EUROPEAN SPACE INDUSTRY CONTRIBUTION TO THE FUTURE EU SPACE LAW

EUROSPACE CONTRIBUTION IN SUPPORT OF THE FUTURE EU SPACE LAW ANNOUNCED BY THE EUROPEAN COMMISSION

Preamble

On January 24th 2023, Commissioner for Internal Market Thierry Breton announced that the European Commission would start working on an EU Space Law to put in place common rules on safety, security & sustainability of our space operations.

This foreseen legislative proposal is built on three justifications for action:

- The EU political context with a number of EU documents having been published in the past months, building towards addressing challenges to the safety, security and sustainability of space operations (i.e., STM Joint Communication of February 2022, Council Conclusions "EU approach to space traffic management" adopted in June 2022, Space Strategy for Security and Defence of March 2023);
- Heterogeneous legislative environment, as 11 EU Member States have adopted their own national space law;
- Consequences of non-action at EU level supposed to induce fragmentation and barriers across the single market, negative impact for the competitiveness of EU industry having to comply with different rules. In addition, no EU common approach is seen as making difficult to defend and promote an EU approach internationally.

The European space industry and European institutions share a common goal: to promote and operate in space in a secure, safe and sustainable way. In this regard, the "EU Space Law" is very much welcome as it aims at **providing a clear and stable legal framework for space activities in Europe**. If this would increase legal certainty for the long-term safety, sustainability and security of space operations, it would also help in attracting investment (by assuring legal certainty for investors) and stimulating and accelerating industrial innovation and research (with the development of new technologies driven by new requirements induced by the Law).

In this respect, it goes probably without saying that **Industry expects the future legislative proposal to support its competitiveness and of course not to risk fragilising its good position on the limited open markets, vis-à-vis international competitors who may not face the same regulatory burdens**. This means that:

- The **EU Space Law shall apply to non-European stakeholders willing to address the EU market**, in order not to create any competitiveness distortion with the European space industry;
- Any service requests resulting from this regulation (e.g., register to collision avoidance entity) will have to apply the **principles of European preference**;
- The regulation must **not lead to additional costs that would penalise the industry**. If this is the case, it will be imperative for the EU to accompany the industry with targeted support measures (e.g., funding, transitional schemes etc.).

The following paper is the attempt from the European space industry, represented by Eurospace, to provide recommendations on the future EU Space Law, specifically insisting on:

- Its added-value and scope;
- The necessity to support and not jeopardise the competitiveness of the European space industry;
- Cyber-security and resilience;
- Feedback on EC non-paper on sustainability.

Scope & added-value

Scope of the EU Space Law

The proposed three pillars (i.e., safety, security and sustainability) are essential if we want to address the full picture of space activities.

Sustainability will be a pillar that addresses environmental issues and encourages responsible behaviour in space activities. In addition to helping the efforts to reduce space debris, this emphasis on sustainability would also help the **European space industry to establish itself as pioneer in space activities that are environmentally responsible**.

The other two pillars, **safety and security/resilience, are essential for the expansion and long-term viability of the European space sector**. The EU Space Law should provide thorough **safety requirements to guarantee the security of both individuals and assets**. The Law would improve the **resilience of space systems and protect crucial space infrastructure** from potential threats by putting in place strong security measures, such as **cybersecurity and risk management frameworks**.

Above all, for Industry, **Space Traffic Management** is the one topic that urgently needs to be specifically included in the various pillars, and for which concrete and efficient measures should be implemented swiftly. To avoid collisions and maintain the long-term viability of space operations, effective control of space traffic is crucial given the growing number of satellites and space activities. To reduce the risk of critical damage from orbital debris and preserve the safety of space assets, the **EU Space Law shall include specific instructions or rules for the coordination, monitoring, and tracking of space objects whether manoeuvrable or not (aiming at an international level playing field between all space actors).**

Beyond the topics already identified by DG DEFIS, the future Law **would gain from the inclusion of other components that would enable the Law to provide a more thorough framework in a rapidly changing space sector.**

Finally, the **scope of application of the Law should also be clearly defined** (in national programmes, EU programmes, missions built by European actors, missions operated by European operators, missions delivering services over EU territory?). Obviously, the ideal situation to avoid distortion of competition with international entities is to **make the Law applicable to all entities delivering services in the EU**. It shall also include definitions that are based in particular on the internationally agreed terms such as “manufacturer of space objects”, “operator” and “manufacturer of components”.

Benefits for the EU Space industry

Industry and institutions have a shared interest: to operate in space, and to promote space operations, in a secure, safe and sustainable way. In this regard, the **EU Space Law is very much welcome as it aims at providing a clear and stable legal framework for space activities in Europe**.

Indeed, **the implementation of an EU Space Law might have a considerable positive impact for the European space industry**, including improved prospects for international cooperation, as well as sustainability, safety and security improvements. For the European space industry, this would increase legal certainty for the long-term, help attracting investment (by assuring legal certainty for investors) and stimulating and accelerating industrial innovation and research (with the development of new technologies driven by new requirements, e.g., sustainability, cyber-security). This could also represent, in a context where employment needs are high within

the European space industry, the occasion to attract and retain young talents valorising a virtuous industrial sector.

A predictable and stable regulatory environment offered by the EU Space Law would be generated through the development of a uniform set of rules that would give clarity and harmonisation throughout the EU. Such a harmonisation, requiring non-European actors to comply to this Law if they want to access to the European market (as already required by the US Federal Communication Commission for non-US operators), would **avoid having a negative impact on the competitiveness of European actors** (already highly dependent on the limited open markets for their financial sustainability).

In addition, it would provide EU stakeholders with an instrument to negotiate peer-to-peer with non-EU actors (on a bilateral basis as well as in international fora and standardisation/regulation bodies) on space-related policy, regulatory and best practices, and finally protect the ambitions and the sovereignty of Europe. Indeed, by offering a standard framework for interaction between EU space companies and organisations from other nations, the **EU Space Law is likely to enhance international cooperation and collaboration**. Through this alignment, administrative procedures would be streamlined, regulatory constraints would be lessened, and relationships with foreign stakeholders would be eased.

Recommendations from industry

Competitiveness

Challenges and opportunities

If the EU Space Law can offer considerable benefits for the European space industry, compliance and competition issues might arise. In order to retain and boost its competitiveness, the European space industry must proactively adapt to the changing regulatory environment and take advantage of the opportunities presented by the EU Space Law.

Challenges:

- **Higher compliance costs for space companies** due to the obligations imposed by their adherence to the new rules and criteria established by the EU Space Law (such as infrastructure investments, technological advancements, operational adjustments etc.). This relates to the capacity of the European space industry to produce at a lower cost and/or offer products at a more competitive price, and its capacity to bear the costs of technological development and innovation.
    - **The regulation must not lead to additional costs that would penalise the industry (i.e., representing a competitive disadvantage). If this is the case, it will be imperative for the EU to accompany the industry with targeted support measures (e.g., additional funding, transitional schemes etc.).**
- **Compliance with the new regulatory framework** will require space companies to manage the transition period and modify their current operations, processes, and business models. This may require changing current procedures and ensuring compliance with the particular standards established by the EU Space Law. One associated challenge is the need **for industry to be fully involved if potentially more stringent requirements than those already applied on current missions** (e.g., French Space Operations Act (FSOA)), are implemented;
- **Loss of competitiveness compared to international competitors**: European space companies may experience a rise in competition from entities from outside the EU that are not subject to the same regulatory framework. **There should be no negative impact on the international market share of the European space industry**. In particular, any impact on cost and innovation capacity would translate into a loss of market share;
- **Loss of European capabilities**: In case the satellites manufacturing or operation rules are too constraining for EU companies, **some may decide to relocate their activities in countries where the regulatory framework would be less constraining**. This would lead to the worst-case scenario where the objectives of the future Law would be missed, and the EU space economy would be affected. This is the reason why the future Law should be applicable to any entity providing services to the EU market, whether or not they are developed in Europe. At the same time, there is the **need to ensure the means/frameworks to secure European capabilities internally**;
- **Necessary increase of the TRL of some solutions required to comply to the Law** which might be low today. Again, this must be supported financially with ambitious and efficient R&D programmes aiming at maintaining the technological readiness of current and new components of the space programme while ensuring the necessary technological leadership to enable the European industry to compete on open markets. The challenge is also to create a regulation that is based on what is technically and economically feasible, for instance:
    - Maturity requirements for Active Debris Removal missions;
    - Regulations on satellites unable to perform the End of Life disposal by its own means;

  - Design for Demise solutions for platforms units including but not limited to optical payload allowing to comply to the on-ground casualty risk;
  - Compliance with the Dark and Quiet Skies for Science and Society;
  - Affordable availability of an external solution to remove failed satellites in case they are unable to self-dispose.
- Issue of permanent **oversight and enforcement of the Law** with dedicated resources at institutional level to monitor the implementation of the Law. In international competition, the EU Space Law should protect Europe's interests;
- **Demonstrating our compliance to other foreign regulations** in the case the EU compliance certification/label is not recognised by other regulators. In this respect, the EU should demonstrate to key economic partners the relevance of its Law and the credibility of its oversight and enforcement to avoid the issue of non-recognition.

Opportunities:

- **Regulatory clarity and harmonisation**: The EU Space Law can offer the European space industry with a clear and unified regulatory framework as it will help to streamline administrative procedures, lower legal uncertainty, and boost market confidence in general. Indeed, a stable legal climate might help European space companies, that are able to offer secure, safe and sustainable systems, attracting new investments and business opportunities. For the specific provision of space services (e.g., in-orbit services), delivering services across borders faces challenges due to varying regulatory frameworks and uncertain authorisation procedures. Transforming the EU into a unified space market could greatly assist in addressing these issues, leading to cost reduction in providing such services;
- **Promotion of European secure, safe and sustainable standards worldwide**: By being proactive, the European Union will allow the European space sector to use agreed rules and procedures at its advantage. Furthermore, the European approach may be seen as more neutral in the worldwide community than the ones of other third-countries;
- **Direct benefits to safety, sustainability and resilience/security**: It may position the European space industry as leader in responsible space activities and push other countries towards more responsible space activities through market-access requirements, thus increasing the safe operation of European space and ground systems (also hopefully averting a further decay of the orbital environment which would pose a hazard to future missions and impact the coming generations of space users). Meeting strict sustainability and safety criteria can improve the standing and dependability of the European space industry, attracting clients and partners that value safe and secure space operations;
- **Increased opportunities for partnerships, knowledge sharing, and joint ventures**, which will increase the market access and international reach of the European space industry, facilitating international collaboration by creating a common framework for cooperation with non-EU parties;
- **Support for R&I**: The EU Space Law could grant support to the European space industry's R&D and innovation efforts. Increasing the competitiveness of the European space industry on export markets can be fostered by an increased funding for Space R&I, streamlined administrative processes, and measures that promote knowledge transfer.

Mitigation of the risks

- **Industry engagement**: it is important to involve all relevant stakeholders, but even more so the participation of industry representatives, experts, and regulatory bodies from the space industry, in the formulation and implementation of the EU Space Law. Engaging with stakeholders in the industry will make sure that their concerns, viewpoints, and insights are taken into account, resulting in more effective and balanced regulations;

- **Start from and align with the "state of the art" of the standards/regulations** (e.g., the European Commission could re-use parts of the French Space operations Act (FSOA) and/or ISO 24113, which is the commonly accepted international standard on space debris mitigation);
- **Comprehensive regulatory impact assessment**: The economic, technological, and operational consequences on the European space sector should be thoroughly assessed, alongside potential approaches to reduce adverse impacts;
- As far as launch services are concerned and, if necessary, to foster interoperability, it would be necessary to **align to the same level the requirements across all EU territories where launches could be operated/where spaceport projects are planned**;
- **Reasonable transition period and flexibility to adapt to the new regulation**: It can assist in constraining the disruption and managing compliance costs. Allowing for flexibility in the implementation of some requirements can allow to adapt to the diverse capabilities and circumstances of different space companies. Support investments to develop and apply solutions to comply to the Law, including incentives (e.g., fiscal benefits) for early compliance could be put in place;
- **A proportionate and risk-based approach to regulation**: By regulating the requirements according to the magnitude and scope of space activities, it is possible to make sure that the regulatory burdens are in line with the potential hazards; with this strategy, low-risk activities are not overly regulated, and high-risk activities are given more attention;
- **Coordination of regulatory frameworks and standards requires cooperation and harmonisation** between EU MS and foreign partners. For European space companies, reducing duplication, facilitating market access, and boosting international cooperation can help create a level playing field and lessen the risk of fragmentation or unfair competition[1];
- **Regular reviews and evaluations of the EU Space Law effectiveness and impact**: This would guarantee that the regulation stays pertinent to changing market demands, technical changes, and global trends. A robust and well-balanced regulatory system can be maintained by conducting periodic assessments that can spot potential dangers, gaps, or unintended consequences and allow for necessary corrections;
- **Mechanisms and incentives to encourage compliance with the EU Space Law**, such as public demand (e.g., public procurements and fiscal benefits), funding programmes, grants, and capacity-building efforts that would make it easier to comply with the Law, promote innovation, and help European space companies remain competitive;
- Envisage an **EU certification/label that could be used by European actors to justify their compliance to sustainability, safety and security aspects of the Law** (in the case it is non-binding). Include international organisations in the discussion as soon as possible to ensure the equivalence of EU labels with their own rules is key;
- **Clarify if and when the EU Space Law is applicable and in which frame** (national programmes, EU programmes, missions built by European actors, missions operated by European operators, missions delivering services over EU territory…). Obviously, the ideal situation to avoid distortion of competition with international entities is to make the Law applicable to all entities delivering services in the EU.

[1] *US recent regulation on the "Mitigation of Orbital Debris in the New Space Age" (https://www.federalregister.gov/documents/2021/09/20/2021-20193/mitigation-of-orbital-debris-in-the-new-space-age) proposes an interesting approach to tackle this issue. "Consistent with other requirements in part 25 of our rules, this requirement will also apply to entities seeking to access the U.S. market using a non-U.S.-licensed satellite or satellite system." Adopting such an approach would force foreign space operators to be compliant with the future EU regulation if they intend to enter into EU market.*

Issues/challenges regarding potential rules/requirements which EU-based space operators may be subject to, when operating space related infrastructures in third countries

- **Extraterritorial applicability**: The scope of the EU Space Resilience and Green extraterritorial application to EU-based space operators and manufacturers doing business in third countries needs to be made clear. To prevent disputes with local laws and provide legal clarity for EU enterprises, it is crucial to determine the jurisdiction and applicability of EU legislation when conducting business outside the EU:
    - While any satellite has to be put safely into orbit whether it is for a European customer or a third country one, in the case a third country customer do not impose the same requirements as the EU Space Law's, a case by case basis approach could be envisaged to mitigate potential extra costs.
- **Adherence to local regulations**: Manufacturers and operators based in the EU may run into difficulties adhering to potentially contradicting local laws in some non-EU countries where they conduct business. Various nations may have their own distinct regulations, licensing processes, or technical standards. To improve compliance and lessen regulatory costs, the EU Space Law may be able to further improve and standardise procedures for collaboration, certification recognition and standard harmonisation between the EU and non-EU nations by offering clearer frameworks and guidelines for cooperation;
- **International trade constraints (tariffs, export controls, market access restrictions, etc.)**: These can negatively affect the competitiveness of manufacturers and space operators established in the EU. To ensure a level playing field and promote global trade for EU businesses, it is crucial to address these impediments through balanced trade agreements (promoting fair competition and protection of our own interests), diplomatic talks, and efforts to open other international markets;
- **International liability regimes**: The EU Space Law ought to take into consideration the difficulties of liability regimes when conducting business in third-party nations. For space operators and manufacturers with operations in the EU, a uniform set of liability regulations and clear frameworks for liability distribution in international space activities would offer legal certainty and reduce risks.

Provision by third-country-based operators of space-related services in the EU

- **Market access and entry requirements**: To provide space-related services in the EU, third-country operators must meet market access regulations and entry procedures, in order not to create any distortion of the market (e.g., if data from European satellites is more expensive due to the level of requirements imposed by the EU Space Law, the downstream sector must avoid giving preference to data from non-European satellites). For compliance and a smooth market entry, it is essential to enable a clear comprehension of the particular regulations, licensing procedures, and technical standards set forth by the EU Space Law;
- **Adherence to EU regulations**: When conducting business in the EU, non-EU based operators should be required to abide by the legal framework established by the EU Space Law. This includes complying with all applicable legal obligations related to sustainability, safety, security and resilience, as well as any other relevant regulations (i.e., WTO regulations and commitments). For preserving legal compliance and establishing confidence with EU stakeholders, it is essential to fully comprehend and fulfil these regulatory requirements;
- **Harmonisation of standards**: To make it easier to provide space-related services, it is crucial to harmonise technical standards, certifications, and quality assurance procedures between the EU and third-party nations. By ensuring interoperability, compatibility, and safety in space activities,

alignment with EU standards should be a prerequisite to facilitate the market entry of non-EU operators;

- **Data protection and privacy**: Non-EU businesses who collect, process, or transfer the personal data of EU individuals are required to abide by the EU's data protection and privacy laws. Maintaining compliance and fostering trust with EU clients and partners require adhering to the GDPR or proving a comparable degree of data protection.

Successfully navigating these aspects will require a solid grasp of the EU Space Law, proactive communication with EU authorities and stakeholders, and an ongoing commitment to upholding the legal standards and requirements established by the EU. This should of course not refrain the EU and its MS to **reinforce a European preference in the case of European and EU MS institutional missions**.

Security: specific recommendations about Cybersecurity

A growing new field lacking definition

Technological innovations like flexible digital platforms and cloud-based ground segment are **bringing new vulnerabilities and threats**. Consequently, the increase of new services and applications will enable a larger panel of potential access points vulnerabilities.

Cyber-security and resilience of all ground and space assets is a must-have if one wants to bring certainty in missions' continuity, guarantee system resilience whatever the cyber vulnerabilities and compliance with security requirements, regulations and certifications are. In addition, **a resilient architecture** of ground and space systems which leads to persistent and robust space services, serves as a **deterrence factor**, especially if it leads to technical advantages that cannot be counted by potential opponents.

In this context of technical innovations and developments, more EU Member States have established space services or developed space-related products and are willing to offer them to the EU; this should not be seen as a competition but as a chance to **gain resilience through burden sharing** and potential redundancy.

The term "resilience" for the space sector is however today lacking a clear definition, as not all definitions given and currently used are specific or suitable for space systems. NATO, for example, has launched work to define the term "resilience" for the space sector without arriving at a single definition[2] (i.e., "*the ability of a space system architecture to provide persistent support for mission success despite hostile actions or adverse conditions*", "*the ability of a system to continue to operate or recover quickly after a disturbance of any kind and from any source to an acceptable level of service*", "*the ability to complete the mission in the face of man-made or natural interference*").

A definition of the term at European level is very much called for, given the impacts that this has in many areas.

In this regard, the European space industry wishes to propose **specific concepts related to resilience that may be used in a European conceptual framework**:

- **Service separation:**
  - It represents mainly the technical separation of services over certain platforms (and not using shared and hosted payloads on other space-based systems). This approach is also adaptable to ground infrastructure where non-bundled assets also give a certain level of hardening.
- **Distribution:**

[2] https://www.japcc.org/wp-content/uploads/Resiliency-in-Space-as-a-Combined-Challenge-for-NATO.pdf

    - It represents an increased number of nodes or assets to define a service. The degradation or the loss of one node would then just have a minor impact on the whole service provision.
- **Diversification:**
    - It represents using different platforms, orbits and/or systems to ensure access to a specific service. This also includes the use of national (military as well as governmental), international and commercial assets and services.
- **Proliferation:**
    - It means aiming at a high level of redundancy through diversification and/or distribution, e.g., by deploying more systems in space or use a wider network of ground-based infrastructure. These systems can be different, as long as they are able to contribute or perform the same service.
- **Protection:**
    - It represents passive technical solutions in hardware and software protection, as well as, the use of redundant subsystems or maintaining in security conditions the systems. It also includes a certain level of organisational or active protection which includes Space Domain Awareness, as well as, the option of planning and conducting space operations.
- **Anticipation**:
    - Resilient space infrastructure requires a fully prepared organisation and terrestrial ecosystem, including recovery plans dedicated training exercises. Each potential threat must be considered both in technical concepts and industrial set-up as well as operational staff and entities. Technical competences and production means must be available and in working condition to be able to react and adapt in case of need.
- **Recovery:**
    - The ability to restore service after a disturbance. It requires fast reaction times in operations and availability of the appropriate means and resources. Severe disturbances, such as loss of space hardware, requires the ability to launch and quickly replace any critical space asset.

Navigating among cyber and electronic threats

Today the space sector faces four types of threats: Kinetic Physical, Non-Kinetic Physical, Electronic (uplink jamming, downlink jamming, spoofing), and Cyber (data intercept or monitoring, data corruption, seizure of control).

Within these threats, two are directly relevant to the to the EU Space Law:

- **Electronic attacks** target the channels through which space systems transmit and receive data by radio frequency (RF) signals. It is therefore necessary to develop countermeasures against unauthorised access, jamming and spoofing attacks;
- **Cyberattacks**, contrary to electronic attacks, target the data itself and the systems using the data. Therefore, the antennas on satellites and ground stations, the landlines that connect ground stations to terrestrial networks, and the user terminals that connect to satellites are all potential intrusion points for cyberattacks, e.g., directed towards data archives, C2 centres and the processing units that perform digital signal and/or AI computation.

And in the field of electronic attacks and cybersecurity, four main threats can be identified:

- **Global supply chain security**: intentionally faulty or counterfeit (“backdoored”) hard- or software can provide access to the design schematics, physical components, and software packages of a given satellite. There is also the issue of increasing the use of open-source software, without appropriate verification, security review and other quality measures, which exposes them further to cyber threats;

- **Attacks against the links between satellites and ground control stations** (uplink & downlink) with a possible capture or modification of the data. This may also lead to advanced attack methods, e.g. replay- or man-in-the-middle attacks;
- **Attacks on terrestrial C2 (Command & Control), data relay stations, and ground systems** that process data with also a possibility of capture or modification of the data as well as allowing advance attack methods;
- **Attacks against the user segment** of a space system (the terminals or devices).

Recommendations

Based on the above elements, the European space industry recommends implementing the following measures:

- **Prepare**:
  - **Complement the recognition of the entire space sector as a sector of high criticality** (i.e. including operators but also ground and space suppliers) either in the **NIS2 Directive**[3] itself (already covering operators) or in a complementary regulation, also addressing EU-owned assets;
  - Provide a clear **definition of** "**resilience**" in a space context and of "**maintenance in security conditions**[4]", to be included in the EU Space Law;
  - Ensure **seamless continuity of compliance with security requirements, regulations and certifications** while transitioning from the development to the end of life (including design and build, launch, operate & maintain, end of life).
- **Protect**:
  - Protect the ground and space systems from **electronic attacks** and **cyber-attacks** (i.e., cyber-electronic warfare) that are generated by ground and/or space entities. Such protection shall be achieved by cooperating and mutually complementing passive capability;
  - Protect the **ground-to-space command link, space-to-ground telemetry link and any cross-links** (uplink & downlink) by deploying protected waveforms and, whenever feasible and cost-effective, exploiting optical links;
  - Build a robust **strategy for cryptography key management** (if key management is inadequate or if the keys are compromised, encryption becomes less effective in providing protection), including Quantum Key Distribution (QKD) according to technical and regulatory timeframes;
  - On top of the ICT network, **protect the industrial supply and development chains** from compromise;
  - Ensure availability of all crucial competences for development & recovery.
- **Secure**:
  - Prepare for anomalies through planning and practice;
  - All stakeholders in the value chain, starting with the customer, need to ensure **secure software development procedures** (by collaborating throughout the software development lifecycle to proactively identify and mitigate security risks, but also following security standard and doing security validation and testing), following the principle of security by design;
  - Include **cybersecurity on-board all satellites** to ensure proper detection, recovery, and response to the related intentional (and not-intentional) threats. This is achieved by

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022L2555

[4] *Maintenance in Security Condition is composed of 4 main activities: Curative maintenance (Problem Management & Vulnerability Management), Defensive maintenance (Crisis management, Security Monitoring), Routine preventive maintenance (Patch policy / on-going arising vulnerabilities management, Obsolescence & cybersecurity management without design impact), Preventive Major maintenance (Obsolescence & cybersecurity management with design impact)*

establishing and applying cybersecurity criteria that relate to the satellite characteristics (including customer(s)) and the consequences (risk likelihood and resulting impact) of a cybersecurity attack. For legacy satellites, due to the high costs and difficulty to update on-board, it is really important to be able to have a realistic view of the attack surface and the obsolescence to manage the risk on a case by case basis;

- Ensure that a space or ground system is **not put in service without appropriate plans to ensure operation in security conditions** to prevent cyber risk to space or ground asset and ensure resilience of services;
- Ensure **appropriate budgeting for cybersecurity (including R&D) and associated maintenance in security conditions** in line with the asset cybersecurity scope (i.e., benchmark indicates maintenance of critical operational system is around 10% Capex/year).

Sustainability in space: specific recommendations about Space Situational Awareness

Space Situational Awareness (SSA) is defined in the European Space Programme Regulation[5] as "*a holistic approach towards the main space hazards, encompassing collision between satellites and space debris, space weather phenomena, and near-earth objects*".

Europe as a whole still strongly depends on US SSA data for collision avoidance purposes, manoeuvre validation and overall understanding of the day-to-day dynamics of the space environment

As such, there is a **major issue concerning access to Space Situational Awareness/debris avoidance data**.

Indeed, the European Space Surveillance and Tracking (EU SST) partnership is a good initiative and a step in the right direction in this area, but today it remains **only a complement to the American service** offered by the North American Aerospace Defense Command (NORAD). If an obligation for industry players to join a collision avoidance entity were to be considered (applying as much as possible the principles of European preference), it would require the **further development, thanks to increased financial support, of much more complete European independent databases** (still being also coherent and compatible with the American service as full independence is today not feasible) in order to drastically limit reliance on non-European players, which today have a major advance in terms of SSA.

Fostering the creation of an internal European market for SSA data and services is therefore urgently needed and **integrating the industries' SSA means and services in EU SST in a commercially viable way to improve our space situational awareness and our anti-collision alerts is the most efficient way forward.** More precisely:

- As the number of active orbital objects increase alongside the need for a more sustainable use of the space domain, **timely and accurate SSA data is becoming a valuable asset of strategic and economic significance**:
  - However, there is as of yet no purely commercially-driven market for SSA data, as the regulatory and anti-collision imperatives remain under the purview of institutional bodies.
- There is thus a **need for institutional anchor customers and contracts** in order to sustain the ability of industrial actors to develop SSA capabilities (i.e., ground infrastructure, sensors etc.) and services answering to the strategic needs of institutional customers and those of the commercial market:
  - While US companies benefit from frameworks contracts with their institutions, European SSA providers do not benefit from European public demand at such level.

[5] *Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing the space programme* https://eur-lex.europa.eu/resource.html?uri=cellar:33f7d93e-6af6-11e8-9483-01aa75ed71a1.0003.03/DOC_1&format=PDF

- As the congestion of the space, especially in LEO, is continuously increasing notably in the light of mega-constellations projects (already launched or in planning), the so-called "human in the loop" (i.e., defined as a model that requires human interaction) decision processes tend to become more difficult and riskier. Consequently, a new generation of services in support of decision making for manoeuvres and collision avoidance actions is needed. **This will be an accessible business for European companies as long as SSA data is also accessible in a sovereign way and without intermediaries**.

In addition, the EUSST or any SSA data service at European level (ensured with public and/or private capabilities) should enable data to be merged as seamlessly as possible, with a "plug and play" system for EU players seeking to manage the risk of collision.

Finally, such an obligation for sustainable behaviour put in place by the EU Space Law would also have to consider a differentiation between satellite operators and standard launch services (i.e., not considering any kick stage or Orbital Transfer Vehicle, whose activity in orbit is less impactful on the sustainability of the space domain (i.e., a few years spacecraft mission vs. a few hours launcher mission, continuous collision avoidance analysis vs. punctual analysis before launch)[6]. In the same logic, a distinction between LEO and GEO due to their varying sustainability implications would have to be made.

Conclusion

The European space manufacturing industry supports the emergence of an EU Space Law, encompassing a European approach on STM, with regulatory and capability pillars in lockstep.

The imperative to act towards an EU approach on safety, security and sustainability, as well as the measures to support such ambition are in line with the European space industry's expectations. A unified and comprehensive Europe, able to speak internationally with a single voice, is key to support the European space ecosystem and protect its strategic interests and competitiveness.

In this respect, **such EU Space Law must be outlined and endorsed as quickly as possible, so as to make Europe the pioneering continent in this field**.

[6] *However, in case the launch service would be extended to orbital manoeuvres, with a kick stage or an Orbital Transfer Vehicle that could operate for weeks or months, the rules to be applied would of course be the same as the ones for satellites.*

Annex 1 - Feedback to EC non-paper on space sustainability

In the summer 2023, the European Commission held a series of workshops with EU MS on the future EU Space Law.

The attached EC non-paper on space sustainability, distributed by EU MS to its industry, aims at setting the scene on the sustainability pillar and identifies a number of questions on how to reduce the impact of space activities on Earth and orbit environment.

This Annex 1 is the European space industry's feedback on the paper.

Regarding the description of the landscape made in this paper do you think some aspects are missing?

More emphasis would be required on the criticality of encouraging international cooperation and coordination to establish and adhere to common standards, guidelines, and best practices, as well as on the necessity of implementing effective Space Traffic Management/Space Traffic Coordination systems, capable of establishing and implementing systems and protocols to manage the increasing number of satellites and space vehicles to avoid collisions and ensure safe operations.

However, while space traffic management and coordination efforts are crucial, they alone may not suffice. The ever-growing population of space debris, stemming from collisions and explosions, poses a significant threat. Of particular concern is the proliferation of non-trackable debris, which can inflict severe damage on active satellites that are unable to evade these objects. Thus, the need for an effective space regulation is paramount to mitigate the hazards posed by the expanding space debris population.

One missing element is the environmental impact of the debris which are not entirely consumed during re-entry. Indeed, in section 2.2 "Environmental impact on Earth", it would be important to add the impact on aviation (for instance the recent case of Spain closing its airspace because of the uncontrolled re-entry of a Chinese rocket body), on marine environment (it is still not understood what impact re-entering space debris has on it when disposed in the oceans) and also on the ground casualty risk linked to objects surviving the re-entry into the Earth atmosphere and that could injure or even kill people and damage/destroy assets on ground. Besides, the impact on the atmosphere of the re-entry of thousands of elements coming from the current and future mega-constellations, as well as of the potential significant dramatic increase of the number of launches, should also be assessed.

There is no mention of the importance of implementing robust cybersecurity and data protection measures, specifically on their key role to shield us against the threats posed to space systems and data by unauthorised access.

The paper also completely omits the promotion of public engagement and education, which should also be a key pillar. European space companies should be encouraged to actively engage with the public and promote awareness about the advantages and challenges of space activities, including through collaboration with educational institutions and outreach programs. Educating the public about the significance of space protection, sustainability, and responsible practices can foster support and participation. However, such engagement should be a business decision and not mandated by law.

Do you use non-binding rules to build the obligations in your authorization scheme (i.e. IADC, national guidelines…)?

Eurospace members commit to:

- Binding rules in Europe (such as the FSOA technical requirements)
- Non-binding rules:
  - Committee on the Peaceful Uses of Outer Space (UN COPUOS)
  - Inter-Agency Space Debris Coordination Committee (IADC) guidelines
  - International Organization for Standardization (ISO) standards
  - European Cooperation for Space Standardization (ECSS) standards
  - Internal company policies

Are there other best practices you can highlight relating to environmental, sustainability and safety of space activities?

- **Develop and enforce STM rules at European level**, notably rules of manoeuvring in case of near collisions and rules of disposal;
- **Encourage and finance qualification of products** that will help to meet those requirements;
- Development of new technologies for the reuse of space systems, prolonging their autonomy in orbit, as well as a more global approach to optimising the design of space systems with regard to environmental constraints;
- **Encourage and finance qualification of new dual launch carrying structures** that would not create mission related debris;
- **Reduce spacecraft orbital lifetime after end of operational mission**, especially for nanosatellites and large constellations (US is moving to 5 years);
- **Continue to promote at EU level all applicable debris mitigation guidelines**, in line with the UN COPUOS's Long-Term Sustainability Guidelines;
- **Develop and finance ADR (Active Debris Removal) solutions and COLA (Collision Avoidance) services** through the leveraging of existing European commercial solutions;
- **Develop eco-design methods and tools** in space products' life-cycle;
- **Decarbonation of propellant production**;
- **Manufacture resilient and reliable spacecraft** minimising the risks of spacecraft failure before end-of-life and fragmentation due to collision or explosion;
- **Control and limit visual brightness** and comply to ITU regulations to protect our Dark and Quiet Skies.

Besides the well-known related guidelines and best practices (IADC, LTS, etc.) and standards, the paper only mentions SSC and SSR. It would be useful to include other relevant similar initiatives, such as WEF's Net Zero Space, ESA's Zero Debris, the SDA's procedures, the CONFERS Guiding Principles for Commercial RPO and OOS, or the Satellite Orbital Safety Best Practices Guide developed by Iridium, OneWeb, SpaceX, and AIAA.

How do you consider the development of requirements to ensure further protection of space activities and of Earth?

Above all, it should adopt a thorough and proactive strategy, and for that, **efficient STM/STC and disposal of existing debris becomes essential.**

The European space industry should contribute to and be involved in the development of space traffic management systems that enable safe and efficient coordination, Collision Avoidance, and SSA. To create such

strong structures, collaboration between industry, government, and pertinent international organisations is necessary.

Some of the examples provided in Annex 1 are already being considered in future regulations (therefore in a binding way):

- Orbit selection shall consider the existing satellites and debris population in orbit:
  - Is it not the case already?
- Obligation to register to a collision avoidance entity, technical means to transmit the precise position of the satellites or debris, other measures related to CA, i.e. ability to perform CA manoeuvres, and ability to predict positional knowledge:
  - They are all important measures to implement and develop. However, it seems necessary to clarify the 'collision avoidance entity' term: its scope must both include European industries as well as institutional agencies. The risk of having only a few of such entities (how would they be selected? Certified?) and thus risk of over costs for the manufacturers/operators is non-negligible. Besides, **it will have to apply the principles of European preference**.
- Launch service provider selection including criteria ensuring space debris mitigation, limitation of debris' release, adherence to space debris mitigation standards are important steps to take to ensure the sustainability of the space domain.
  - The FSOA limits the number of debris to 2 for a dual launch and 1 for a single launch. The aim should be zero intentional release of large derelict hardware in orbit. It also imposes an obligation to re-enter or place in a graveyard orbit the top floors of the launcher out of protected areas after the end of the mission as well as an obligation to passivate objects left in orbit, to avoid the creation of new debris. The FSOA also adopts the IADC principles on debris that are in accordance with the guidelines of the UN COPUOS. It would be wise to extend these already demanding rules to other Member States in order to foster norms of responsible behaviours in space as well as a regulatory level-playing field within the EU and avoid the distortion of the internal market.
- Reliable and safe post-mission disposal and quality and reliability control during operations (i.e. monitoring of successful self-disposal predictions, passivation and disposal manoeuvres including acquisition of safe graveyard orbits and limiting surviving fragments in re-entry scenarios)
  - These are requirements already imposed by the FSOA and they need to be implemented at European level without exceeding them.
- Limitations for orbital lifetime after disposal:
  - The FSOA compiles strict requirements on this subject (25 years).

The list of high-level topics proposed in Annex 1 is already quite complete. However, for some of them, industry could propose some modifications since they seem:

- **Either too stringent** (e.g., the bullet "*Re-entry shall either cause the satellite to demise completely or be performed in a controlled manner*" or "*Reliability design, i.e. no single points of failure in disposal systems*") ;
- **Or not fully complete** (EC could have mentioned some dedicated requirements for MEO in order to protect Galileo orbits in MEO).

These modifications could be done as soon as industry has access to a more detailed draft of this EU regulation.

Annex 2 – Eurospace members status

Company	Country
Aerospacelab	Belgium
Air Liquide Advanced Technologies	France
Air Liquide France Industry	France
Airbus Defence & Space Gmbh	Germany
Airbus Defence & Space Ltd	United Kingdom
Airbus Defence & Space Netherlands B.V.	Netherlands
Airbus Defence & Space Sas	France
Airbus Defence & Space Sau	Spain
ALTEC	Italy
ALTER Technology-TÜV Nord France	France
ALTER Technology-TÜV Nord S.A.U.	Spain
ALTER Technology-TÜV Nord UK	United Kingdom
AntwerpSpace N.V.	Belgium
APCO technologies	Switzerland
Arianegroup Gmbh	Germany
Arianegroup Sas	France
Arianespace	France
Avio Spa	Italy
Azur Space	Germany
Beyond Gravity AB	Sweden
Beyond Gravity Austria	Austria
Beyond Gravity Swiss	Switzerland
CGI France SAS	France
CGI Deutschland B.V & Co. KG	Germany
ClearSpace	Switzerland
CS Gmbh	Germany
CS GROUP - France	France
CS Romania	Romania
Dassault Aviation	France
Deimos Engenharia	Portugal
Deimos Space	Spain
Deimos Space Romania	Romania
Deimos Space UK	United Kingdom
eGEOS	Italy
Elecnor Infrastrutture e Aerospaziale	Italy
Enpulsion	Austria
GMV Aerospace & Defense S.A.U.	Spain
GMV GmbH	Germany
GMV Innovating Solutions B.V	Netherlands
GMV Innovating Solutions S.R.L. (B)	Belgium
GMV Innovating Solutions S.R.L. (RO)	Romania

GMV Innovating Solutions SARL	France
GMV Innovating Solutions Sp.z o.o.	Poland
GMV NSL Limited	United Kingdom
GMV Soluciones Globales Internet S.A.U.	Spain
GMVIS Skysoft S.A.	Portugal
Indra Sistemas SA	Spain
Kongsberg Defence & Aerospace	Norway
Loft Orbital	France
MOLTEK	Netherlands
MT Aerospace AG	Germany
Neuraspace	Portugal
OHB ITALIA	Italy
OHB Systems AG	Germany
Pangea Aerospace	Spain
REOSC	France
RHEA Group	Belgium
SABCA	Belgium
Safran Aero Boosters	Belgium
Safran Aircraft Engines	France
Safran Data Systems	France
Safran Electrical & Power	France
Safran Electronics & Defense	France
Safran Engineering Services	France
Safran Filtration Systems	France
SENER Ingeniería y Sistemas, S.A.	Spain
SITAEL S.p.A.	Italy
SpaceAble	France
ST Engineering iDirect Europe CY NV	Belgium
Telespazio Belgium SRL	Belgium
Telespazio Germany Gmbh	Germany
Telespazio Italy Spa	Italy
Terma A/S	Denmark
TESAT Spacecom GmbH&Co. KG	Germany
Thales Alenia Space Belgium	Belgium
Thales Alenia Space France	France
Thales Alenia Space Germany	Germany
Thales Alenia Space Italy	Italy
Thales Alenia Space Luxembourg	Luxembourg
Thales Alenia Space Poland	Poland
Thales Alenia Space Spain	Spain
Thales Alenia Space Switzerland	Switzerland
TNO	Netherlands
TTTech Computertechnik GmbH	Austria