Widening the horizons of outer space law

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V Space Traffic Management: The Need of the Hour*

Abstract

This paper addresses the topic of Space Traffic Management from the perspective of the progressive development of international space law. It looks at current international space law and developments in the UN space law context and other fora, including industry initiatives. Although some elements relevant for STM can be found in the current regime, they do not provide a satisfactory legal basis for an STM regime. Traffic management regimes in air law and the law of the sea, specifically regarding international airspace and the high seas, may provide inspiration for the establishment of a global STM regime. In the absence of clarity at the level of international law, bottom-up approaches are emerging. The challenge will be to ensure that these approaches are compliant with the relevant principles of international space law, and eventually converge into a harmonised global STM regime that will preserve the safety and sustainability of outer space activities for the benefit of current and future stakeholders.

1 Introduction

A relatively new topic has gained the attention of the space law community, of which Professor Sergio Marchisio is a highly respected member and long-time friend. This topic is 'Space Traffic Management' (STM).[1] The term has been used in earlier writings on space law, but it is making the headlines more regularly now that outer space – and especially the region of Low Earth Orbit (LEO) – is becoming increasingly 'congested, contested

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* *Liber Amicorum Sergio Marchisio*, Giovanni Ardito et al. (eds.), (Editoriale Scientifica Napoli, 2022), pp. 1139-1154.

1 See e.g., P. LARSEN, *Space Traffic Management Standards*, in 83 *J. Air L. & Com.*, 2018, pp. 359-387; PJ BLOUNT, *Space traffic coordination: developing a framework for safety and security in satellite operations*, in *Space: Science & Technology*, 2021, https://doi.org/10.34133/2021/9830379; S. KAISER, Space Traffic Management: Not Just Air Traffic Management for Outer Space and More Than Data Analytics, in *2018 Proc. IISL*, 2019, pp. 301-315. K. HAVLIKOVA, *Legal Aspects Concerning Space Traffic Management*, in 46 *Air Sp. Law*, 2021, pp. 235–256; C. MIHAI TAIATU, *Space Traffic Management: top priority for safety operations*, in *2017 Proc. IISL*, 2018, pp. 15-33. See also T. MASSON-ZWAAN and M. HOFMANN, *Introduction to Space Law*, 2019, ch. 8, specifically pp. 115 ff.

and competitive'.[2] The topic of STM has been adopted as an official agenda item by the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) in 2015, demonstrating the need, and desire, for international coordination among States.[3]

Despite this growing awareness about the importance of the topic, the term STM is shrouded in vagueness; indeed, so far, no internationally agreed definition of STM exists. The most well-known ones are those used in the 2006 study of the International Academy of Astronautics (IAA)[4], and in the European Space Policy Institute (ESPI) report of 2020.[5] This paper is based on those definitions, which read as follows:[6]

> IAA: 'Space traffic management means 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 interference'.
>
> ESPI: 'Space Traffic Management is an organisational and operational concept that involves a set of complementary means and measures to enhance the safety of on-orbit operations and to safeguard the long-term sustainability of the space operating environment'.

The growth of private commercial space activities plays a large part in the increased relevance of STM. Activities such as commercial Earth observation, large constellations of small satellites, space resource utilisation and suborbital flights create challenges for the existing regulatory framework, which was shaped by the initial two space powers at a time when space activities were mainly carried out by States. Issues of congestion, increased risk of collisions, competing stakeholders' interests and a growing population of debris are now the order of the day. The changes brought about by the commercialisation of space activities and the increasing participation of private actors contribute to the need to track the presence and movement of an ever-larger number of active and inactive objects in outer space.

In addition to this trend of privatisation and commercialisation, another factor that affects the current space playing field is that many new States are aspiring to become space powers. On the one hand this creates a need for capacity building to ensure that they become responsible space actors, while on the other hand it implies that reaching consensus in UNCOPUOS,

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2 This term was first used at the Sixty-eighth meeting of the General Assembly, First Committee, 25 Oct. 2013, see https://www.un.org/press/en/2013/gadis3487.doc.htm.

3 This growing interest is further exemplified by an ongoing EU study, Spaceways, funded under the EU H2020 research and innovation program, see www.spaceways-h2020.eu.

4 IAA, *Cosmic Study on Space Traffic Management*, 2006.

5 ESPI, *Towards a European Approach to Space Traffic Management*, Report 71, 2020. Available at https://espi.or.at/publications/espi-public-reports/category/2-public-espi-reports.

6 In addition, see US, *Space Policy Directive-3, National Space Traffic Management Policy*, 2018. Available at https://trumpwhitehouse.archives.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/.

which has been the preferred decision-making mechanism since the start of the space era, is becoming increasingly difficult. This was seen during the adoption of the UN Long-Term Sustainability (LTS) guidelines in 2019, which took close to ten years.[7] Reaching international consensus on an STM regime may well face the same difficulties, but this does not affect the urgency of the topic.

2 Analogies

The fields of air law and maritime law contain regimes to manage traffic, which may to some extent be helpful in designing a traffic management regime for space. Although analogies are never perfect because situations and circumstances differ, they can still be useful. For this reason, the following sections address air law and the law of the sea, with a focus on traffic management in international airspace and in international waters, which are areas outside national sovereignty, like outer space.

2.1 Air Law

The Convention on International Civil Aviation, also known as the Chicago Convention, established the International Civil Aviation Organisation (ICAO), an international intergovernmental organisation.[8] The Chicago Convention is considered as the foundation for safety in flying, and foresees a common air navigation system at global level, with services being provided by States.

The Convention is supplemented by nineteen Annexes containing Standards and Recommended Practices (SARPs). Annexes 2 and 11 are most relevant for the topic of STM; they concern the Rules of the Air and Air Traffic Services respectively. Member States must implement SARPs at national level, and Article 38 of the Convention provides that States must notify differences in the event of non-implementation. In combination with the Convention, SARPs provide for a flexible and up-to-date legal framework for international civil aviation.

Article 28(a) of the Chicago Convention addresses air navigation facilities and standard systems. It provides that States, as far as they may find practicable, must provide airports, radio services, meteorological services and other air navigation facilities that would facilitate international air navigation. States fulfil this obligation by means of national legislation. The measures taken by States must conform with SARPs. A State can fulfil this obligation directly or delegate it to a private operator within its territory or in a neighbouring State.

7 See *infra*, sec. 3.5.

8 ICAO Doc 7300/9, Convention on International Civil Aviation, Ninth Edition, 2006, www.icao.int/publications/Documents/7300_cons.pdf.

The provisions of Annex 2 and Annex 11 apply without exception over the high seas. Annex 2 on Rules of the Air addresses, amongst other, the avoidance of collisions, including rules for proximity, right-of-way, landing, surface movement of aircraft, operation on and in the vicinity of an aerodrome, and others. Annex 11 on Air Traffic Services makes a distinction between air traffic control services, flight information services and alerting services. States must determine the territories over which they have jurisdiction and the portions of the airspace and aerodromes where air traffic services will be provided.

In addition to this international system, there are also regulations at the level of the European Union (EU). The European rules of the air are known as Standardised European Rules of the Air (SERA).[9] They are based on the ICAO SARPs.

Contrary to air law, space law merely lays down general principles for the behaviour of States in outer space.[10] Likewise, there is no international organisation comparable to ICAO that governs the safety of space activities. UNCOPUOS is a permanent committee of the UN and has no legislative capability like ICAO and has neither the capability nor the capacity to regulate and oversee the safety of spaceflight like ICAO does for aviation.

2.2 Law of the Sea

An analogy can also be drawn between STM and sea traffic management, to the extent that the high seas, like outer space, are outside the national sovereignty of States, and that traffic coordination is equally essential to mitigate collision risks at sea. In this respect, the UN Convention on the Law of the Saw (UNCLOS)[11] and the framework of the International Maritime Organisation (IMO)[12] are relevant.

The UNCLOS regime distinguishes between territorial sea and international waters. A particularity is the existence of the Exclusive Economic Zone (EEZ), which extends up to 200 nautical miles beyond the territorial sea. According to Article 56 UNCLOS, the coastal State has sovereignty over the EEZ as far as natural resources are concerned, and jurisdiction over

9 Regulation (EU) No. 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No. 1035/2011 and Regulation (EC) No. 1265/2007, (EC) No. 1794/2006, (EC) No 730/2006, (EC) No. 1033/2006 and (EU) No. 255/2010.

10 See *infra*, sec. 3.3.

11 United Nations Convention on the Law of the Sea, concluded at Montego Bay on 10 December 1982.

12 E.g., International Convention for the Safety of Life at Sea (SOLAS), 1974 which refers to Vessel Traffic Services and creates guidelines, see https://www.imo.org/en/OurWork/Safety/Pages/VesselTrafficServices.aspx; see also: Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972; International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978.

artificial islands, marine scientific research, and environmental protection. The need to navigate safely and avoid collisions is a major concern in the maritime environment, where traffic is essential for, among others, transportation and commerce. Sea traffic management mechanisms encourage the dissemination of information with other vessels. However, there is no international sea traffic management regime. Instead, Vessel Traffic Services (VTS) are provided by the most proximate State, due to the presence of harbours and ports, based on national, regional and international guidelines, norms and standards. In addition to collision avoidance and sustainability, sea traffic management aims at preserving the integrity of communication, trade, and commerce.

At the EU level several initiatives exist as well, such as the H2020 projects EfficienSea[13] and ACCSEAS.[14]

As space traffic and the reliance on space capabilities increase, the need for STM can be expected to grow to resemble the maritime regime and address other factors in addition to collision avoidance and preserving sustainability.

After having summarised the regimes of traffic management in international airspace and in international waters, the time has come to see whether space law contains a similar regime, or at least elements on which such a regime could be based.

3 International Space Law

The existing international legal regime for space activities can be found within the space law framework of the United Nations (UN).[15] International space law primarily comprises of five treaties adopted by UNCOPUOS. The Outer Space Treaty (OST) was the first international agreement to ever regulate space activities. It was followed by the Rescue and Return Agreement (ARRA),[16] the Liability Convention (LIAB),[17] the Registration Convention (REG),[18] and the Moon Agreement (MA).[19]

13 http://www.efficiensea.org/.

14 https://www.iala-aism.org/technical/e-nav-testbeds/accseas/.

15 In addition, regimes and initiatives of other international bodies like the International Telecommunication Union (ITU) and the Conference on Disarmament (CD) are relevant, as well as those of regional bodies that deal with matters connected to STM, i.e., the European Union (EU) and the European Space Agency (ESA). However, they cannot be addressed in the limited scope of this paper.

16 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 1968, 672 UNTS 179.

17 Convention on the International Liability for Damage caused by Space Objects, 1972, 961 UNTS 187.

18 Convention on the Registration of Objects Launched into Outer Space, 1974, 1023 UNTS 15.

19 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1979, 1363 UNTS 3.

The UN space treaties do not contain any explicit reference to STM. They contain principles and general provisions that govern the conduct of States in the exploration and use of outer space. Several of these provisions are relevant to STM, such as those addressing responsibility for national space activities, liability of the launching State, registration and jurisdiction over space objects, and the avoidance of harmful interference. These can be used as foundation for an STM regime and will be addressed in the next paragraphs.

3.1 State Responsibility

According to Article VI OST, a State is internationally responsible for the activities of its nationals in outer space, which should be authorised and continuously supervised. The responsibility of States extends to the activities that are carried out by governmental as well as non-governmental entities. Article VI forms the basis for the adoption of national space laws that lay down the conditions under which a State authorises the activities of its nationals. Furthermore, it calls upon States to maintain an overview of the progress of their national activities, from the launch to the end of the mission, as well as potential changes, including the position and trajectory of the launched object.

These elements are relevant for the adoption of STM guidelines, which, if not legally binding at international law, might be implemented at national level.

3.2 State Liability

Article VII OST creates international liability for a State for damage caused by its space activities. The liability provision of the OST is further elaborated in the LIAB. According to Article VII OST, a State can be held liable if it qualifies as a launching State, i.e., if it launches or procures the launching of an object into outer space or if its territory or facility are used for the launch. Once a State qualifies as a launching State, it will always remain a launching State, and can be held liable even in the case of transfer of ownership in orbit.

Article II LIAB provides for absolute liability in case of a damage caused by space objects on the surface of the Earth or to an aircraft in flight, while Article III LIAB provides for fault liability if damage is caused 'elsewhere than on the surface of the Earth', i.e., in outer space. Fault is not easy to prove, as it is not defined by the LIAB and may depend on applicable national law. The prospect of 'eternal' liability and the uncertainties surrounding the concept of fault may be convincing arguments for the establishment of an STM regime; after all, non-compliance with such a regime may well be seen as an element of fault, while compliance with such a regime may help to argue the absence of fault.

3.3 Registration and Jurisdiction

According to Article VIII OST the State Party on whose registry an object is launched into outer space shall retain jurisdiction and control over that object. Moreover, (one of) the launching State(s) must furnish basic information for the UN registry, as well as a national registry. The REG specifies the information that must be provided and calls for States Parties, especially those with monitoring and tracking facilities, to respond, under equitable and reasonable conditions, to requests for identification of space objects that caused damage. States should also share preliminary information regarding their missions with the international community by furnishing registration information to the UN Secretary-General. However, the treaties do not specify when an object should be registered, which may result in untimely registration and an inaccurate record.

Furthermore, changes in the orbital parameters of an object are not required to be registered. Jurisdiction and control over space object must be exercised throughout their lifetime. This may be particularly challenging for small, non-manoeuvrable satellites or non-functioning space objects, hence the relevance of registration in the context of STM.

3.4 Harmful Interference

During their activities in outer space, States must refrain from causing harmful interference with the activities of other States. Article IX OST obliges States to pay due regard to the corresponding interests of other States, and to enter into international consultations if their activities could cause harmful interference.

This provision is generally seen as the legal basis for additional, non-legally binding instruments adopted by UNCOPUOS or other bodies in the field of space debris mitigation and the long-term sustainability of space activities, which are addressed in the next section. It will also likely serve as an important legal basis for a future STM regime.

3.5 Guidelines

In addition to the treaties, UNCOPUOS has adopted two sets of guidelines that are relevant in the context of STM, viz., the Space Debris Mitigation Guidelines of 2007[20] and the Long-Term Sustainability Guidelines of 2019.[21]

20 Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, https://www.unoosa.org/pdf/publications/st_space_49E.pdf, endorsed in UN Doc. A/RES/62/217 (22 Dec. 2007).

21 UNOOSA, Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space, 2021, www.unoosa.org/documents/pdf/PromotingSpaceSustainability/Publication-_Final_English_version.pdf

For the latter, especially the ten guidelines in category 'B' on the 'Safety of Space Operations' can be associated with elements for STM.

Both these sets of guidelines are not legally binding; they can be qualified as 'soft law'. But this soft law character should not be underestimated, as the guidelines may evolve into international customary law with sufficient State practice and *opinio juris*, and thus become binding on all States.

Furthermore, States may decide to make them binding in their national legal order, by requiring private entities to comply with them as a condition for obtaining a license.

4 Developments in UNCOPUOS

Although the current legal framework as contained in the treaties contains certain elements that are relevant for STM, it does not provide a clear legal basis for establishing an STM regime. Likewise, the sets of guidelines for debris mitigation and LTS are relevant, but not specific enough to serve as basis for an STM regime. Thus, it is not surprising that the Legal Subcommittee of UNCOPUOS started to consider the matter in 2015 and adopted an agenda item titled 'General exchange of views on the legal aspects of space traffic management' as a single issue/item for discussion. The item has been on the table for several years now, but no concrete results have been obtained yet. As mentioned in section 3.1, this is not surprising in view of the difficulty of reaching consensus in a large and divergent group of States, combined with the general reluctance of States to enter into new legally binding agreements.

In order to reflect the general orientation of the debate, the deliberations about STM in the draft report of the session of the Legal Subcommittee of 2021 are briefly highlighted below.[22]

At that session, which was conducted mostly virtually due to COVID-19, the members of UNCOPUOS noted that the outer space environment was becoming increasingly complex and congested, owing to the growing number of objects in outer space, the diversification of actors in outer space and the increase in space activities, and it considered that 'space traffic management *could* be considered in that context' (emphasis added). It took note of several measures that could be undertaken at national and international levels to improve the safety and sustainability of spaceflight, such as:

> 'Collision avoidance, re-entry and fragmentation services through the development and operation of space surveillance and tracking capabilities; the issuance of conjunction warnings as a public service; the registration of space objects; pre-launch notifications; the reporting of annual launch plans; space debris removal techniques; international coordination efforts through ITU to manage radio fre-

22 Report of the Legal Subcommittee on its sixtieth session, held in Vienna from 31 May to 11 June 2021, UN Doc A/AC.105/1243, para. 192 ff.

> quencies and geostationary orbits; the transfer of responsibilities for space flight safety support between government departments to enable access to a broader range of data and analyses through an open-architecture data repository; a policy on space traffic management rule-making; a report on requirements for on-orbit servicing; an international symposium on ensuring the stable use of outer space that focused on space traffic management and on-orbit servicing; and a space traffic management conference at the European level.'[23]

Several delegations made a connection between STM and LTS, noting that without the development of an effective STM system through regulation and monitoring, the use of outer space by future generations could not be ensured. The importance of adopting a uniform definition of STM was also raised.

The need for a pragmatic approach was raised, excluding, for the time being, the development of binding rules. The relevance of capacity-building to ensure that emerging space actors can efficiently participate in discussions on the topic was also brought up.

Lastly, delegates observed that the following elements should be taken into account in developing an international STM framework: (i) increased requirements for information-sharing, in particular through SSA programmes; (ii) incentives for international cooperation and capacity-building; (iii) common operating rules and safety standards; (iv) notification mechanisms, in particular for launches, orbital manoeuvres and re-entries; (v) right-of-way rules; (vi) specific safety-related provisions aimed at increasing transparency and trust between States; (vii) provisions for the mitigation and disposal of space debris; and (viii) environmental regulations.

It remains to be seen when a concrete outcome can be expected from these debates; as noted before, the adoption of the LTS guidelines took nearly ten years. In the meantime, other governmental and non-governmental actors at national and/or regional level will continue to move forward, and their decisions will certainly influence the international debate. The next section will elaborate on several non-governmental initiatives.

5 Other Developments

In the absence of progress at the international level, governmental and non-governmental actors who are facing a direct and real need for an STM regime are taking action. These initiatives result in the adoption of standards, norms, policies, and best practices which will no doubt influence an eventual international agreement. Coordination at international level is important to ensure that they are in line with international legal principles as agreed among States. Several noteworthy initiatives are addressed below.

23 Ibid, para 195.

5.1 Satellite Industry Association

The Satellite Industry Association (SIA)[24] is a US trade association representing US satellite operators, service providers, manufacturers, launch services providers and ground equipment suppliers. It closely collaborates with space agencies and regulatory bodies to implement regulations, and with the space industry to foster industrial initiatives and the adoption of best practices for the sustainability of space endeavours. In 2020 SIA published a White Paper on 'The Future of Space and Space Traffic Coordination and Management'.[25] The association observes an increased need for a futureproof space traffic coordination and management (STCM) regime, and that the current framework of space law requires review and, in some cases, revision.

The paper cites six topics as the most important STCM issues, as follows:

- Timeliness: current SSA services are insufficient to ensure space safety and sustainability of the space environment.
- Orbital accuracies: the accuracy of datasets needs to be improved; operators often rely on very conservative assumptions for decisions to implement collision avoidance decisions, resulting in a flood of warnings.
- Commercial SSA and STCM services: commercial services are needed to augment current governmental services.
- Tracking and advanced SSA analytics: diverse SSA tracking networks and sensor types are needed, and their data must be brought together using modern data fusion engines and analytics.
- Open Architecture Data Repository (OADR): satellite operators have been proactively contributing data on their spacecraft, and that model must now be extended across the global space operator population under a robust STCM enterprise.
- Availability of information: SSA and STCM data must be made readily available to all space operators, commercial or governmental, regardless of mission, altitude or nationality.

The paper then provides four recommendations, as follows:

- Action and funding: the US government should act now to implement a modern STCM environment and create a US-developed cutting-edge space sustainability model.
- No imposition of specific technologies: innovation must be allowed to ensure the most cost-efficient and effective technologies.

24 https://sia.org/.

25 https://sia.org/wp-content/uploads/2020/09/REVISED-White-Paper20-STCM-Sept-23rd-V1.0.pdf.

– Government to encourage best practices: commercial space industry participation and support is needed to ensure wide-spread adoption of space safety practices and to reduce unnecessary and burdensome regulations.
– Endeavour to meet global needs: US and international space activities must be included, which requires leadership of the US government, commercial stakeholders and like-minded space-faring counterparts.

The White Paper demonstrates the commitment of the US space industry to invest in STM, even without binding regulations in place.

5.2 Space Data Association

Established in 2009, the Space Data Association (SDA) is an international organisation that aims to enhance safety of flight via sharing of operational data and promotion of best practices across the industry. Its membership includes the world's major satellite communications companies, such as EUTELSAT, INTELSAT, SES and INMARSAT. The SDA works to improve the accuracy and timeliness of collision warning notifications, and collaborates with all interested entities to help define the next generation of STM systems and capabilities.[26] Its objective is to promote the quick communication and exchange of adequate information between space operators operating in GSO to avoid collisions and the creation of space debris.

A partnership between SDA and Analytical Graphics, Inc., a US. technology company, led to the creation of the Space Data Center, a platform for collecting information related to space objects communicated by space operators and an anti-collision alert system, considered to be more practicable than data from the Combined Space Operations Center (CSpOC).

5.3 Space Safety Coalition

The Space Safety Coalition was established in 2019 and adopted 'Best Practices for the Sustainability of Space Operations', applicable to all spacecraft regardless of physical size, orbital regime or constellation size.[27] Building upon previous initiatives including the UN space debris mitigation guidelines and the standards of the International Organization for Standardization (ISO) and the Consultative Committee for Space Data Systems (CCSDS), the five Best Practices provide the following:

– Spacecraft owners, operators and stakeholders should exchange information relevant to safety-of-flight and collision avoidance. Direct reference is made here to SSA and STM.

26 https://www.space-data.org/sda/
27 https://spacesafety.org.

- In selecting launch service providers, space operators should consider the sustainability of the space environment.
- Mission and constellation designers and spacecraft operators should make space safety a priority when designing architectures and operations concepts for individual spacecraft, constellations and/or fleets of spacecraft.
- Spacecraft designers and operators should design spacecraft that meet a number of best practices. Nine items are listed, including the requirement that spacecraft should strive for a disposal process providing a probability of successful disposal of 95%, that spacecraft designs should consider including technologies and features that facilitate capture and deorbit, and that spacecraft should be designed to be reliably trackable from the ground using passive tracking means.
- Spacecraft operators should adopt space operations concepts that enhance sustainability of the space environment.

So far, the Best Practices have been endorsed by nearly fifty entities from around the world, ranging from manufacturers, operators, insurance companies, consultancies and launch service providers to associations and other non-governmental entities, who undertake to promote and strive to implement them within their respective organisations.

5.4 ASD-Eurospace

Eurospace is the trade association of the European Space Industry. In 2004, it became the Space Group of the Aerospace and Defence Industries Association of Europe (ASD).[28] In February 2021, the group published a position paper titled 'Space Traffic Management (STM): An Opportunity to Seize for the European Space Sector – EUROSPACE Manifesto for a European Global Answer on STM'.[29]

The paper observes that current initiatives and decisions regarding STM, e.g., in the US, are likely to create a challenging environment for European actors, as they could have a significant impact on the sustainability of Europe's autonomous access to space and its use because of dependency on the US and the need to comply with guidelines and best practices defined by and for US actors. Furthermore, they could affect the competitiveness of the European space manufacturing industry.

The paper urges the EU to be at the forefront of the discussions about STM and to be proactive, it argues that a European approach could be seen as more neutral than the US approach in the global community. Recommendations for specific actions include the coordination of EU Member States' national efforts, the creation of an internal European market for SSA, the

28 https://eurospace.org.

29 https://eurospace.org/wp-content/uploads/2021/03/eurospace-pp_space-traffic-management_opportunity-for-europe_final_february-2021.pdf.

creation of funded programme lines for STM, and the promotion of a strong industrial involvement in the EU Space Surveillance and Tracking (SST) Support Framework, established by the EU in 2014.[30]

The Eurospace paper demonstrates that the European space industry sector is concerned about US dominance in the field of STM and wants Europe to become actively engaged in the process towards the creation of a global STM regime.

5.5 World Economic Forum

A last interesting development to mention here is a system, developed by the World Economic Forum (WEF) in cooperation with several partners, to rate the sustainability of space systems. The 'Space Sustainability Rating' (SSR) was first presented in 2019, and could become a metric to know how well a satellite or satellite system could avoid the creation of space debris. A successful SSR could result in encouraging more responsible behaviour in outer space, including the activity of decommissioning satellites and actively removing space debris. A good rating could spotlight missions that contribute positively to space environment, while a bad rating could influence insurance premiums.[31] The SSR will use factors such as data sharing, choice of orbit, measures taken to avoid collisions and plans to de-orbit satellites at the end of their mission, and how easily satellites can be detected and identified from the ground, to score the sustainability of satellite operators.[32]

In June 2021 the École Polytechnique Fédérale de Lausanne (EPFL) Space Center (eSpace) was selected to host this 'Space Sustainability Rating' (SSR) initiative.[33] The Center will lead the SSR towards an operational system as the next step of the initiative which started several years ago.

6 Conclusions

The space landscape has changed dramatically in recent years, both in terms of activities and in terms of actors. These changes are creating new challenges that need to be addressed to maintain space safe and sustainable.

The current international UN legal framework governing space activities does not include provisions specifically related to STM, neither in the treaties, nor in the subsequent soft law instruments. However, the treaties do contain principles about, e.g., the supervision of space activities,

30 https://www.eusst.eu/.

31 https://www.weforum.org/projects/space-sustainability-rating.

32 ESA, *Space sustainability rating to shine light on debris problem*, 17 June 2021, www.esa.int/Safety_Security/Space_Debris/Space_sustainability_rating_to_shine_light_on_debris_problem.

33 https://espace.epfl.ch/research/space-sustainability-rating.

avoidance of harmful interference and liability for damage, whereas the non-binding instruments address ways to mitigate space debris and to ensure the long-term sustainability of space activities. All these hard- and soft law provisions are relevant for the future adoption of a global STM framework, and, read together, can be interpreted as an incentive for States, international organisations and private entities to perform their activities in outer space in a cooperative, safe and sustainable manner.

In terms of State responsibility, national law can implement STM guidelines agreed at international level. In terms of liability for damage, the adoption of a global STM regime will likely facilitate the attribution of fault in case of damage occurring in outer space. In terms of registration, what is lacking is a clear obligation to share timely information about space missions. A future STM regime will therefore need to include relevant capabilities and requirements for adequate space situational awareness. But the 'eternal' duty of the State of registry to exercise jurisdiction and control may convince States of the need for agreeing on an STM regime. Lastly, in terms of due regard for the activities of other States, the adoption of an STM regime will facilitate the avoidance of harmful interference.

Current developments in various non-governmental fora, in addition to various national and regional developments, such as in the USA and the EU, can be useful in paving the way for international agreement. It must be ascertained that these initiatives are compliant with the principles of international space law. Hence, coordination between these actors and UNCOPUOS is of great importance, so that the work of both groups converges into a workable, efficient and strong global STM regime. Non-State actors should be allowed and encouraged to provide input to the debate in UNCOPUOS. Hopefully the Committee will see the merit of taking these developments into consideration, as they emanate from those who are directly affected and are likely to present pragmatic solutions for keeping outer space safe and sustainable for current and future generations.