

Security in Outer Space: Stakes for Europe

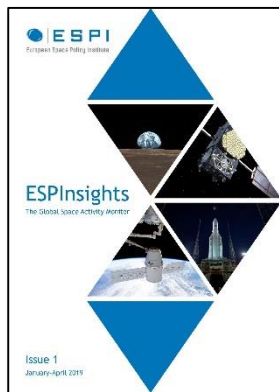
Lecture at Prague Security Studies Institute
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Independent public think-tank in space policy

The European Space Policy Institute (ESPI) provides decision-makers with an informed view on mid- to long-term issues relevant to Europe's space activities. In this context, ESPI acts as an independent platform for developing positions and strategies.

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- 2-pager
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- Regularly
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 - Space Venture Europe
 - Business and Policy Perspectives on Microlaunchers
 - The Rise of Private Actors in the Space Sector

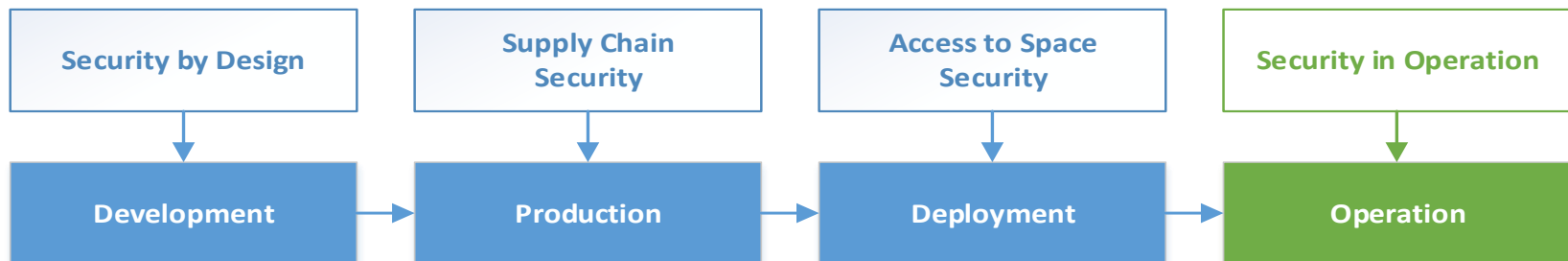
Springer Books



Space security: a multidimensional concept

Security in Outer Space	Outer Space for Security	Security from Outer Space
The protection of the space infrastructure against natural and man-made threats or risks, ensuring the safety and sustainability of space activities.	The use of space systems for security and defence purposes.	The protection of human life and the Earth environment against natural threats and risks coming from space.

- **Space Situational Awareness (SSA):** Current and predictive knowledge and understanding of the outer space environment including space weather and location of natural and manmade objects in orbit around the Earth;
- **Space Environment Protection and Preservation (SEPP):** Preventive and curative mitigation of negative effects of human activity in outer space on the safety and sustainability of the outer space environment;
- **Space Infrastructure Security (SIS):** Assurance of the infrastructure ability to deliver a service that can justifiably be trusted despite a hazardous environment.



Policy areas and activities: ESPI Matrix

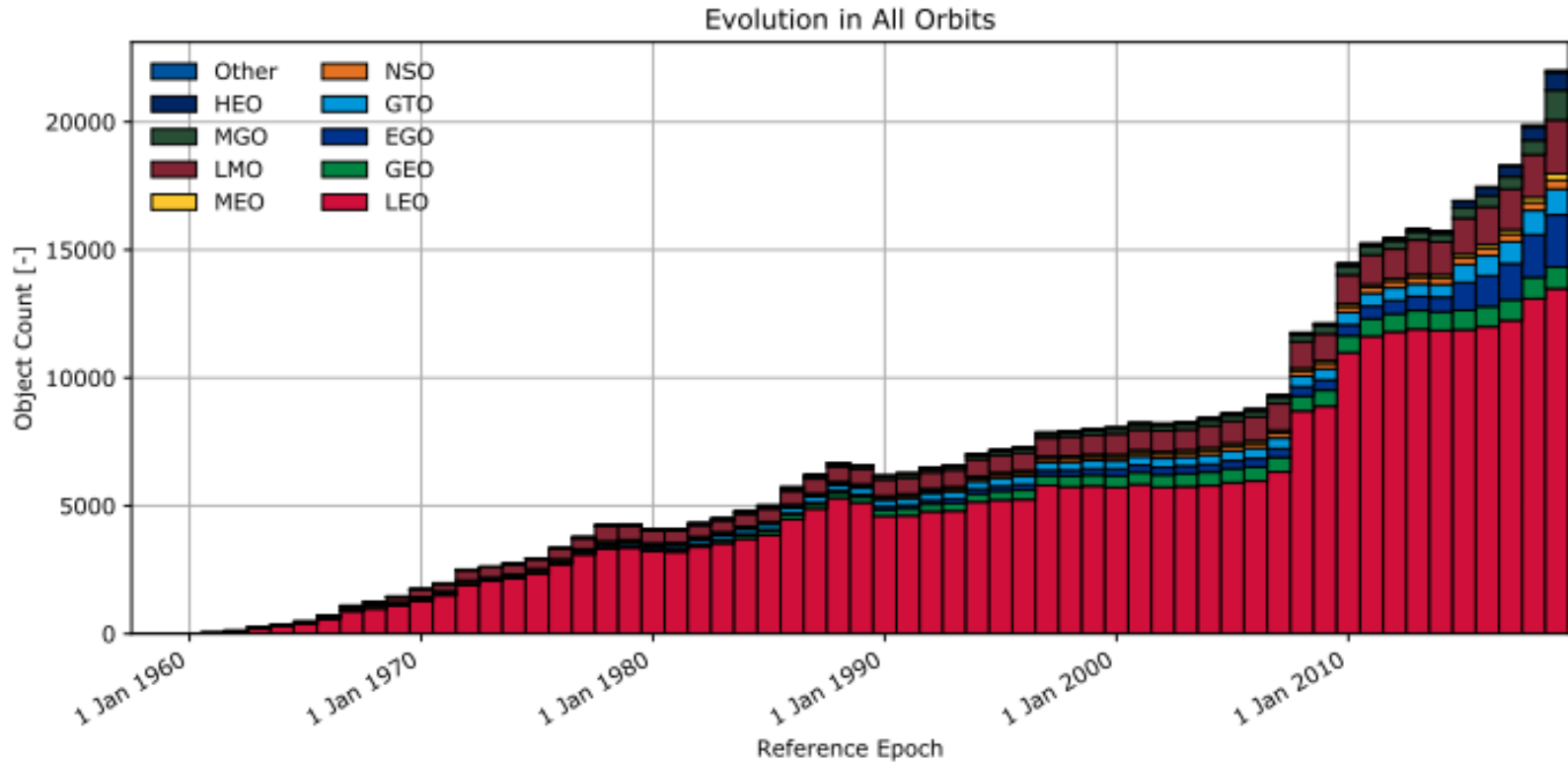
	Capacity-building programmes	Legal and regulatory regimes	Diplomacy and cooperation
Space Situational Awareness	<ul style="list-style-type: none"> • SST capabilities development • Space weather models development • SSA services delivery 	<ul style="list-style-type: none"> • Space objects registration obligations and procedures • SSA data policy 	<ul style="list-style-type: none"> • SSA data sharing agreements • TCBMs
Space Environment Protection and Preservation	<ul style="list-style-type: none"> • CleanSpace technologies development (e.g. active debris removal solutions) 	<ul style="list-style-type: none"> • Space law (e.g. end-of-life obligations) • Standards for space environment-friendly design (e.g. passivation devices) 	<ul style="list-style-type: none"> • Space Debris Mitigation Guidelines • Long-term sustainability guidelines • International Code of Conduct proposal
Space Infrastructure Security	<ul style="list-style-type: none"> • Security enhancing technologies development (e.g. secure links, materials) • Resilient system architectures (e.g. fragmented systems) 	<ul style="list-style-type: none"> • Space programme security rules and procedures • Security and safety standards • Supply chain control processes (e.g. import, qualification) 	<ul style="list-style-type: none"> • Collision avoidance procedures and coordination • Deterrence through hosted payloads on allies' satellites

Rising challenges to space infrastructure security

- Space is an increasingly congested and contested resource:
 - **Multiple and diverse:** different mitigation and protection measures;
 - **Interrelated and interdependent:** holistic approach *required*
 - **Ubiquitous and inclusive:** all systems affected, different degrees of exposition/vulnerability;
 - **Intensifying:** various trends (e.g. increasing space activity, new concepts, connected space, strategic target, ‘space control’ capabilities);

Unintentional hazards	Intentional threats	Space weather hazards
space debris, accidental interferences...	ASAT, malicious interferences, cyberattacks...	geomagnetic storms, solar storms...

- Growing dependence on space: risks for society and economy at large.

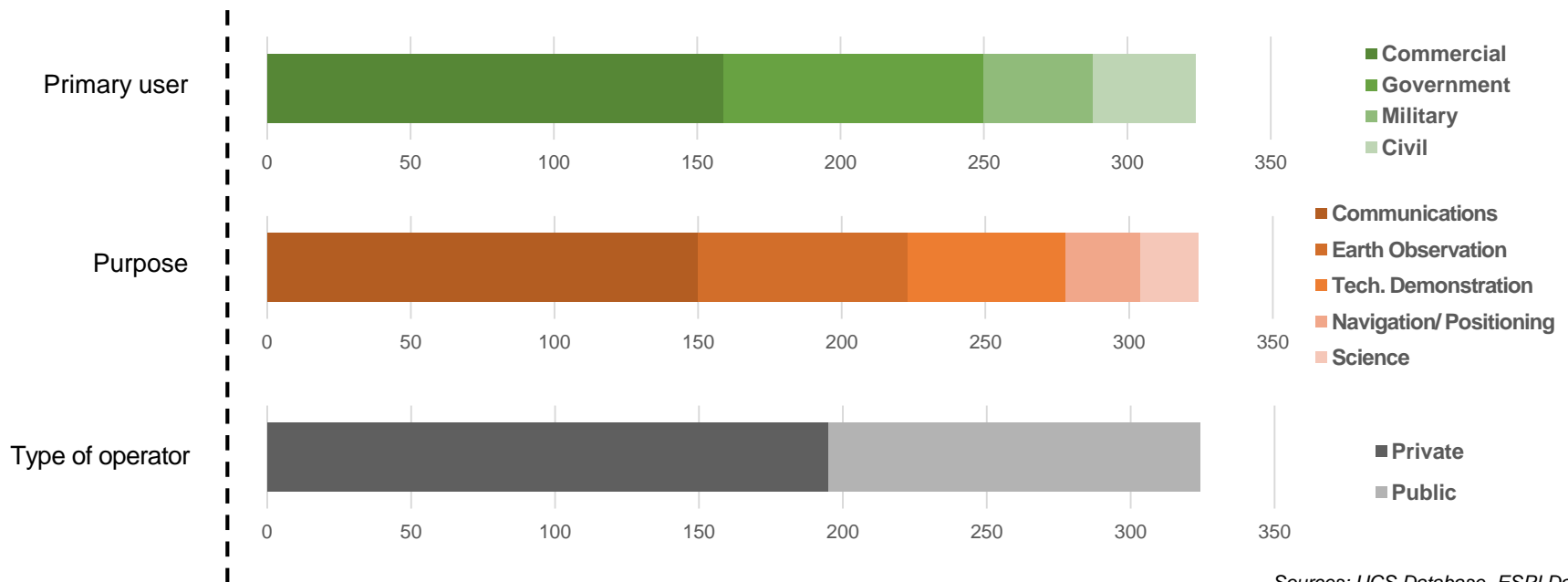


(a) Evolution of number of objects.

Source: ESA's Annual Space Environment Report (May 2019)

European Space infrastructure is

- **A result of a long-term substantial investment** by public and private actors
- **Owned / operated by a variety of actors** (EU, ESA, EUMETSAT, national states, private operators...)



Sources: UCS Database, ESPI Database

European policy drivers

- **Secure the results of the continuous and substantial investment** made by public and private actors;
- **Protect the European economy and society** against risks related to its pervasive and sizeable dependence on the space infrastructure;
- **Contribute to a service oriented policy** by assuring the ability of the infrastructure to deliver a service that can be justifiably be trusted, in particular for users in defense and security;
- **Guarantee European autonomy and freedom of action** in the field of security in outer space with implications on the space domain at large (non-dependence).

Long-term stakes

“Promote Europe’s position as a leader in space, increase its share on the world space markets, and seize the benefits and opportunities offered by space.”

- **Space security now holds a central position in space diplomacy:** Need to play a prominent role on the international scene, as a promoter of a clear, united and consistent “European way”.
- **Security plays an increasing role in commercial space markets:** Support the European industry competitiveness and stimulate the emergence of a commercial market.

European approach – Key elements

National governments: core actors of space security in Europe

- Space security policy **primarily addressed at national governmental level and driven by domestic security and defence strategies with some reluctance to transfer sovereignty.**
- **European cooperation progressing** but remains **mainly structured through bilateral and intergovernmental frameworks** (pan-European cooperation still faces hurdles).

European approach – Key elements

ESA: a key player of capability-building

- **ESA launched a number of initiatives** including an SSA programme (limited SST component on MS request), a Cybersecurity excellence centre, the CleanSpace initiative, IADC...
- **ESA made efforts to improve its capacity/legitimacy to handle security-related activities.**

European approach – Key elements

EU: consolidating its role in space and security & defence policies

- **Space security is of special importance for the EU**, at the crossroad of space and defence & security policies, two strategic areas of development of the EU.
- **EU awards an increasingly great importance to the security of its space programme** (e.g. security accreditation, security architecture, data security policy, synergies with defence...).
- **A number of activities are supported by/embedded in EU programmes** (e.g. EU SST support framework, H2020 R&D projects, international diplomacy initiatives).

Rising stakes for Europe call for:

- **First**, definition of policy objectives and mobilization of appropriate resources in an efficient manner (in part. for SSA capacity-building):
 - **Technology roadmaps, programmatic schedules from all potential sources of funding, sufficient level of coordination among different stakeholders**
- **Second**, implementation and definition of appropriate (and agreed) governance schemes:
 - **More prominent European leadership, minimization of unnecessary duplication of efforts, adequate involvement of industry**

2020 – a Turning Point for Europe in Space

- EU MFF 2021 – 2027, #VdLCommission, EP 2019 – 2024, ESA CM/19 Space19+

Security in Outer Space:

Transatlantic Perspectives

The Case of Space Traffic Management

Europe – A Space Power?

Transatlantic Perspectives

U.S. approach – Policy drivers

- **Assure military superiority in space and on the ground:** Space infrastructure is a critical component of warfare; Strengthening of deterrence in space and on the ground; Re-emergence of a space warfare doctrine and need for tactical response options in space.
- **Safeguard national security against space vulnerability:** Growing perception of vulnerability in space (i.e. concept of Space Pearl Harbor); Need to protect critical space assets against threats (e.g. ASAT, cybersecurity, jamming & spoofing).
- **Foster commercial space:** Give way to a potentially promising commercial market; Foster competitiveness from cost-effective economic agents; Avoid diverting valuable public assets from their strategic missions.
- **Reinforce global leadership in space:** Position the U.S. as leader in a domain of increasing strategic significance on the global scene; Promote space safety standards and norms across the international community.

U.S. approach – Key elements

- **Unmatched SSA capabilities** thanks to massive investments from defense budgets; expected to be further improved (Space Fence programme)
- **Promotion of deterrence- and resilience-oriented architectures:**
 - Fragmented systems (e.g. constellations, miniaturized systems)
 - Hosted payloads (e.g. hosted DoD payload on Norwegian satellite)
- **Space Policy Directive 3:**
 - Reorganization across military and civil/commercial branches
 - Encourage and facilitate U.S. commercial leadership
 - Improve SSA data interoperability and enable greater SSA data sharing
 - Develop STM standards and best practices
- **Space Force:**
 - Congress approval required;
 - Symbolizes new U.S. posture, reactions expected on international scene

Parallel routes towards common objectives

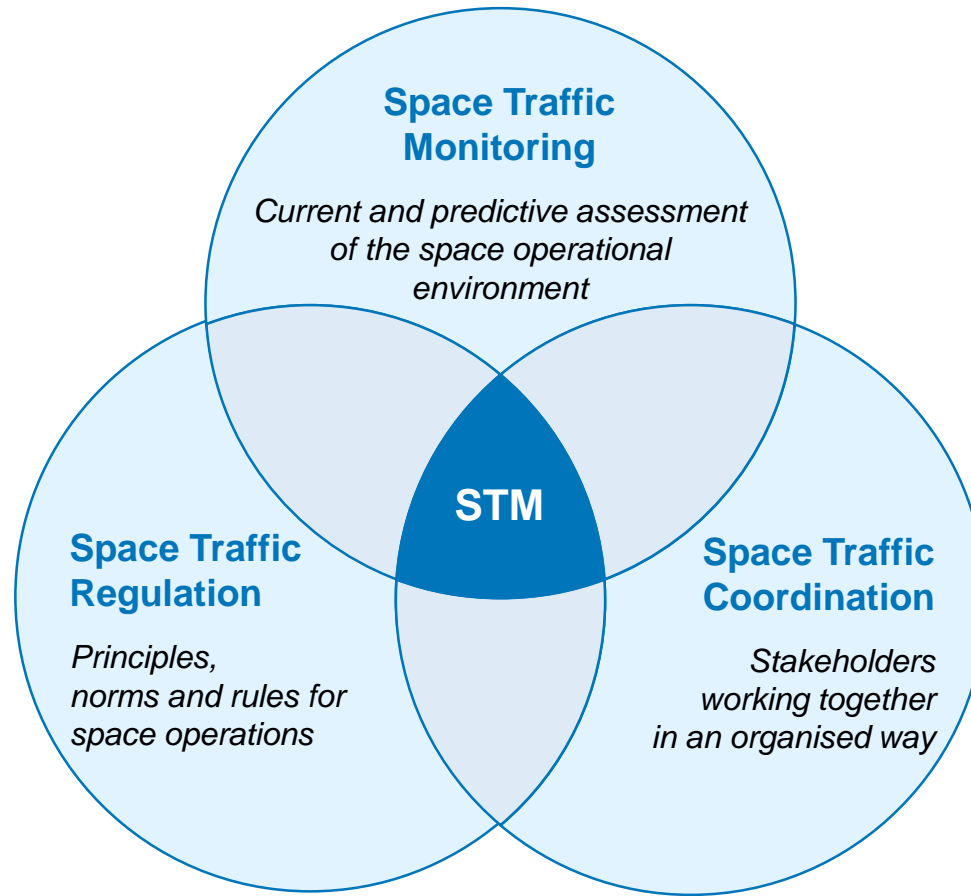
	United States	Europe
Policy drivers	<ul style="list-style-type: none"> National security (vulnerability, Space Pearl Harbor...) Military superiority in space (Ultimate high-ground) Promotion of commercial market 	<ul style="list-style-type: none"> Protection of investment and of socio-economic return Meeting security requirements of service-driven policy Achieve autonomy
Organisation	<ul style="list-style-type: none"> Sharing of responsibilities between DoD and DoC (SSA/STM); Top down approach to military/civil domains Other national institutions on case-by-case (NASA, NOAA, FCC, FAA) Intricate relations between the different actors 	<ul style="list-style-type: none"> Multiple actors loosely coordinated European countries (dual approach, reluctance to transfer sovereignty, European cooperation challenged) EU and its agencies (crossroad of space and security policies, evolving role under consideration) ESA (capability-building)
Major developments	<ul style="list-style-type: none"> New national space security strategy National STM policy (SPD-3) Establishment of a Space Force within the DoD 	<ul style="list-style-type: none"> New regulation (SSA component) Upcoming Space Defence Strategies (France, UK); Rising awareness in policy debate (capabilities, coordination, cooperation with partners)
SSA capabilities	<ul style="list-style-type: none"> Self-sufficient (unmatched SSA capabilities, precision to be improved, coverage to be complemented) Enhancement: Space Fence, SSA data “crowdsourcing” 	<ul style="list-style-type: none"> Strong reliance on U.S. SSA data sharing agreements; Improvement of SSA capabilities expected in coming years
Involvement of private actors	<ul style="list-style-type: none"> Policy intends to foster commercial activities (SSA data, contribution to STM...); Developing commercial activity in SSA data and related services 	<ul style="list-style-type: none"> Mostly contractors (R&D projects, development and manufacturing); Repeated calls for more industry-led initiatives but no policy decision

The Case of Space Traffic Management

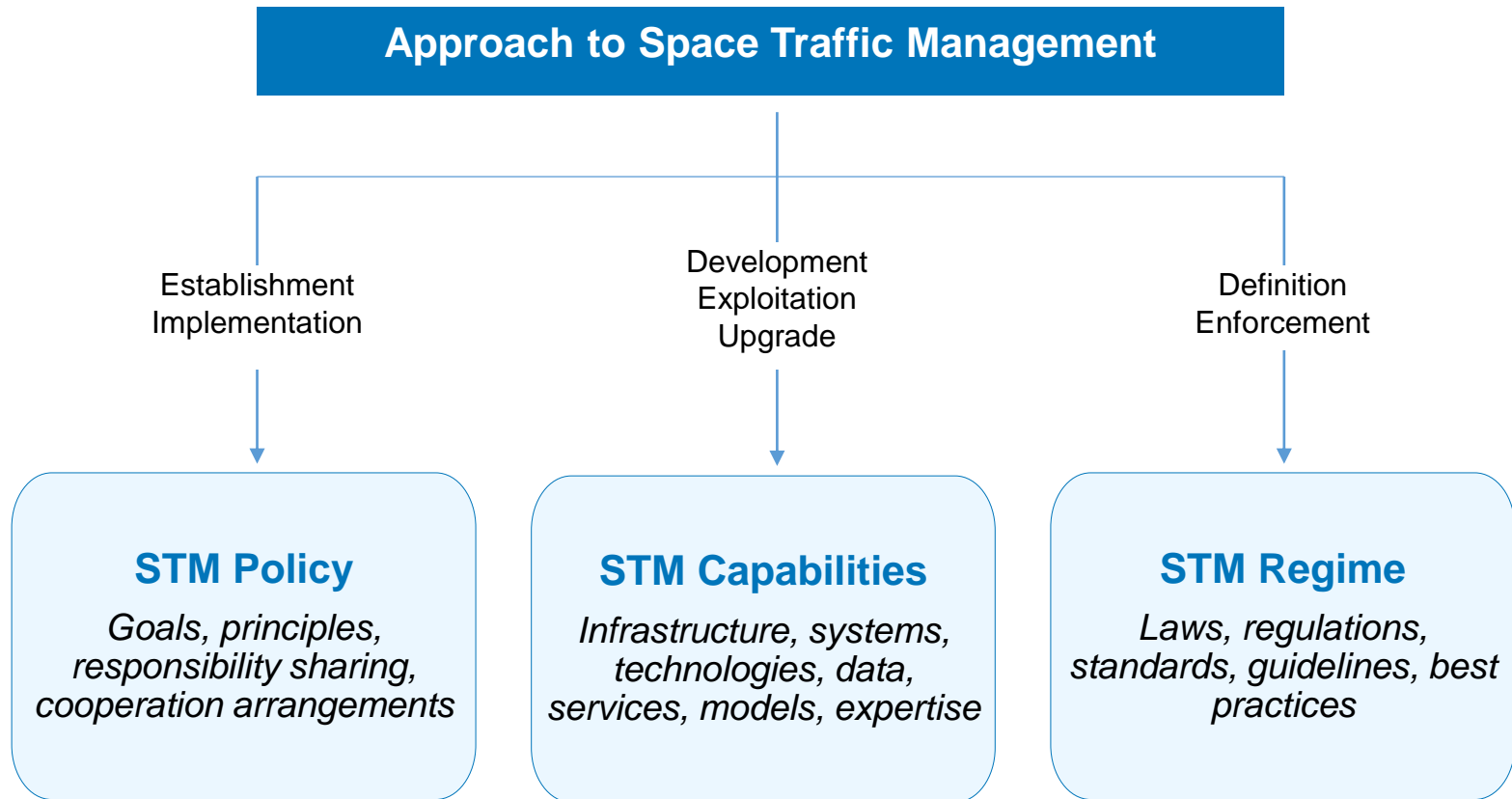
What is Space Traffic Management?

- **Various definitions:**
 - **IAA:** *“the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radio-frequency damage”*
 - **SPD-3:** *“the planning, coordination and on-orbit synchronization of activities to enhance the safety, stability and sustainability of operations in the space environment”*
 - **The Aerospace Corporation:** *“the classification of services designed to help satellite operators avoid physical or operational conflicts.”*
- **Among all of them, there is generally convergence on:**
 - **Objective:** enhancement of safety and sustainability of space operations
 - **Scope:** Physical and RF risks, across the space mission lifecycle
 - **Components** of operational and organizational nature

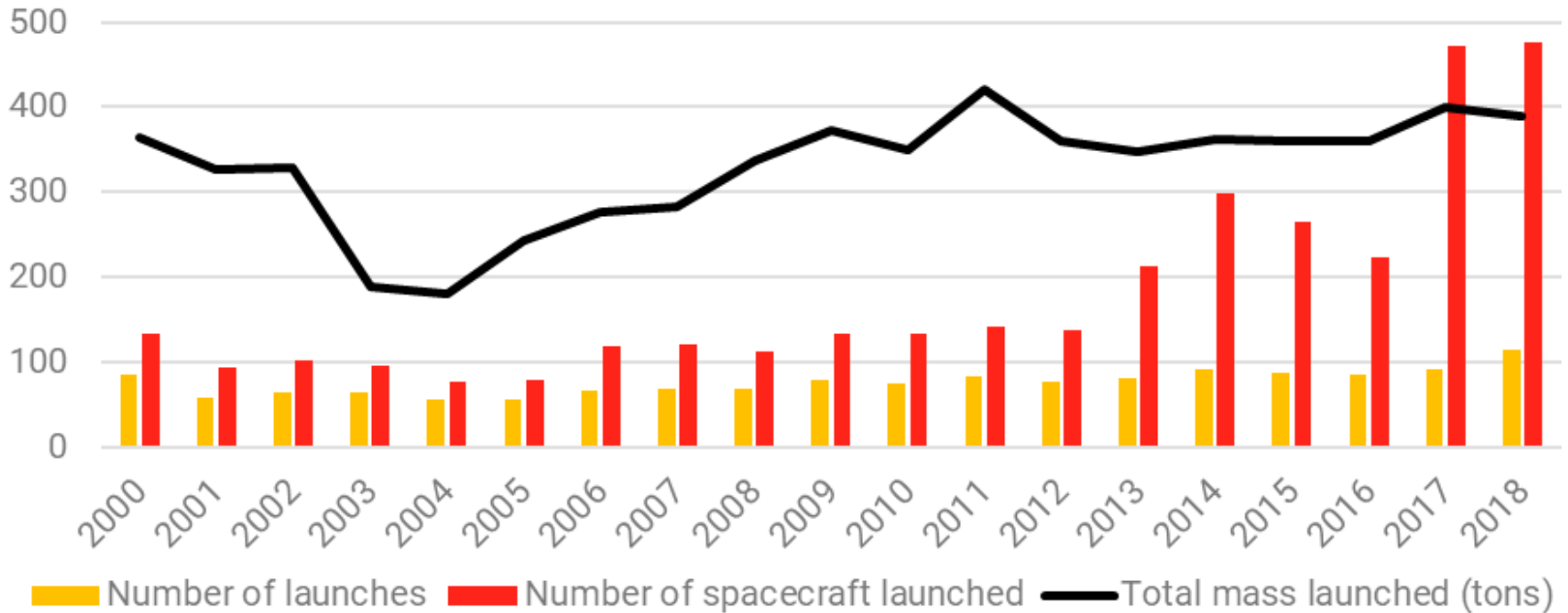
ESPI STM Model



ESPI STM Model



Rising challenges to space infrastructure security...



Source: ESPI Database

+ expected

Large LEO constellations

Rendezvous and Proximity Operations

Utilisation of small satellite missions

...calling for Europe to prepare its own position

- **Others are taking position already** – USA moving forward with the implementation of SPD-3 (June 2018), which calls for:
 - Reorganization of responsibilities across military and civil branches
 - SSA data enhancement and SSA data policy
 - Specification of STM best practices and norms
 - Coordination at international level, inviting other space-faring nations to take position as well
- **Impetus to consider a possible European approach to STM** – need to coordinate the views, requirements and possible contributions of different stakeholders
- **STM has the potential to contribute to the objectives of European space strategy**, due to its impact on:
 - Safety and security
 - Competitiveness and growth
 - International positioning

Increasing traction for STM in Europe

- **Increased ambitions for space safety and security:**
 - **Enhanced SSA component** for the EU space programme 2021-2027
 - **ESA “Safety & Security”** pillar of Space19+
 - **EEAS 3SOS initiative** to promote sustainable space operations
 - **New EU instruments for security and defence** (e.g. PESCO, EDF...)
 - **Rising ambitions from Member States** (National strategies, SST consortium enlargement)
- **STM - preliminary discussions and first initiatives:**
 - Recognition of the issue by **top-level representatives** (EU, ESA, national)
 - **H2020 project** for STM (upcoming Work Programme)
 - STM pilot project submitted for funding by the **European Parliament**

Toward a European STM Policy?

- **Multiple existing building blocks in Europe for STM**
 - Different scopes and objectives
 - Different stakeholders
 - Different leadership
- **Current “bottom-up” approach has some limits:**
 - Risk of incompatibility, incoherence and inconsistency
 - Risk of divergence of interests among stakeholders
 - Risk of duplication of effort and reduced cost.-effectiveness
- **Growing need for a “top-down” policy providing:**
 - Shared principles and common objectives
 - Agreed delineation of roles and responsibility
 - High-level guidelines for implementation

Europe – A Space Power ?



“Europe has always been an important space power.”

“Last year, we adopted a Space Strategy for Europe. With this strategy, we set our vision and ambition for Space: to remain a space power and to embrace the challenges ahead.”

Commissioner Bieńkowska, 33rd Space Symposium, April 2017



“Looking at where we are: Europe is a true space power. The second in the world.”

“That being said, [...] the world is changing in front of us. [...] It is the position of Europe in space that is at stake.”

Commissioner Bieńkowska, 11th Annual Conference on European Space Policy, January 2019

What kind of Space Power is Europe?

What is “Space Power”?

What does it entail?

What are the requirements?

How do you establish it?

Is it desirable?

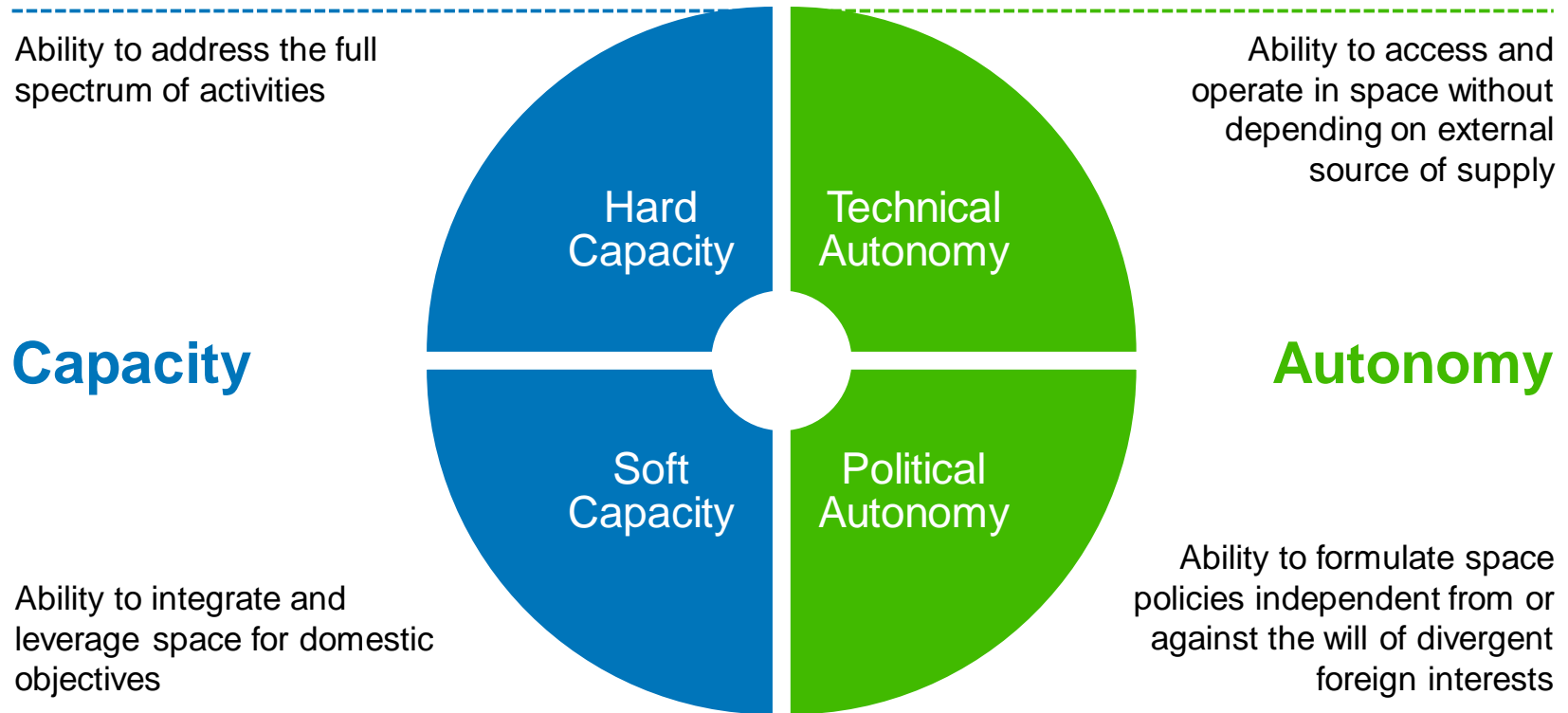
How do you exercise it?

Do we want it?

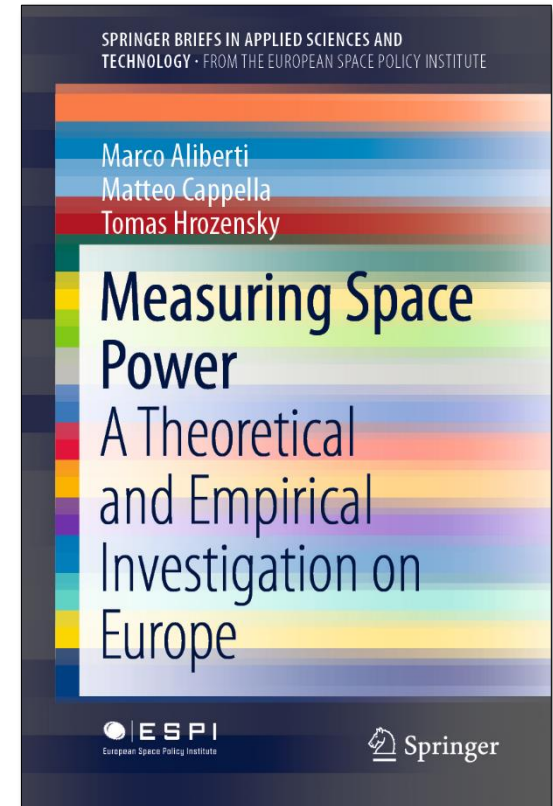
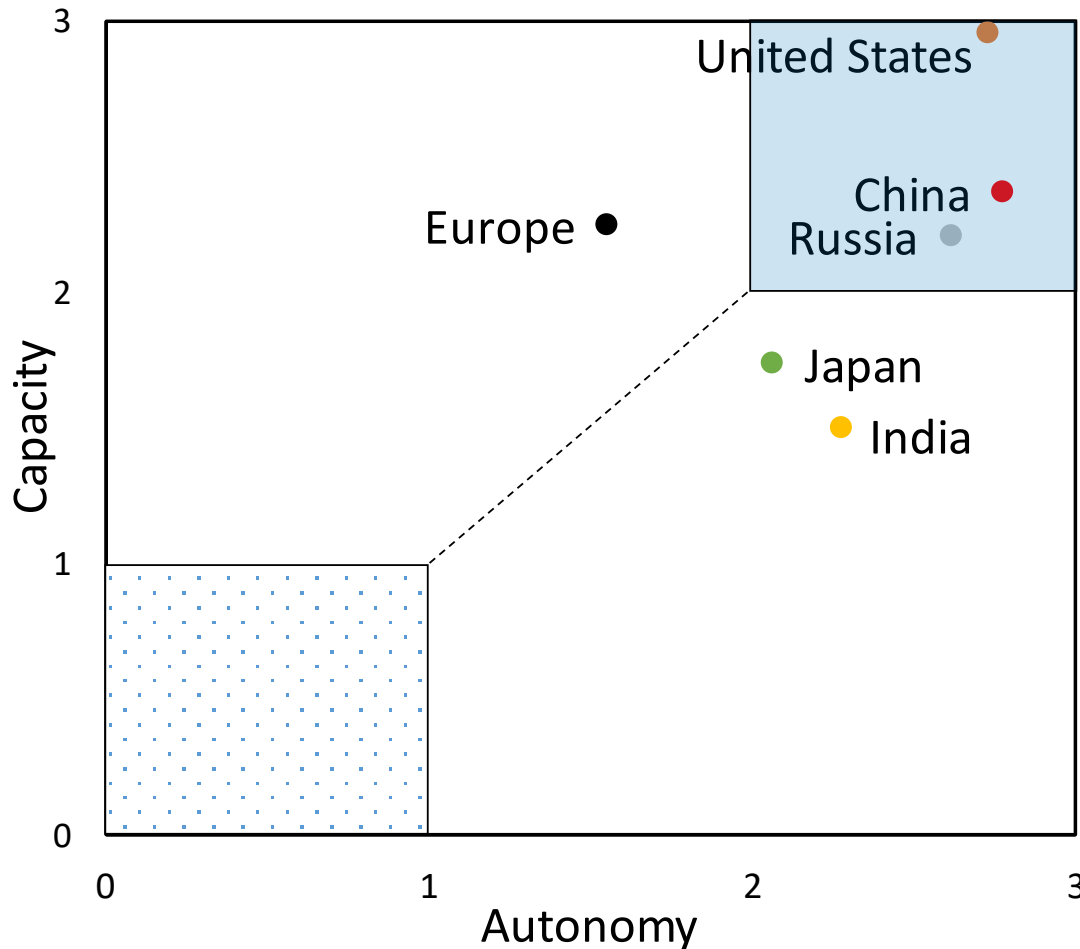
For what purpose?

What are the implications?

What is “Space Power”?



Space Power Map



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**Evolution of the Role of Space
Agencies - Executive Summary**

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