



Promoting Cooperative Solutions for Space Sustainability

Principles and Drivers of Space Policy

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TOPICS

Promoting Cooperative Solutions for Space Sustainability

- Why do States decide to develop a space policy and a space agency?
- States have different approaches to the development of a space program
- Space policy development
- Economic considerations
- Realities of the international space community
- Questions for the space community



Why Start a Space Program?

Promoting Cooperative Solutions for Space Sustainability

- Advance technological development, e.g.,
 - Information technologies
 - Communication
 - Health
 - Resource management
 - Spin-offs to non-space sector
- Advance in-country scientific capacity
- Explore the universe, advance knowledge
- Improve management and use of State resources
- Advance industrial capacity & economy
- Improve national security



Political Competition

Promoting Cooperative Solutions for Space Sustainability

- Gain international prestige as part of the “space club”
 - U.S.-U.S.S.R competition during the Cold War
 - Formation of NASA
 - Apollo program
 - China’s emphasis on human spaceflight



States Vary Widely in Resources and Ambitions

- States with large economies and access to advanced technology:
 - Develop full range of capabilities, including human spaceflight
 - Russia, USA, China, [Europe]
- States with medium to relatively large economies:
 - Generally develop wide range of capabilities:
 - Enhance overall scientific and technological prowess
 - Provide a range of benefits to their citizens
- States with modest resources:
 - Cannot match investments of larger States
 - Can develop an active, but more narrowly focused, space program, typically, satcom and Earth observations; some space science



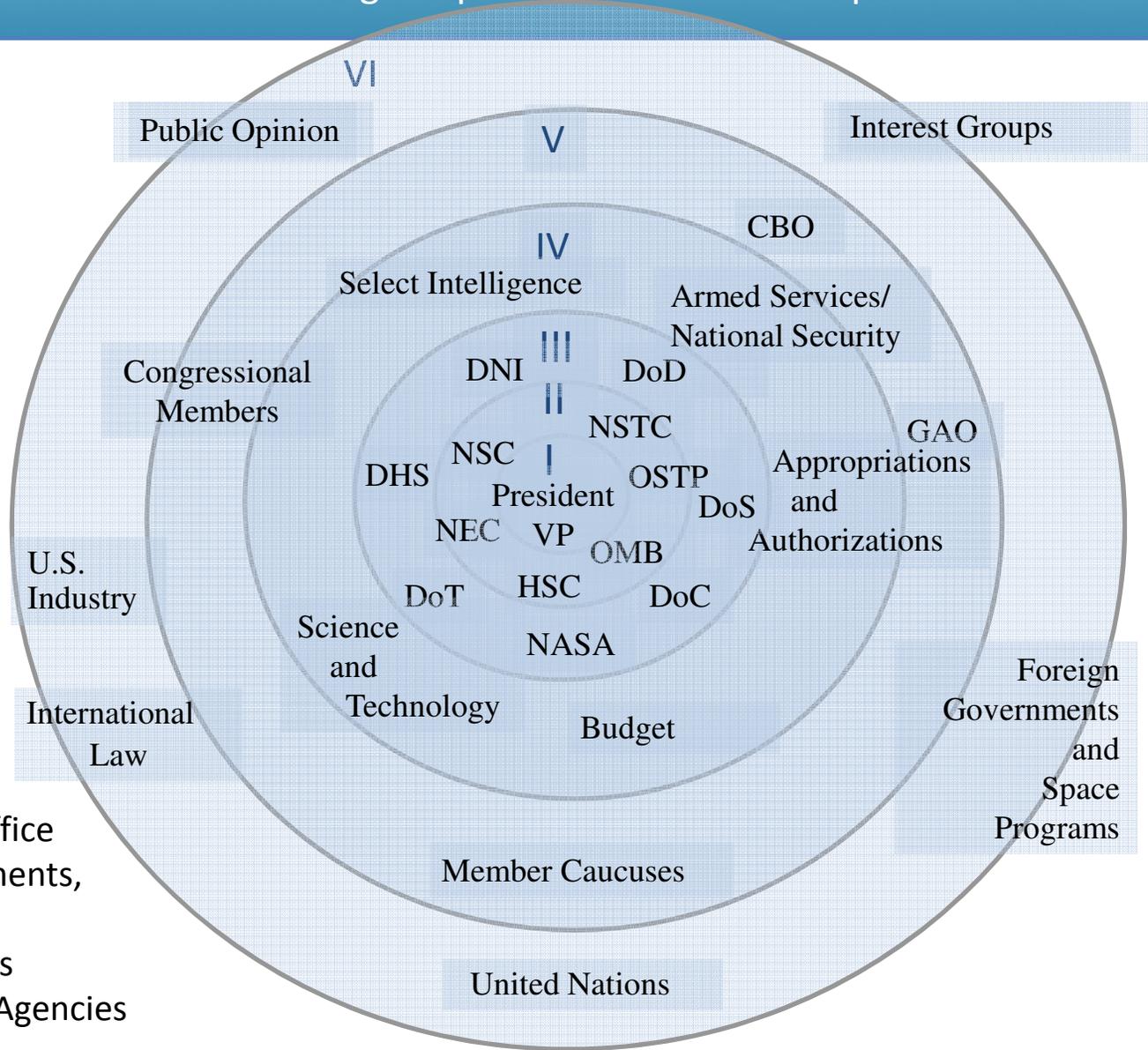
Space Policy Development

Promoting Cooperative Solutions for Space Sustainability

- For success today, space activities require:
 - Public and private long term funding
 - Clear focus on goals
- Investment in space systems largely a governmental activity:
 - The scale of the investment
 - Public goods (improved weather forecasting, natural resource management, national security, etc.)
- Important partners:
 - Private sector
 - Universities, other educational entities
 - Interest groups (professional societies, NGOs)
 - Other States



A "Hierarchy of Levels" in the U.S. Government's Space Policy Network



- I President, personal staff
- II White House Executive Office
- III Executive Branch Departments, Agencies
- IV Congressional Committees
- V Congressional Members, Agencies
- VI All others



Policy Coalitions

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Policy is shaped by coalitions of actors with a stake in the outcome

	SCIENCE	TECHNOLOGY	COMMERCE	SECURITY	AUTONOMY	FINANCE
ACTORS	Scientists	Engineers	Business	Defense & Intelligence	Politicians	Treasury
VALUES	Shared knowledge	Innovation, Competitiveness	Competitiveness, Profit	Stability, predictability	National security, Prosperity	Fiscal discipline, Priorities
VIEW SPACE AS	Object of Scientific exploration	Opportunity to improve quality & technological Capability	A growing business opportunity	Space for intelligence, Force enhancer	National prestige, foreign policy tool, Intl negotiating power, regional autonomy	In cost vs. benefit terms
FUTURE TRENDS	Global science	Sharing costs & risks	Global supply chains	Situational awareness	Regional cooperation	Cost sharing



Economic Rationales

Promoting Cooperative Solutions for Space Sustainability

- Space activities advance technological development--
 - Inspire the study of complex subjects.
 - Require highly educated workers
 - Sustain broadly based intellectual infrastructure.
 - Address human needs
- Advance scientific capacity
 - Many scientific disciplines involved in space research
 - Inspires study of math and science



Economic Rationales - 2

Promoting Cooperative Solutions for Space Sustainability

- Improve management and use of State resources
 - Earth observation systems, e.g.,
 - Weather
 - Agriculture
 - Health
 - National security
 - Telecommunication, e.g.
 - Tele-health, Tele-medicine
 - Tele-education



Economic Rationales - 3

Promoting Cooperative Solutions for Space Sustainability

- Advance industrial capacity & economy
 - Promotes study of science and technology
 - Development of high-tech manufacturing
 - Development of precision manufacturing
 - Space systems create new enterprises
 - Promotes innovation



Economic Promise of Space Systems

Promoting Cooperative Solutions for Space Sustainability

- Many more remote sensing resources than ever before
 - Many operating satellites
 - Electro-optical
 - Synthetic aperture radar (SAR)
- Powerful analytic software
 - Image processing
 - GIS
- Increasing numbers of PNT systems
- Many new applications that use PNT capabilities
 - Cell phones, cameras, tablet computers
- Telecom



Realities (B)

Promoting Cooperative Solutions for Space Sustainability

- Rapid expansion of space activities, including space tourism
 - Many more Earth observing systems in low Earth orbit
 - Position, Navigation & Timing (PNT) systems in mid-Earth orbit (MEO)
 - Many more communication satellites in GeoSynchronous Orbit (GSO)
 - Increasing focus on lunar exploration
 - Startup space tourism services to near Earth orbit
 - Long term plans for orbital space tourism



Realities (A)

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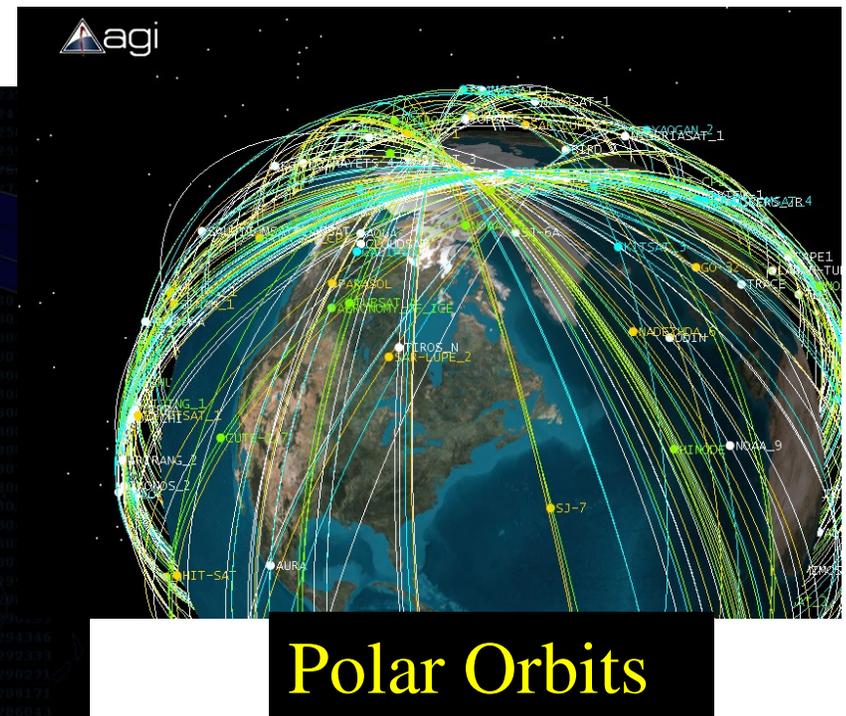
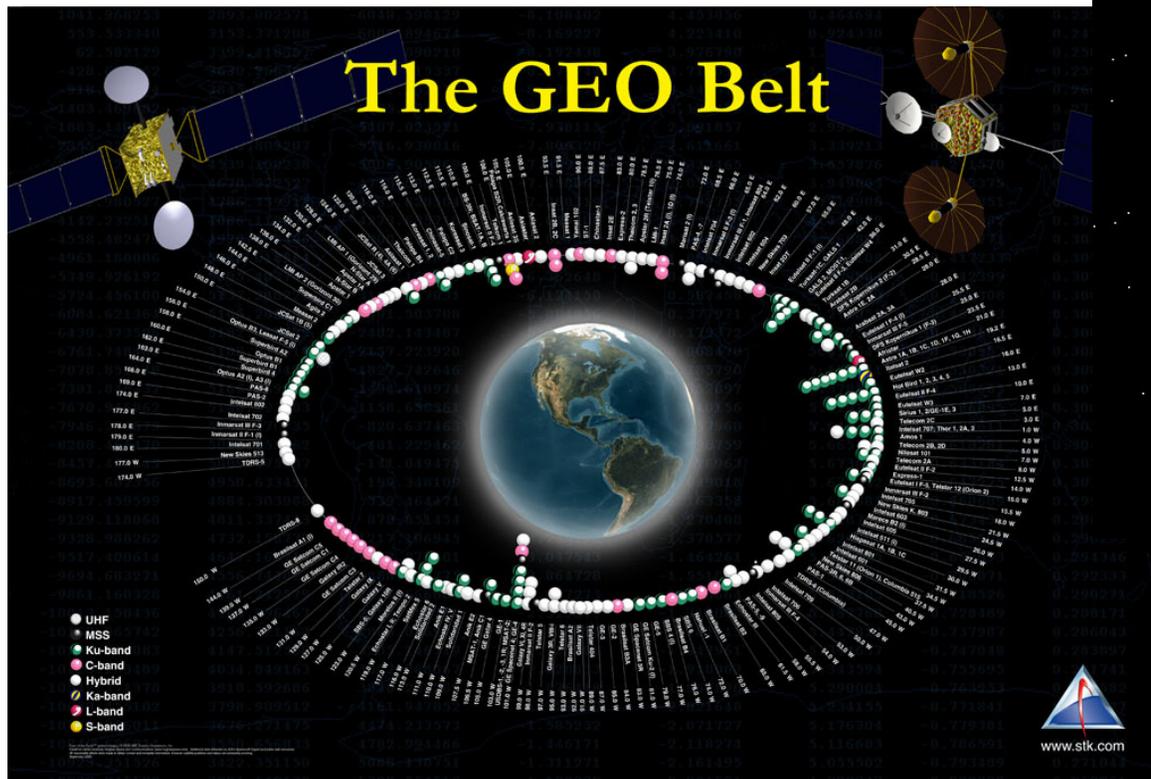
- Growth in number of space actors, especially from emerging space States
 - In past decade, spacefaring States (operators of satellites) increased from 27 to about 50
 - Launching states = 8
 - S. Korea will soon make it 9
 - Increases number of possible partners for cooperation
 - Increases opportunity for beneficial international agreements on management of space activities



Crowding in Key Orbital Regimes

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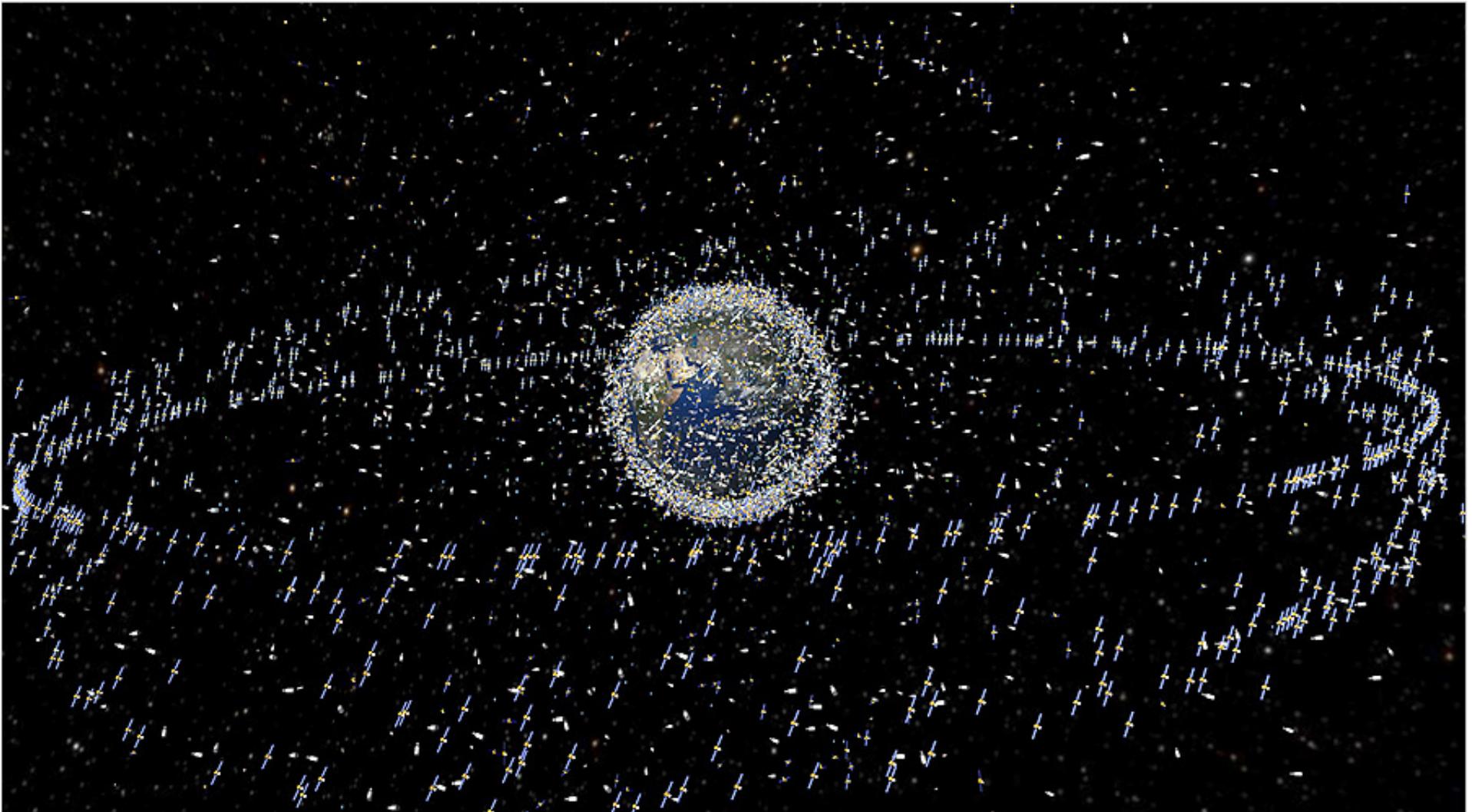
- Polar orbits (Earth observation satellites)
- Geosynchronous orbits (communications satellites)





Debris in Orbit

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Questions for the Space Community

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- **How to improve use of space resources for the benefit of humanity (space systems are expensive)?**
 - Major issue: improvement of delivery of public good space benefits to the end user, for example,
 - Response to natural disasters
 - Management of natural resources (water, forests)
 - Integration of space data with terrestrially-derived data
- **How to guarantee the sustainability of space activities for their benefits?**
 - Increasing crowding in key orbits
 - Increasing amounts of debris in space
 - Space weapons development



THANK YOU!

QUESTIONS?