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
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
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 some France, 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 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
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?
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)
“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 FORESEEABLE FUTURE
Questions?

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