

### The Role of Space as a Global Common Good for Critical Infrastructure and Industry: a Workshop Report

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# DGAP REPORT

## Strategic Compass

# The Role of Space as a Global Common Good for Critical Infrastructure and Industry

## A Workshop Report



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## WORKSHOP RESULTS PAPER

Compiled by Dr. Christian Mölling & Florence Schimmel

Space-related topics transcend the “basket” logic of the Strategic Compass (SC) as they touch on aspects of all issue areas. To break down this complex topic, the workshop was based on an input paper and focused on aspects of infrastructure, congestion, and competition. While discussions cannot and should not look exclusively at security and defense, participants were encouraged to spotlight initiatives relevant for the scope of the SC process.

### SPACE INFRASTRUCTURE IN AND FOR EUROPEAN SECURITY

1. Participants agreed that **space provides invaluable services and capabilities that are highly relevant for everyday life, for military and civilian defense and security, and for the overall resilience of the union.** Space offers technical means to help mitigate the potential risk of strategic surprises, to ensure the independence of political decisions, and to increase the resilience of many of the systems we rely on. **The digital transition of our societies has made clear the crucial role of space in ensuring autonomous access to information and safeguarding digital sovereignty,** e.g. in terms of communications and data storage. In the SC process, space-related issues affect the EU’s capacity to act in each of the SC’s baskets.
  - 1.1. **European space capabilities must remain in place, and their resilience should be improved,** particularly with reference to the denial of service and/or access. However, the EU often faces problems of fragmentation as, for example, different European militaries launch their own satellites without pooling assets.
2. One speaker analyzed the transformation of space: it is becoming **more hybrid, more competitive, more innovative, more challenging to strategic interests and governments, and involves increasingly more players from both public and private spheres.** In the medium term, the space industry will contribute massively to the field of emerging and disruptive technologies. This provides an **essential economic opportunity, though some questioned whether there was sufficient demand for small and heavy launches in Europe for the EU to sustain its own market.**

3. Experts defined space as a cross-sectoral and multi-domain enabler that started out as a strategic asset and is gaining consistently more importance for a range of policy fields. For example, space-based technology was deemed critical for climate change mitigation since as many as two thirds of the Intergovernmental Panel on Climate Change (IPCC) goals are achievable only with space-based service components.
4. The participants agreed that **developments in space pose a challenge to the EU’s ability to preserve autonomous access and shape governance as a global actor.** One expert emphasized how the threat from space is greater than simply that of anti-satellite weapons as miscalculations and collisions can happen accidentally and have a devastating impact.
  - 4.1. A key requirement if the EU wants to remain an actor in space is to ensure a competitive position regarding launches. One contributor raised **the question of what might be the consequence of drastically reduced launch costs.** It is possible that this would revolutionize the mobility of goods and people just as radically as canals transformed transport in pre-industrial revolution England, or as containerization reshaped global trade.
  5. One expert attested that the EU has everything it takes to be a space power player, but must be bolder, more active, and engage in more risk-taking. For the SC, that means answering the following questions:
    - 5.1. Which problems can be solved or mitigated, and which cannot (at this point in time)?
    - 5.2. What solutions are available, and what is their nature (political, technical, procedural, etc.)? And for which technological and financial challenges do we need partners?
    - 5.3. Which aspects of this can be addressed via the Strategic Compass?

6. Many participants agreed that the **SC should help increase the resilience of space infrastructure**. One suggested using a declaration on the importance of certain assets for deterrence. It was emphasized that the EU should aim to find a technological solution to future dependencies, explore alternatives (both public and private), and reduce the risk of losing capabilities. Some experts underlined that **the cost of inaction is complete dependency, and possibly even exclusion from space**.

6.1 In crisis management, both civilian and military missions rely on space-based services for the fulfillment of their mandate and the safety of the mission environment, e.g. via navigation and positioning. One participant voiced the potential for the establishment of early warning systems against any attack on this infrastructure.

6.2. It was suggested that since cyber threats and related activities led by third countries are high on the agenda, the diversity and abundance of capabilities in space should be capitalized on more, inter alia to secure information and communication lines.

6.3. One expert added that the protocol for potential attacks on EU space assets should be clarified.

## CONGESTION AND COMPETITION IN SPACE

7. One expert remarked on the tendency to think of space as infinite. However, **increasing congestion showcases the limits of frequencies and orbital positions and increases competition. Both the resulting collision risks and the growing opportunities for malicious acts call for action to preserve open and fair access through regulation**.

8. Participants agreed that space would remain contested and congested in the foreseeable future, even if the geopolitical environment was not developing as it currently is. More actors will emerge and try to capitalize on the opportunities presented by space, meaning competition over orbits and frequencies, for example, regardless of whether actors have military ambitions. Participants added that the expert community expects an additional 10,000 satellites to take

up lower orbit positions in the course of the next decade.

8.1. One speaker raised the **question of whether competition for orbits and frequencies was a “winner-takes-all” race**. If so, speed is important, and “land grabs in space” will have to be prohibited to ensure that governments favoring fair regulation will not be too late.

8.2. Participants agreed that it is important for Europe to position itself regarding possible future constellations, and to ensure resilience throughout. Experts wondered how to attract, retain, and train the necessary human capital.

9. World markets are defined by competition among states, as well as an ever increasing number of private actors. **The European commercial market was deemed to be facing strong competition, even among allies like the US and like-minded countries such as India (a potential partner?), especially in terms of emerging low-cost offers**. China’s market is not open to third states at all. Under these conditions, **concerted industry policies for a strong and competitive space economy are important**, and government and commercial capabilities must be balanced.

9.1. Some experts questioned whether the overall European market was substantial enough to be sustainable and to produce sufficient innovation. As an indicator, it was mentioned that even the biggest actors in Europe are no longer able to keep up with developments, and are looking for partnerships. One expert argued that the European ecosystem should be secured by helping new companies and start-ups to join research centers and big companies in order to jointly provide the necessary capabilities.

Some participants regarded **public-private partnerships as less important and promising than government funded venture capital investment**, with the CASSINI Space Entrepreneurship Initiative cited as a good example of the latter.

10. DG DEFIS has the composition it does because the Commission considers links between the space, civil, and defense industries to be crucial, and the commissioner has been tasked to work on finding synergies. Participants agreed that the SC process should there-

fore identify the capabilities and partnerships needed for Europe to secure critical capacities in the short- and medium-term. **The dual nature of space tech and space activity fosters the industrial ecosystem and economy.**

10.1. The SC process should be linked to new initiatives on Government Satellite Communication and situational awareness in space.

## GLOBAL AND GOVERNANCE PERSPECTIVES

11. Participants agreed that currently, geopolitical and military considerations are important in mobilizing resources for national space innovation. Large powers that depend on space militarily such as the US, China, and Russia are investing in anti-satellite weaponry and similar equipment. Participants agreed that **if Europe does not secure independent access to space, it will eventually lose its ability to act.**

11.1. Participants questioned the extent to which the EU can have a constructive relationship with other players such as the US and Russia. Some suggested that the more actors develop a presence in space, the more interest they will have in at least some degree of governance, not only in terms of actions with malicious intent, but also unintended accidents. **If certain orbits become unusable due to debris, for example, increased interest in at least a baseline of regulation is probable.**

11.1.1. Some experts suggested that **the best approach for the EU is to assert responsible behavior and signal that the EU is there to regulate.** Including the UK in these efforts was deemed desirable and helpful.

11.2. One expert proposed shifting arms control activities from definition talks (along the lines of “what is a space weapon and what is not?”) to the exchange of doctrines and perceptions. In doing so, the EU would prioritize developing a mutual understanding and decreasing tensions rather than looking to put measures in place immediately and tracking compliance, this being a positive but currently unrealistic ambition.

12. The speakers agreed that **the EU should therefore pay special attention to the evolution of the legal and normative environment**, for example supporting the UN GA Resolution 75/36 and the International Telecommunications Union (ITU). A situation where the first innovator is able to unilaterally define the rules should be avoided in order to comply with the spirit of

the UN Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (generally referred to as the “Outer Space Treaty”) that “the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind.”

12.1. One expert found that **as a global community, we are nowhere near the levels of governance of low and medium earth orbit that is needed for situational awareness and traffic management.** They suggested that it is unlikely to be possible to gain support for the kind of centralized action that would be needed to replicate the system for geo-synchronous orbit developed by the ITU. Still, Europe should be at the forefront in order to capitalize on network power and shape rules, with at least the goal of preventing collision scenarios.

13. The experts unanimously agreed that the global space industry is on the verge of a paradigm shift: **the upstream market is still defined by governments, but the lowering of launch costs for orbit in particular will drastically alter the demand, and bring the commercial market to self-sustainability.** Of the 19 launches made by SpaceX this year, for example, 13 were for their own commercial objectives.

13.1. It was proposed that **the EU should establish a roadmap to avoid other space nations determining the rules, and to give guidance and room to industry.** A global secure connectivity initiative with a constellation in low Earth orbit could offer secure connectivity for Europe and Africa. As UN processes are time-consuming (but very important), **the EU should pursue a policy-centered approach** and offer timely solutions to problems that become increasingly pressing. This could include **developing standards for interoperability, data management, and when and how to share data publicly.**

14. On the question of possible future cooperation between NATO and the EU, experts referred to the two actors’ simultaneous strategy processes and the fact that that both are currently in the process of defining their positions on issues such as the weaponisation of space. The establishment of common baseline positions will be a prerequisite for future collaboration, as well as discussions on topics such as offensive and defensive actions in space or the possible repercussions for Article 5 violations.

14.1. Some experts said that while EU-NATO and EU-ESA partnerships might be the first to come to mind,

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**the partnership basket could and should include other actors, including those from the private sector** that can help contribute to space situational awareness (SSA) and space surveillance and tracking (SST).

14.2. One expert argued that Europe is quite prepared to cooperate with some of its competitors. Even though any collaboration might mean giving away knowledge that could serve dual purposes, the ESA was deemed capable of managing that risk. However, the EU should focus on its own assets, allowing the ESA to focus on

its partnerships as most EU Member States are also ESA members, and the organization has extensive experience cooperating with international partners. Moreover, while the ESA focuses on science, the dual-use nature of EU space assets such as Galileo could make cooperation with potential competitors more difficult.

14.3. **All partnerships should follow guidelines from the proposed roadmap to ensure that all investments are strategic.**

*The workshop took place on 23rd June 2021 with support from the German Federal Foreign Office. This paper sums up the main points of the discussion as perceived by the rapporteurs. It does not necessarily reflect their opinion. Participants included representatives from member state ministries and the European Union, as well as from the European think tank community. We thank all participants and especially our excellent speakers for their valuable input. Any comments are welcome and may be sent to [schimmel@dgap.org](mailto:schimmel@dgap.org)*

## INPUT PAPER

By Torben Schütz

### THE INCREASING IMPORTANCE OF THE FIFTH DOMAIN

Space is all the rage these days. From governments creating space forces or space commands to billionaires trying to beat each other to space, the “final frontier” above our heads attracts more attention today than it has for a long time. It does so for good reason, as space assets are a vital part of the modern global infrastructure, geopolitical rivalries have extended into orbit, and the space industry is in the midst of significant change towards commercialization and future self-sustainability.

**The EU and its member states have an interest in actively managing these changes and bending them towards securing space as a global common** that continues to serve humankind. Space as a “cross-sectoral and multi-domain enabler”<sup>1</sup> provides several **valuable capabilities for the crisis management and resilience baskets of the Strategic Compass: from global positioning and navigation information to intelligence, surveillance and reconnaissance to communications**. All of these can be made available instantaneously or near-instantaneously, and globally. Moreover, all of these are helpful in military or civilian operations, and for a range of scenarios from humanitarian or disaster aid to combat missions. In addition, they are helpful for understanding situational changes caused by natural activity or human adversaries. Thus, it is clear what space delivers to civilian and military capabilities in Europe, and its contribution to economic prosperity is well documented.<sup>2</sup>

### CHANGES IN SPACE, FAST AND SLOW

**Currently, a combination of medium-to-long term continuous developments and disruptive change are creating a new situation in space**, which can be best described as “congested, competitive and contested.”<sup>3</sup> Ongoing developments include, for example, advances in microelectronics that enable better satellites, e.g. for earth observation (especially for small- and nano-satellites), the proliferation of ballistic missile technology and growing market availabil-

ity of commercial launch systems (allowing easier access for more actors), the increasing number of militaries using space assets (increasing the dependency on and strategic importance of space assets), and the proliferation anti-satellite (ASAT) weapons, from kinetic effectors to cyber and electronic warfare capabilities.

**Intensified global competition and the beginning commercialization of space have introduced rather sudden, disruptive changes. Perceptions of competitiveness drive the space policies of the world’s major space powers.** This is especially relevant for mobilizing state resources, military-strategic perspectives on space, and the regulatory environment.<sup>4</sup> **On the other hand, commercialization is the main driver for lowering launch costs, primarily in the heavy launch market. Such reductions are paramount for gradually introducing self-sustainability** in a market that is so far driven by government-induced demand. But lowering launch costs and making spaceflight more of a “regular” activity also entails strategic and military advantages for countries as it allows for rapid replacement of space assets. Moreover, both lower launch costs and rapid replacement capabilities increase the resilience of space infrastructure, e.g. in case of a conflict that includes warfare against space assets.

### FROM THREATS AND CHALLENGES...

**This new situation has created threats and challenges for space as a domain, and the assets in it, as well as space-industrial capabilities and adjunct technologies.** First, the potential weaponization of space by hostile actors, and what Fiott has termed “disruption”<sup>5</sup> in space constitute the foremost threat to space assets themselves (see Figure 1). Second, congestion of particularly valuable orbits and frequencies threaten space as a useable domain for everyone. **Next, commercialization and its impressive technological innovation and development speed have lowered launch costs, especially in the upstream market of space launches. This disruption threatens European industrial capabilities in this sector** as they depend on turnover made from the addressable global launch market

1 Daniel Fiott, “Securing the Heavens – How can space support the EU’s Strategic Compass?” *European Union Institute for Security Studies* (April 2021), p.2 <[https://www.iss.europa.eu/sites/default/files/EUISSFiles/Brief\\_9\\_2021\\_0.pdf](https://www.iss.europa.eu/sites/default/files/EUISSFiles/Brief_9_2021_0.pdf)>.

2 *European Commission*, “Communication on a Space Strategy for Europe, COM(2016) 705 final,” (Brussels, 2016), p. 2, <<https://ec.europa.eu/docsroom/documents/19442>>.

3 Roger G. Harrison, “Unpacking the Three C’s: Congested, Competitive, and Contested Space,” *Astropolitics*, 11:3 (2013), pp. 123-131, DOI:10.1080/14777622.2013.838820.

4 Torben Schütz, “Revolutionary by Design – The US National Security State and Commercialization in the US Space Sector,” *French Institute of International Relations* (2020), p. 25 <[https://www.ifri.org/sites/default/files/atoms/files/schutz\\_revolutionary\\_by\\_design\\_us\\_space\\_2020\\_.pdf](https://www.ifri.org/sites/default/files/atoms/files/schutz_revolutionary_by_design_us_space_2020_.pdf)>.

5 Fiott (2021), p.3.

(see Figure 2 & Figure 3). Finally, the intensive mobilization of national resources by large space powers, the US in particular, due to their perception of space as a competitive domain threatens European technological innovation. Aggressive spending by government-funded venture capital funds like In-Q-Tel, for example, also targets European innovators in the start-up space, luring them to work primarily in and for the US.

## ...TO SOLUTIONS AND MITIGATION MEASURES

Using the EU's Strategic Compass to address the full range of challenges in space is impossible. However, the Compass can address some issues and lay the groundwork for subsequent policy actions by the EU and its Member states.

**Weaponization and disruption will require active diplomacy and passive improvements on future space assets.** They therefore fall into the Strategic Compass's resilience and capabilities baskets. Both represent the lowest common denominator the EU and all Member states are likely able to agree upon, and should be listed in the Compass. **These include political and technical solutions for the next generation of satellites.** On the political side, continued diplomatic efforts for international agreements on responsible and sustainable behavior in space are necessary. Even though **arms control for space** has not as yet advanced very far, **a shift from focusing on assets towards a more open exchange on doctrines akin to dialogues on nuclear doctrines could help to defuse tensions or at least clarify intentions.** On the technical side, radar-absorbing paints, onboard sensors for detecting incoming objects, and increased maneuverability of space assets will increase their resilience against some ASAT capabilities, and thus increase deterrence. **Moreover, R&D efforts should support structural factors that enhance resilience, for example distributed constellation instead of singular assets wherever possible.**

**Diverging views on the weaponization of any European space assets (even for exclusively defensive purposes) or on future arms control agreements in space will make further specifications in the Strategic Compass difficult.** New space capabilities like in-orbit operations or active debris removal, and their potential security impact and threat to space assets, will also likely require additional discussions among Europeans. **Lastly, the Compass could invite relevant EU defense-related bodies like the EDA, as well as EU member states, to explore non-space applications that could provide similar services and capabilities to those provided by current space assets.** If confrontation in space escalates, the significant current military-strate-

gic dependence on space assets should at least be mitigated via alternative solutions such as the use of very high-flying drones as communication relays.

**Congestion of orbits and frequencies cannot be solved for the time being, only managed.** With the growing commercialization of space, the democratization of space access, and the further proliferation of small- and nano-satellites, the number of objects circling our planet (including both active assets and debris) will grow quickly. Hence, space traffic management (STM) and space situational awareness/space surveillance and tracking (SSA/SST) capabilities are becoming increasingly critical. **While the EU is already investing in this area, the Strategic Compass should underline the importance of SSA/SST for space safety. Both STM and SSA/SST are important to preserve space as a useable domain for the Union's space assets and to create a clear operational picture for military operations in space.** Successfully managing congestion will increase space infrastructure resilience, and Europe's ability to attribute hostile behavior and secure its space capabilities.

**Protecting the European space industry and its technological innovators will further increase the EU's resilience and space capabilities.** Even though the EU and wider Europe currently possess a competent and competitive space industry, **rapid changes, especially in upstream space markets like the launch and satellite manufacturing markets, will have detrimental consequences.** While the primary European medium-to-heavy launch system, Ariane 5, was so far successful in retaining a sizeable share of the globally addressable market, future success is by no means guaranteed, even when it is replaced by its successor, Ariane 6. This, in turn, could increase launch prices, incentivizing European governments to seek international, primarily commercial, alternatives, leading to a self-perpetuating circle. While downstream markets such as service providers would not be hit hard, launch restrictions were one of the original reasons for Europe to finance its launch family. **Should the Compass clarify the close relationship between industry and autonomy in this still largely government-driven market, it could also recommend the establishment of a "launch European" clause for not only EU space assets, but national ones too.**

**Given the ongoing evolution of the commercial space market, neither the EU, the ESA or any of their Member states can continue with "business as usual". Beyond continuous support for space industries and R&D expenditures, reforms are needed at both the EU and national levels – and fast.** These include reforms to the way money is distributed, especially to start-ups, in order to prevent them from being lured away to the US by gov-



ernment-funded venture capital funds like In-Q-Tel. Such change will require more risky spending behavior, and the EU Commission's CASSINI is a crucial first step in the right direction. **The most fundamental question is whether combined governmental and private demand in Europe is sufficient in scale to initiate commercialization in the space launch market**, as has been the case in the US, and whether European governments and private actors will be willing to "buy European". If not, it is important to ask in which industrial areas the EU and its member states should focus their efforts.

**International cooperation** in space between the EU and its member states, NATO and both traditional and emerging actors, **is another area where the Strategic Compass's partnership basket should provide guidance. As NATO is establishing common policies for security and defense in space, close concertation between the two makes sense.** Lastly, **diverging opinions amongst EU member states** regarding the regulatory environment in space can endanger European unity, which the Compass might counter to a certain degree. **This is especially true when it comes to finding a common position on the weaponization of space and potential related arms control agreements. Unfortunately, the Compass's influence is, at best, limited on another critical topic:** the commercial realm that can increase space policy friction in the EU, **primarily through uneven European participation in the Artemis Accords.** However, as the Accords might be one of the most impactful international agreements on the future of space commercialization, they will have a disproportional impact on the development of space industries around the globe, thus affecting Europe's autonomy in this respect.

The EU should continue to make efforts to promote sustainable use of space by the international community in line with the International Code of Conduct (ICoC), paying particular attention to emerging space powers. **However, the EU must also acknowledge that the current approach and form of the ICoC has produced few results, in spite years of dedicated diplomatic activity.** Adapting the ICoC to the positions of other essential stakeholders or more incentives might be necessary to enlarge its range of action. In any case, retaining a careful balance between regulation for sustainability and industrial competitiveness will remain a challenge for Europe, as well as for other countries and their industries.

**Crisis management in space remains a primarily theoretical priority for Europeans.** However, it might arrive sooner than anyone wants to acknowledge. **Therefore, developing processes, for example by means of an EU Space Exercise, and through a dedicated EU Strategy for Space and Defense,<sup>6</sup> would build valuable know-how for handling complex situations,** which can be expected to become more frequent given the trajectory of developments in space.

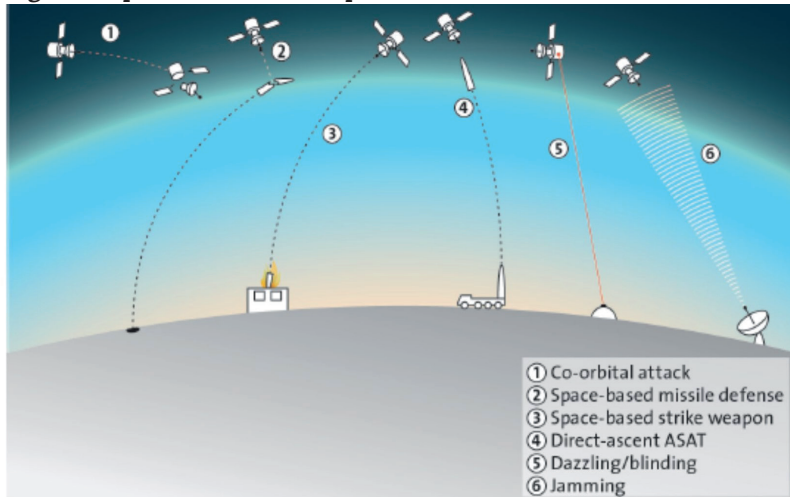
Space has always been militarized, and served as a stage for international competition throughout the Cold War. **However, the currently-emerging circumstances, arising from the emergence new space actors and a greater global reliance on space requires broad adaptation from all involved, including both the EU and its member states.** Specifically for the Strategic Compass, additional ideas for policies can be found in Daniel Fiott's excellent paper<sup>7</sup> on the issue (see Figure 4).

<sup>6</sup> Fiott (2021), p.5.

<sup>7</sup> Ibid.

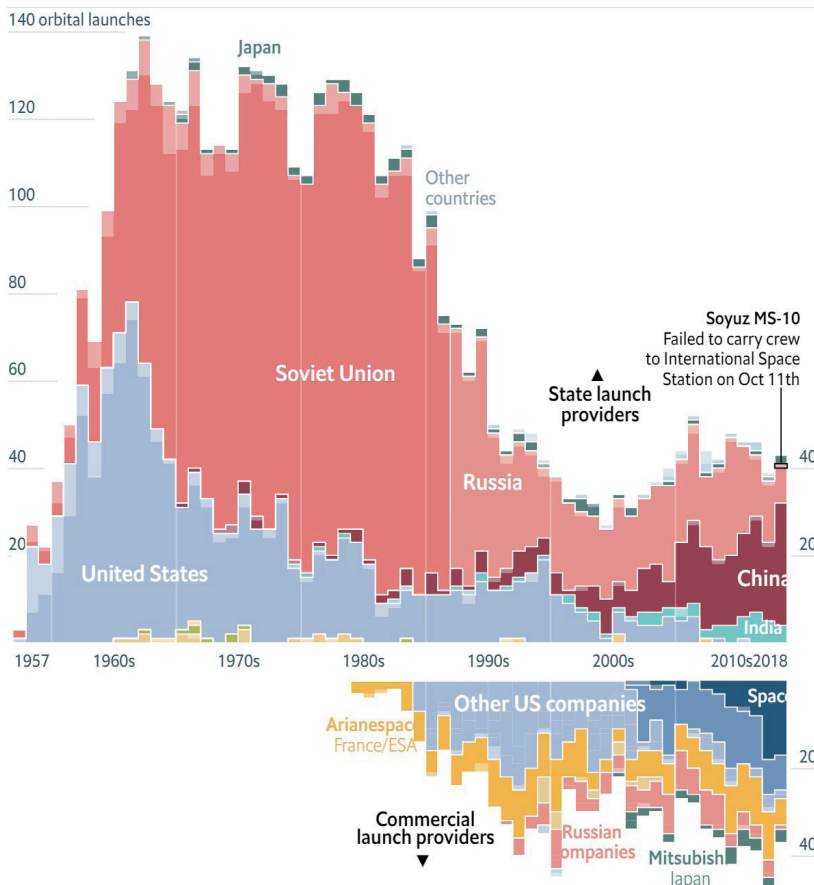
## DEVELOPMENTS IN SPACE IN FOUR FIGURES

**Figure 1: Space and ASAT Weapons**



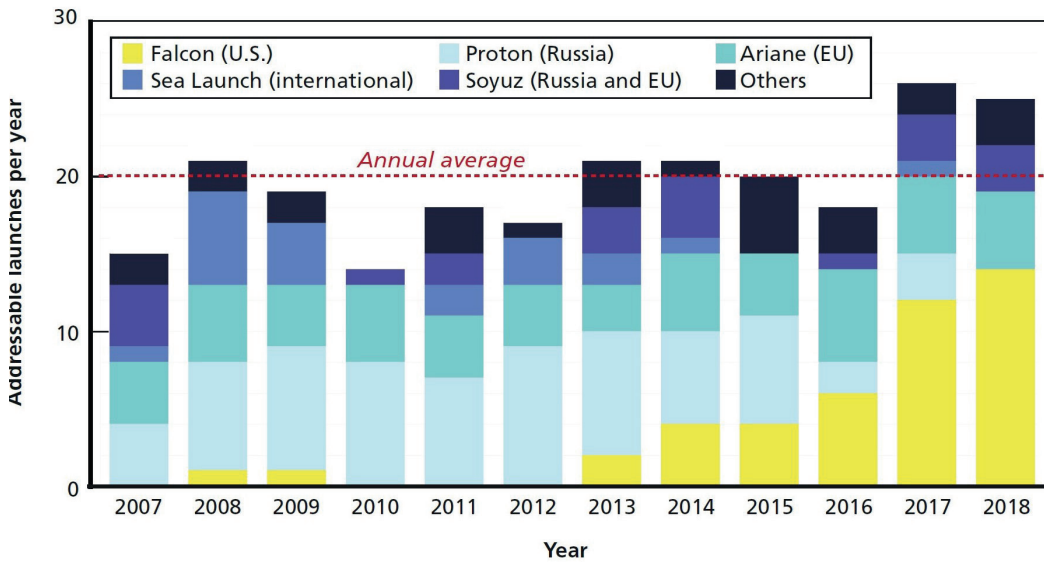
Source: Michael Haas, "Vulnerable Frontier: Militarized Competition in Outer Space," *Centre for Security Studies – ETH Zurich* (2019), <<https://css.ethz.ch/en/services/digital-library/articles/article.html/189524/>>.

**Figure 2: Space Launch Frequency over time**



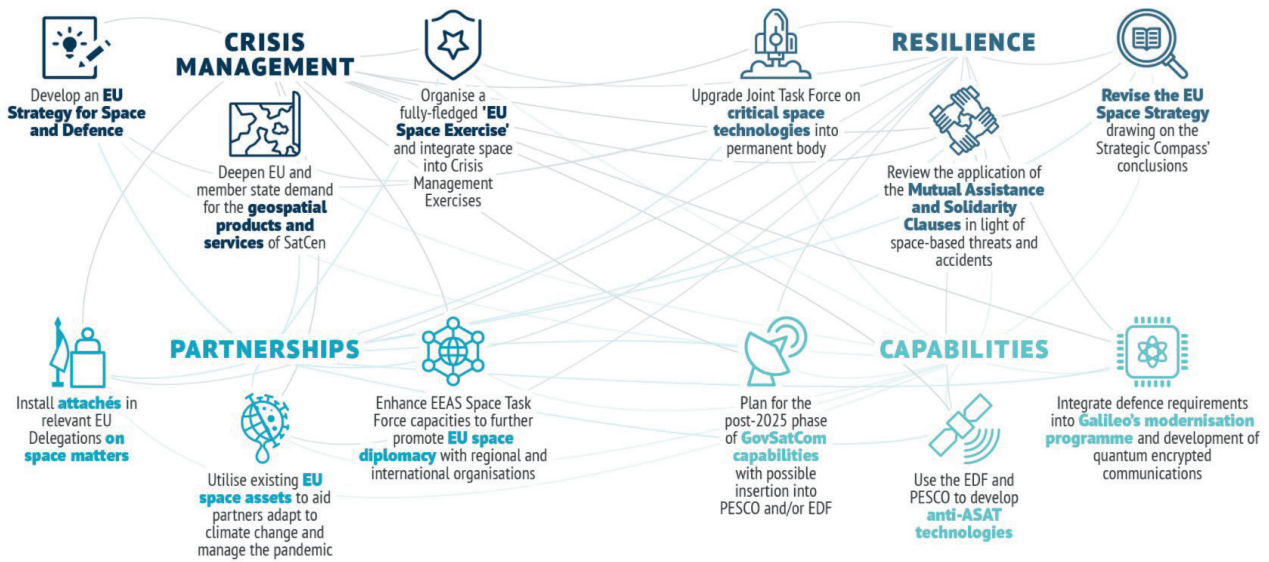
Source: *The Economist*, "The space race is dominated by new contenders" (October 2018), <<https://www.economist.com/graphic-detail/2018/10/18/the-space-race-is-dominated-by-new-contenders>>.

Figure 3: Global Addressable Commercial Heavy Lift Launch Market by Launch Vehicle, 2007-2018



Source: Bonnie L. Triesenberg, Colby Peyton Steiner, Grant Johnson, et al., "Assessing the Impact of U.S. Air Force National Security Space Launch Acquisition Decisions: An Independent Analysis of the Global Heavy Lift Launch Market," RAND Corporation, p. 26 (Santa Monica, 2020), <[https://www.rand.org/pubs/research\\_reports/RR4251.html](https://www.rand.org/pubs/research_reports/RR4251.html)>.

Figure 4: Additional Policy Ideas for the Strategic Compass & EU Space Policy (per Compass Basket)



Source: Fiott (2021), p.5.

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