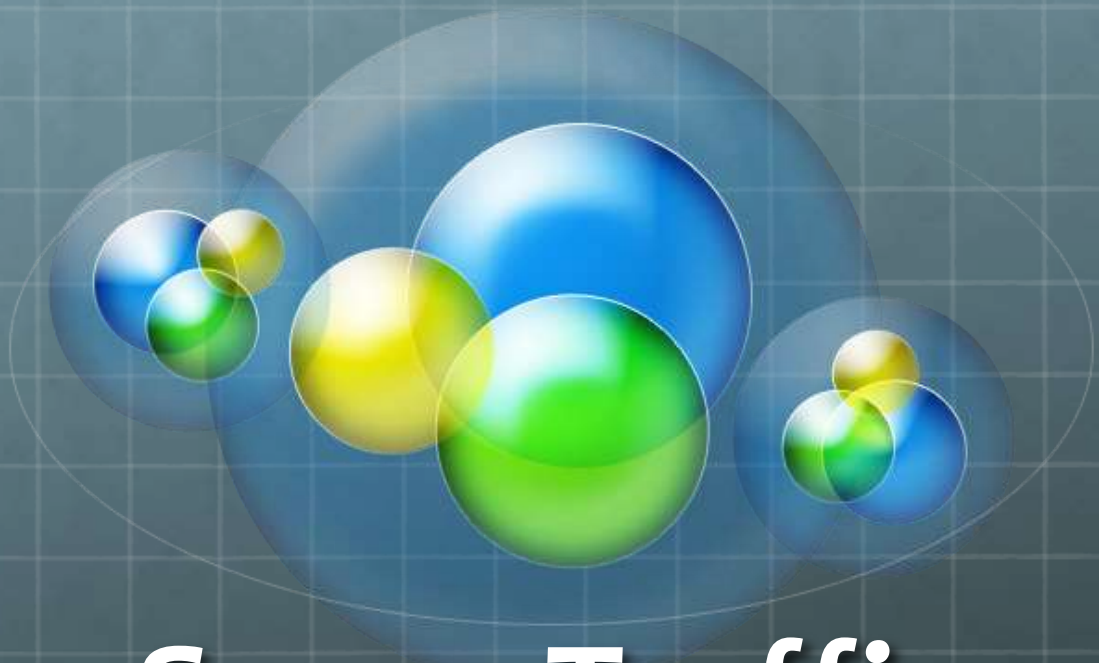

Space Traffic Management

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Theresa Hitchens

The Problem

- Increased activity on orbit
  - 1,381 active satellites; 23,000 pieces identified debris (>10 cm); millions more of smaller debris
  - Increased number of operators with different skill sets, now some 80 including even universities and NGOs
  - Plans for thousands of small "Cubesats" in LEO for new functions such as space-based Internet
  - Congestion in usable orbits: increased RF interference, potential for collision (poles, LEO)
  - Inadequate capabilities to monitor satellite and debris disposition

The Problem, cont'd

- Lacunae of legal and/or regulatory mechanisms re operations on orbit
- International treaties address only a few aspects
  - OST 1967: States responsible for gov / non-gov sat activities; shall avoid harmful contamination; bans sovereignty in space; States liable for damage caused by space objects
  - Liability Convention 1972: States responsible for objects launched from territory (some dispute); absolute liability for damage on Earth, fault-based for damage to other space objects

The Problem, cont'd

- Registration Convention 1975: requires launching States to maintain a registry of ALL objects launched; report basic info to UN Registry "as soon as practicable"
  - Name of launching State or States; an appropriate designator of the space object or its registration number; date and territory or location of launch; basic orbital parameters including:
    - Nodal period
    - Inclination
    - Apogee
    - Perigee
  - General function of the space object
  - CAN report more info, not required
  - No requirement to report after initial launch parameters

The Problem, cont'd

- In US, plethora of regulating agencies – sometimes using different standards (i.e. debris mitigation)
  - FAA – ground ops, launch phase
  - FCC – RF frequency, licensing of commercial sats
  - NASA – licensing of NASA launches
  - DoD – licensing of military launches
  - State – responsible for compliance with int'l treaties, and sat registration with the UN
- This means different congressional authorities invested

The Problem, cont'd

- SSA a critical foundation for safety, security and sustainability of space operations
  - Few countries have capabilities: US, Russia, China, shares someFrance, EU
  - USAF has the best SSA system and shares *some* basic positioning data and conjunction warnings
    - System still has technical gaps
    - Wants to offload this mission to civilian agency (FAA?)
    - BUT doesn't want to let go of data collection/provision
      - Which make movement to a civilian agency moot
  - No other country routinely shares data

The Question

- Is a new regime for space activities to regulate satellite operations – Space Traffic Management (STM) – now required to ensure safety of satellites and sustainability of the space environment?
- Aspects of this question now under discussion in the United States, as well as several international bodies
  - COPUOS STS Working Group on Long-Term Sustainability guidelines for best practices (2010-2018)
  - COPUOS Legal Subcommittee mandate for STM discussion (2015 …)
  - NASA study mandated by Congress 2015; Nov. 2016 deadline

What Is STM?

- No legal or agreed definition
  - 2006 study conducted by the International Academy of Astronautics (Cosmic Study on Space Traffic Management) defines STM as follows: “Space traffic management means the set of technical and regulatory provisions for promoting safe access to outer space and return from outer space to Earth free from physical or radio-frequency interference.”
  - IAA working on follow-on study
- No agreement on need for legal vs. voluntary measures

Potential Elements of STM

- Cosmic Study identifies three "phases" of space operations (both technical and regulatory) where STM would be relevant:
  - Launch phase: define air space vs. outer space; clarify definition of "space object;" clarify "launching State;" *institute pre-launch notification requirement*
  - In-orbit operations phase: maneuvering/collision avoidance; lack of adequate SST; ITU rules re orbital slots only applicable in GEO; *need "zoning" (restrictions on certain activities in certain orbits)?*
  - Re-entry phase: could certain descent corridors be mandated?

STM Elements, cont'd

- Widespread agreement on need for improved debris mitigation
  - UN voluntary Debris Mitigation Guidelines 2008; COPUOS LTS
- Ditto need for improved SST/SSA, especially data sharing
  - Debris mitigation guidelines, UN 2013 GGE on TCBMs, COPUOS LTS, EU draft Code of Conduct
  - No solution due to perceived national security needs
  - STM impossible without a global baseline of SST data
- Efforts to improve collision avoidance capabilities
  - Both at international, national and industry level
  - JSpOC JSM III; AGI COMSpOC

STM Elements, cont'd

- Need for notification/regulation of satellite maneuvers under discussion
  - GGE, COPUOS LTS, academia
- Consideration of active debris removal (both technical aspects and regulatory) under discussion
  - Potential COPUOS LTS agenda item
  - Industry/academic consideration of tech approach, legal issues
- RF interference increasing (ITU no enforcement power)

STM Elements, cont'd

- "Cubesats" and very small sats falling outside regulatory regimes --- how to manage?
  - Often use frequencies that do not require ITU registration
  - In US, no regulatory body
  - Difficult to track due to size
  - Short-life spans = debris increase
- Ideas for management include reflectors, transponders or ban on usage above certain altitudes

Key Challenges

- International treaty rights and obligations vague
  - Are many legal disagreements
- National regulations/practices differ widely
- Potential new activities (ADR, RPO, asteroid mining, civilians in space) lack governance methodologies
- National STM alone cannot solve problems, thus international agreements required; SSA sharing critical
- National security tensions rising – breeds secrecy
  - Question of space warfare in future?

Conclusions

- A global STM regime logical given increase in space traffic
  - Precedents in air (ICAO); sea (Law of the Seat Treaty)
- Current debates reflect different aspects of the problem, but no “one stop shop” approach or solution
- Geopolitical tensions (US/Russia/China) creating hurdles
- EXPECT MUCH DITHERING FOR FORESEABLE FUTURE

Questions?

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