

## PROJECTS FOR THE REGULATION OF SPACE TRAFFIC MANAGEMENT\*

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**Abstract.** The elements of the STM regime are the two dimensions of space traffic (in the scientific-technical and regulatory domains) and the three phases of space traffic: the launch, the on-orbit operations and the return. Examples of traffic regulations include launch safety rules, a specific air-space regime, manned spacecraft safety rules, regulations governing debris removal, traffic laws for orbital phases, return safety regulations (e.g. descent corridors), frequency use and avoidance of interference, environmental regulations, etc. Implementation and control mechanisms are primarily national regulations for licensing, arbitration and enforcement, operational assessments, coordination, and civil-military cooperation. This article is based on the concept of STM, which emphasises the need to respond quickly to unexpected events in space by creating a regime that encompasses all aspects of space activities.

**Keywords:** Space Traffic Management; ITU; UN COPUOS; Space Situational Awareness; space safety.

### INTRODUCTION

Space operations today are mainly managed separately by individual countries and activities: the ITU, the IADC Committee and the Committee on Earth Observation Satellite (CEOS), as well as companies and private initiatives (e.g., the Space Data Association). Concept STM emphasizes the need to respond quickly to unexpected events in space, by creating a regime that includes all aspects of space activities. One of the main provisions for the future management of Space would be to assign resources for managing space debris control, collision avoidance and frequency interference.

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This concept was presented in a 2006 report (International Academy of Astronautics – IAA) prepared by the STM working group.

Also involved in the development of this system were: International Space University (ISU) and IAASS. STM is defined, as a set of technical and regulatory rules for guaranteeing safe access to space, operations in space and return from space to Earth without physical interference and without radio frequency interference. STM is treated as a navigation system, not as a system that excludes the activities of states. It can be a good solution to safety and security issues in Space. So far, only a few research studies and working group conferences on this topic have been published. Three STM-related initiatives on governmental grounds are working groups: the group working on the draft 2007 EU Code of Conduct: The Long-Term Sustainability of Outer Space Activities Working Group in the Scientific and Technical Subcommittee of the UNCOPUOS, The Governmental Group of Experts (GGE) on Outer Space and TCBM; the latter two were established in 2010. The reasons behind the topic is the large increase in the activities of sundry entities in space. The new approach to STM focuses on broad regulation (based on a functional principle).

## 1. ACTIVITIES OF UN ORGANIZATIONS-COPUOS AND UNOOSA

Space activities are not only linked to the scientific and technical domain, but also provide a range of services to humanity (for example, information in the event of flooding). The broad application of space for many millions of people has contributed to a new perception of space, in which so many different systems operate. Hence, security on Earth is strongly linked to security in space. Global governance in Space is made by two main bodies: COPUOS and UNOOSA. They are both responsible for promoting sustainable development in peacefully use and development of Outer Space for all humankind. Recently there are new global topics such as climate change or Earth observation of natural disaster risks [di Pippo 2014, 16-17].

COPUOS is the only forum where representatives of the States, currently 70, have been elected and they have the opportunity to raise any question related to using space. Currently at the international space fora the following topics are widely discussed: space weather disaster recording and reporting, cleaning-up space debris, national legislation, international cooperation mechanisms, long-term space activity, definition and delimitation of space, exploitation, space for social and technical development, gathering and providing information on space objects located nearest to the Earth.

COPUOS and its subcommittees work on the basis of consensus and make recommendations to the UN General Assembly for consideration

and adoption, in the form of a resolution. There are also working groups within the subcommittees (3) dealing with such issues as nuclear weapons in space (in 1980 the group was supposed to be involved in research and control of practices in the use of nuclear weapons sources). In 1983, the mandate changed and this group has been used to develop techniques for the safe use of nuclear sources. In doing so, COPUOS has submitted a series of rules concerning the use of nuclear sources by the Assembly. The principles have been implemented by United Nations General Assembly (UNGA) in Resolution 47/68 of 1992.<sup>1</sup>

There is also expert group on space weather and global health. Subcommittee on Legal Affairs has three working groups dealing with issues such as national status space treaty, definition and delimitation of space, international review mechanisms for cooperation in the peaceful exploration and use of space. COPUOS also deals with the development of standards for handling space debris. Inter-Agency Space Debris Coordination Committee (IADC) recommendations were adopted by COPUOS as Guidelines on Space Debris [Jakhu, Sgobba, and Dempsey 2011, 30-31].

COPUOS has been very successful in its first 25 years of existence and operation in international cooperation, negotiations and adoption of fundamental principles of law Space Council (5 treaties). Since 1979, COPUOS hasn't drawn up a treaty. In the 1980's and 1990's, the inspirational role of the General Assembly of the United Nations in the development of international space law diminished. The slowdown in the pace of UN's work on space legal issues is sometimes explained by the fact that the UN has already developed and adopted the general principles and norms necessary to regulate the cooperation of states in space activities.

However, a limited number of countries are involved and these activities are not as intense as in the field of air transport, for example. It is also believed that there is no need for a similar regulation of space activities so far. The position of some countries opposed to new treaty regulations in this area is important. States directly involved in space activities, including the US, are concerned about imposing unjustified restrictions on them by further regulating these activities, which could hamper their national space programs [Łukaszuk 2006, 15].

On the other hand, common rules are needed in order to develop an integrated approach to use of space between States and space organizations. Today instead of the treaties, COPUOS is only preparing UN Assembly resolutions. Other international organisations have addressed specific cooperation issues international and regulatory environment. COPUOS has

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<sup>1</sup> A/RES/47/68, 85th plenary meeting, 14 December 1992, 47/68 – Principles Relevant to the Use of Nuclear Power Sources in Outer Space.

therefore become more static and potentially obsolete. The UN is currently being criticized for short-sightedness and a lack of future prospects, but it is not the Secretariat organisations are guilty of a lack of vision. This remains a matter for the states, which have the choice between activity and inactivity.

The principle of consensus has never been a problem if Countries would like to discuss the issue in a forum. COPUOS actively cooperated with the Third UN Conference on Exploitation and the peaceful uses of space ( UNISPACE III), held in Vienna in 1999. The topic outside UNISPACE III was the coordination of navigation systems (GNSS), for which a separate forum has been set up (ICG) assisted by UNOOSA in its secretariat functions.

COPUOS is not involved in arms issues and does not play a role in trials of commercialisation and privatisation. COPUOS is currently working, *inter alia*, on a code of conduct in space or in integration with Space Data Association (SDA). The Hague Code on the ballistic missile proliferation procedure was accepted emissions of most countries and has gained more ratifications than the 1967 The Outer Space Treaty (OST). Some people ask themselves how to activate COPUOS. It seems there is no need for organisations such as ITU (International Telecommunication Union) to cooperate with COPUOS.

Similarly for Earth observation, the Committee on Earth Observation Satellites (CEOS) manages on its own. Other specialised organisations shall have its own space programmes (UNESCO, WHO, FAO). Outside COPUOS, the following shall remain also two very important issues: i.e. space exploration ( International Space Exploration Coordination Group – ISECG) and private space. COPUOS faces the challenge of involving private stakeholders in its work.

UNISPACE II has provided basis for a Non-Governmental Organisations Contact Platform (NGO). At present, the Member States are characterized by different set up of their delegations: some send their government experts, others send their inspectors researchers from academic centers or industry. Each institution may be observer of COPUOS sessions, with the exception of the private sector (otherwise ITU). COPUOS could explore a list of potential stakeholders to closer cooperation. It is important that the Committee the participation of the non-governmental sector in their work.

Karl SchroegeI thinks that COPUOS could address issues that need more attention or guaranteed the coherence of space law activities and regulation. In other areas COPUOS should only be involved if it brings added value. It could be a consultative forum for the development of initiatives. COPUOS should define its tasks in the UN system taking into account current needs. It must also fulfil its regulatory function as a platform for

exchange and coordination with other governmental and non-governmental international institutions in the field of space activities. Schroegele states that the oversight functions in the UN system should provide guidance for the programming of UNOOSA, to support and lead space applications in a wide range of initiatives UN.

UNCOPUOS could oversee these efforts. There is a need for more activity of UN specialised agencies in the Committee sessions and greater interaction between COPUOS and the governing bodies of these institutions. It should also be considered whether the structure of a body with two subcommittees is still justified or not. Perhaps one would suffice a lead committee with ad hoc working groups (open to all) under the authority of to the head commissioner [Schroegele 2011, 93].

Since its creation the role of the Committee has decreased under the major space treaties. It is a result of the policy of the states. States prefer to establish its principles and declarations in the form of the UN resolutions because they don't want to be bound by hard law regulations. Perhaps it would be a good idea to initiate such action again, particularly in face of major problems such as suborbital flights or exploration and removal of contaminants in space. Some authors even put forward the idea of creating a new international treaty, taking into account definitions such as orbital and sub-orbital flights, open skies and the creation of a mechanism for controlling States liability for accidents [Halstead 2010, 205].

In an attempt to strengthen the global governance of outer space activities in the twenty-first century, the Committee on the Peaceful Uses of Outer Space, its subsidiary bodies and the Office for Outer Space Affairs should strengthen the Committee's unique position as the primary intergovernmental platform for international space cooperation and the negotiation of instruments pertaining to space activities, and work towards further increasing its membership. Promote the Committee's role as the main center for space-related international coordination and cooperation mechanisms, to ensure better information flow with member States; promote the universality of the United Nations treaties on outer space by developing, by 2020, a guidance document that will assess the existing legal regime on outer space and identify possible gaps with a view to fostering an international regime of responsibility and liability and ensuring that space law is a strong pillar of global space governance.

Also by strengthening capacity-building and technical assistance provided by the UNOOSA in the field of international space law, policy and space-related institutional capacity-building as fundamental tools in those efforts, promoting the United Nations Register of Objects Launched into Outer Space of the UNOOSA by improving existing registration practices and information exchanges on the basis of existing mandates, including measures

that seek to increase transparency and improving the efficiency of the registration mechanism; restructure the Committee's agenda in order to address, in a comprehensive manner, the use and utility of space as a driver of sustainable development and the issues of safety, security and sustainability of outer space activities, including the exchange of information on space objects and events, in-orbit collisions and interferences, space operations and space traffic management; strengthen coordination between the three intergovernmental platforms, namely, the Scientific and Technical Subcommittee, the Legal Subcommittee and the Committee on the Peaceful Uses of Outer Space, to enable agenda items to be addressed in a comprehensive, cross-cutting manner combining scientific, technical, legal, policy and decision-making dimensions; strengthen cooperation with the United Nations entities dealing with space, in line with the United Nations system-wide efforts to increase coherency.<sup>2</sup>

The theme of the global governance appeared at the fifty-ninth session of COPUOS, which prepared the UNISPACE+50 high level conference 2018 priorities. The proposed thematic priority 2, has been entitled "Legal regime of outer space and global space governance: current and future perspectives", with some objectives and mechanism for implementation (A/71/20, § 296) such as promoting the universality of the five United Nations treaties on outer space, assessing the state of affairs of those treaties and their relationship with other relevant international instruments (principles, resolutions and guidelines) governing space activities, analyzing the effectiveness of the legal regime of outer space in the twenty-first century, with a view to identifying areas that may require additional regulation. The evaluation will be performed by developing the questionnaire of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space to encompass an assessment of the legal regime of outer space as a pillar of global space governance, studying potential future legal and institutional initiatives intended to ensure that outer space is explored and used for peaceful purposes and to ensure that access to outer space remains open and free for the benefit of all countries, in order to establish that international space law is a relevant part of global space governance in the twenty-first century in the light of the significant scientific developments and technical advances that have affected space activities [Schrogl 2010, 132].

The proposed questions relate to the legal regime of outer space and global space governance, Moon Agreement, international responsibility and liability, registration of space objects. The role of the Office for Outer Space Affairs as a focal point for information exchange and a forum for discussing

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<sup>2</sup> A/AC.105/1166, 13 December 2017, General Assembly, V.17-08851, p. 10, COPUOS, The "Space2030" agenda and the global governance of outer space activities, Note by the Secretariat.

the progressive development of international space law should be strengthened, especially at the administrative and executive levels. In the future, the UNOOSA should be officially encouraged to conduct targeted capacity-building, education and training in space law and policy, building upon the United Nations Platform for Space-based Information for Disaster Management and Emergency Response programme, with the objective of establishing a capacity-building platform.

In the guidance document, it was considered important that the Office for Outer Space Affairs would be given the necessary mandate to develop, in close cooperation with States and regional organizations and mechanisms, as appropriate, the prerequisites for targeted technical legal assistance aimed at governmental and regulatory authorities, and to take action to foster holistic cross-sectoral capacity-building efforts that address the broader space community, in order to be able to tailor such efforts to the particular needs of developing countries. In that regard, the Office should also be mandated to develop a model for national space legislation.

## 2. PROJECT FOR INCLUSION OF SPACE ISSUES IN ICAO

Global governance of space in UN is also connected to the cooperation with other UN bodies, such as ICAO. According to some authors, it seems to ICAO appears to be the most appropriate forum to deal with space activities related to security issues, mainly if it is about air navigation. ICAO has, so far, developed legislation on governance ATM (Air Traffic Management) airspace through SARP's (standards and recommended practice) to aircraft in airspace above sea areas full capacity (72% of the airspace)<sup>125</sup>. ICAO has extensive legislation (technical annexes to the Chicago Convention) and the implementation system [Sgobba 2014, 15-18].

These annexes could be amended by adding specific provisions on space issues (e.g. spacecraft, licensing regulation), the Chicago Convention could be updated by establishing ICAO's jurisdiction in space. Due to possible risk potential in the event of a collision between a spacecraft and an aircraft, the amendment of the rules shall consider prevention, i.e. as soon as possible. This applies in particular to suborbital vehicles, which will soon be operating commercial flights. When establishing new SARP's and complementing existing SARP's, ICAO shall take into account the problems and areas that exist today (e.g. security or environmental protection) rather than in times of need the creation of the Chicago Convention in 1944, hence space should not be a topic foreign to ICAO.<sup>3</sup>

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<sup>3</sup> One of the working documents for the 175th Session of the ICAO Council of 30 March 2005 presented by the ICAO Secretary General concerned space matters and was under

Due to uncertainties as to the correct classification of commercial ships operating in supra-airpace under the Chicago Convention, some of the investigators propose to update it (create broader definition of an aircraft) and the creation of a new Annex 20 dedicated to space also to review the aviation conventions in terms of their applicability to space objects, such as in the 1999 Montreal Convention on the air carrier liability or the Beijing Convention on Safety in the concept of “security”.<sup>4</sup> ICAO could also deal with security audits in the field of space, and oversee the implementation of the technical Annexes aspects of space through national surveillance.

Within itself the ICAO could also set up a team responsible for investigating and researching the space accidents (without supervisory functions). A new organizational structure with a new space division is proposed under the direct authority of the Secretary-General of ICAO. ICAO would also be competent enough to establish rules for the certification process of spacecraft. ICAO distances itself to immediate necessity of a regulation of space. ICAO refers to the legislative experience of COPUOS and declares mutual cooperation. ICAO notes the rapid development of space technologies and new trends (commercialization of space activities, more and more convergence points with civil aviation, e.g. in the area of aircraft and space object constructions). ICAO is not enthusiastic about creation of the new Annex and believes that it is necessary first to get to know and understand the existing problems, and only then create with the help of a study group guidance material. In one of the working documents for the 175th Session of the ICAO Council of 30 March 2005 presented by the ICAO Secretary General concerned space matters and was under consideration by the Council. One of the conclusions of the document was the suggestion that the future topic of suborbital flights should be addressed by ICAO (Aviation law and technical standards).

ICAO Resolution A29-11 provides that ICAO will continue to be responsible for determining the position of civil aircraft in all matters relating to space. In June 2014 ICAO has sent a State Letter to Member States (AN 1/64-14/41) requesting information on the activities of the space sector in their territories and forthcoming plans on this subject. According to ICAO, it is too early to develop SARP’s; at present there is not enough understanding of the subject to integrate it into the work cycle

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<sup>4</sup> See more at: [www.icao.int](http://www.icao.int) [accessed: 09.08.2018].



of the organisation. Raising awareness among countries is essential and further research is therefore required.<sup>5</sup>

Under the auspices of ICAO, the ICAO Space Learning Group has been established to assist the Secretariat in his space-related work. Relevant international organisations were invited to nominate their experts to participate in the group. The group's task shall be to examine questions relating to civil space transport in order to better understand the future needs of industry and, in particular, to start plan safe, effective and routine activities in an unoccupied space. The aim of the learning group is to check the relevant regulations and recommendations prepared by Member States and develop a work programme for consideration by the ICAO's Air Navigation Commission, including the space theme within GANP and GASP (Global Air Navigation and Global Aviation Safety Plans) [Abeyratne 2013, 387].

The group goal is to inform ICAO of important matters relating to suborbital flights, collecting and sharing best practices on these activities in the coming years and determine whether the space component should be included in future plans for navigation and safety. ICAO encourages the participation of the Commission, in close cooperation with the industry and international organisations, carries out questionnaires on transport issues, initiates discussions on the use of airports/spaceports, in order to support suborbital flight operations, space delimitation and aircrafts space and air delimitation, integration of the navigation system, responsibility for space activities or needs of creation of a new annex on space. The concept of legal security for suborbital flights was established at the 175th ICAO Council meeting in June 2005. The Council, due to increasing importance of commercial transport of passengers has been exchanging views, whether such flights fall within the scope of the 1944 Chicago Convention and are subject to under the ICAO regulatory regime. The Council noted that COPUOS had considered possible legal scenarios, with regard to suborbital vehicles, in order not to duplicate tasks.

The Council decided to follow the work of the subcommittee and to be kept informed of the outcome of its. ICAO has participated in several meetings of the subcommittee to see the scope of activities in which it could be involved with ICAO. From 18 to 20 March 2015, the first ICAO meeting took place in Montreal on a space seminar organised together with UNOOSA. The symposium gathered about 300 experts from all over the world, representatives of industry and scientific centres, Universities and academics from various aviation and space organisations. The idea of the symposium was to develop an agreement between ICAO and UNOOSA on maritime

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<sup>5</sup> 129 Informal briefing to the Council 21 October 2013, performer by N. Graham, Director of Navigation Bureau, ICAO.

challenges for aviation as well as space activities. Next year the symposium was continued, in 2017 in UNOOSA headquarters. As there is currently no international body to deal with space safety as ICAO for aviation, some authors' note that ICAO should be involved in space matters, hence the proposal for amending the technical annexes and possible addition of a new one on space [Fitzgerald 2014, 3-34].

Aeronautical and space issues have very much in common for example: the international dimension of space accidents, involving: passengers, astronauts or private crew and passengers. ICAO's activities would be based on four pillars, i.e. policy and regulation, safety oversight, monitoring (inspection, search and rescue) and independent accident investigation (to prevent and determine the causes). The current ICAO structure would be expanded to include a new compartment (Space Navigation Bureau) subordinate to the ICAO Secretary General and Deputy Directors. It would be responsible for issues relating to launching (site related certificates), accident prevention, traffic management (Space Traffic Management), maritime safety oversight and certification and space medicine (including crew and passenger medical examinations).

In addition, the new section would be under the direct authority of the ICAO Secretary and would be independent the accident office and the Space Safety Oversight Audit. The idea to change the scope of ICAO's activities was based on the fact that COPUOS was not been able to amend existing space conventions for many years. It was therefore considered that ICAO's competence should now be extended, while clarifying the questions that are still open, such as those concerning the differences between different kinds of spaces or the classification of space objects. ICAO could also develop a certification procedure security for commercial space service providers, Operators call on the ICAO to adopt the task of harmonising air and space law in the following years [Dempsey and Mineiro 2010, 250-52].

It is important here to harmonise the rules within SARP's (as provided for in Article 37 and 38 of the Chicago Convention). Since, in accordance with the ICAO Convention, it is responsible for emissions from air navigation should also have an impact on air traffic and the associated space movement.

Therefore, it is proposed that the Council of ICAO broadens the organisation's scope of activities and amend the annexes (so that ICAO's oversight also covers e.g. suborbital and air traffic related to suborbital flights). Another solution would be to adopt a new treaty. The existing ICAO Air Navigation Bureau would therefore extend the scope of its own activities. A separate office could solve the problems with the interface between air and space navigation. The sooner these matters are settled, more collisions

in space will be avoided. At present there are no common standards for aerospace operations, there is no vision for the future or hope for new regulations. It is certain that space objects cross the air border at they enter into space. It is often an international space, because many of the launches take place from areas located close to the oceans (for safety purposes). ICAO currently has regulation in place ATM for aircraft over the high seas. Object classification should be based of functional approaches. Another way to address space security issues is to create a new organisation, following the example of EASA in Europe. Such an organisation (some do not explicitly mention the restructuring of EASA and the appointment of a section to deal with the following issues including e.g. suborbital flights would be involved in, *inter alia*, certification [Marciacq, Tomasello, Erdeleyi, et al. 2014, 261-306].

### 3. THE EUROPEAN UNION AND SPACE

Under the Treaty on the Functioning of the European Union (TFEU),<sup>6</sup> which codified the Union's competences in the field of space, space activities have become a domain not only for individual Member States. The European Space Policy has become an area of so-called shared competence between the EU, the Member States and ESA, on the one hand, and the EU, on the other (European Council, Parliament and Commission). The Lisbon Treaty of 2007,<sup>7</sup> in Article 189, concerns the promotion of scientific and technological development, industrial competence, the implementation of space policy, and so on. This provision gives the EU a clear mandate to intervene in space-related matters, and therefore plays an important role for Europeans. The EU has been given legal competence under the Treaty to deal with all space policy issues, be they human activities, satellite applications or international cooperation. The Treaty indicates European competence in the space domain. The subsidiarity principle still applies (the EU can only act if it does something more effectively than the Member States). The exception is cooperation for research, technological development and space. Shared parallel (cumulative) competence does not block national activities.

Regional space law is a law mainly developed by the EU institutions, together with implementing and initiating legislation (communications, green papers and white papers) and the case law of the European Court of Justice (ECJ) in the Lisbon Treaty (EU space policy upgraded to the core categories and areas of EU competence (1998, 2000 and 2001). Communications

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<sup>6</sup> Treaty on the Functioning of the European Union, OJ C 326, 26.10.2012, p. 1.

<sup>7</sup> Treaty of Lisbon amending the Treaty of European Union and the Treaty establishing The European Community, signed at Lisbon, 13 December 2007, OJ C 306, 17.12.2007, pp. 1-271.

to the European Council calling for a coherent space policy have contributed to the resolutions of the Council on the European Space Strategy and on signing of the Framework Agreement between the European Community and ESA in 2003. The three main sets of EU/EC space law sources are: acts of international space law adopted under UN systems implemented in the EU/EC system, acts in the form of EU/EC institutional regulations, i.e. regulations, directives and decisions, and 237 agreements between the Member States and international organizations and arrangements for the participation of EU Member States in specialized international space co-operation programmes, such as Ariane or ISS.

The 2007 Treaty of Lisbon is crucial in this respect. 2003 White Paper – Action Plan and the Framework Agreement with the European Space Agency (ESA) in 2003<sup>8</sup> set out fairly broad principles for institutional cooperation. EU/EC law governs space policy (satellite technology, market relations) and the EU economy (satellites, space infrastructure, space launch systems). EU policy refers to freedom of access, exploration and use of space. It refers to the use of space for self-defence and calls on Member States to explore and use space peacefully.<sup>9</sup> It encourages countries to implement ITU recommendations and regulations and to adopt Space Debris Mitigation Guidelines (COPUOS). New problems for EU law include the development of space transport, space tourism, insurance, liability, the extraction materials from the Moon, space debris and the risk of collision with debris. Space law is therefore applicable in the institutional sphere (policy, operational activities, agendas, ESA, Space Council, EU Satellite Centre, European Space Law Centre, ESA). There are also areas subordinate to the old pillars (scientific, technical, economic, GALLILEO, GMES – Global Monitoring for Environment and Security, and tasks for the EU's Common Foreign, Security and Defense Policy, cooperation outside the EU).

EU space law is evolving. New elements of the EU regulatory areas (analogical with air law) and the important role of international organizations (regional cooperation), i.e. ESA, ITU or ISS, have just been developed and should be highlighted. European space law is confronted with new trends (technical, market, privatization, liberalization, globalization). Cooperation with the private sector is among the most important roles of international organizations and Europe (e.g. in the Earth observation sector). ESA has broad competence to coordinate Member States' space policies. Therefore, given that European space law is rich in normative content (attempts

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<sup>8</sup> White paper – Space: a new European frontier for an expanding Union – An action plan for implementing the European Space policy SEC (2003) 1249; COM (2003) 673 final.

<sup>9</sup> Opinion of the European Economic and Social Committee on the Communication from the Communication to the Council and the European Parliament: European Space Policy COM (2007) 212 final, OJ 162, 25.6.2008, p. 3.

to introduce new legal regulations, e.g. concerning intellectual property), there is a need to harmonize activities in a various areas and to strengthen cooperation between space law and universal environmental law.

According to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions *The EU Space Industrial Policy – unlocking the growth potential of the space sector* states *inter alia* that “Space is not only a technical challenge. It has and will continue to have a strong political dimension, which has not yet been sufficiently developed at European level.”<sup>10</sup>

Thus it is important for Europe to remain a long-term leader and independent actor in access to space, both in the telecommunications industry and in navigation and Earth observation. In order to meet these challenges, Europe needs to achieve technological independence, security of supply and maintain independent access to space in order for the European space industry to grow sustainably. The political dimension of space has been driven in recent decades by those European countries which are the most active in space. However, the political power of these countries may not be sufficient to cope with future challenges in the face of increasing competition from new emerging spacefaring nations. An EU space policy could strengthen European identity at international political level. At the same time, EU intervention could provide a stronger political impetus to space policy, for example by introducing appropriate framework conditions to sustain and support European space activities and the competitiveness of European companies in the global marketplace.

The EU’s space industrial policy focuses on five specific objectives: creating a coherent regulatory framework; further developing a competitive, efficient and sustainable industrial base in Europe; supporting the global competitiveness of the European space industry and encouraging industry to become more cost-effective; developing markets for space applications and services; and ensuring technological independence of spacefaring nations and independent access to space.

The Communication also devotes much attention to research and innovation. They are not only key elements of industrial space competitiveness, but also essential components of sustainable economic growth in the short and long term and affect the EU’s ability to remain competitive in an increasingly globalized economy. The space budget under Horizon 2020 will cover research, development and innovation with an option of creating the right conditions for Europe to be competitive in space, creating the right conditions for progress in space technologies, space data exploitation including

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<sup>10</sup> COM(2013) 108.

scientific missions and commercial exploitation of space data, creating the right conditions for European research and development in the context of international space partnerships (e.g. ISS).

The Communication also refers to the need of broadening the range of available and existing financial instruments, to making a better use of public procurement policies, establishing and implementing a genuine European policy on as-built systems, and to ensure the sustainability of space activities in Europe. The Communication sets out in an annex the envisaged space-related industrial policy measures, including the development of a legislative framework for space to strengthen the European space market, the monitoring and improvement of the framework for export control and intra-EU transfers, ensuring the availability of radio spectrum, exploring the need to embed commercial space activities in a regulatory framework and supporting research and technology or European industry access to the global market.

Some believe that the EU should become a member of COPUOS. It is important for the European and international parties to cooperate on the International Code of Conduct for Outer Space Activities. The proposed EU Code is an international diplomatic initiative on security, defense and disarmament in space. The code is addressed to all countries and upholds the principle of self-defense. The Code introduces principles of international government cooperation in order to counteract the threats of The Code promotes the sharing of SSA (Space Situational Awareness) data and the communication of all abnormalities of significant risk (e.g. re-entry or orbital collision).

#### 4. RULES OF STM PROGRAMMES

Space Traffic Management (STM) concept has caught wide attention, above all due to the growing number of entities (both state and private) operating in Space. Both LEO and GEO orbital systems involve a continuous collision risk. In order to mitigate this risk, satellite operators that track Space objects and their dynamics are required to keep vigil at all times for the purpose of ensuring safe and effective use of Space.

Indeed, the STM concept is not new; the first mention about such a project regarding military aviation dates back to 1932. Later, this idea was revived in France, when its satellite was damaged by Space debris. The tasks of STM include in particular orbit management and collision avoidance but solid studies are required in this regard because there are few publications concerning the civil application of STM. The military is the party that is most interested in this system now. For the time being, there are still

more questions than answers regarding STM [Dickinson 2018]. Space flights include various stages (e.g. launch, orbiting and return); the STM system would cover them all. Such traffic should be organized and transparent for each operator. It must be remembered that spaceships cannot reach Space and return to Earth without crossing the airspace, which is used by aircraft. Therefore, the Space Traffic Management system must not pose a threat to the security and safety of both aircraft and Space objects. Moreover, there is a high risk of collision of active and defunct objects in Earth orbit.

The research on STM were reflected in, among others, the 2006 report titled “Cosmic Study on Space Traffic Management”, which was prepared by the research group of the International Academy of Astronautics (IAA). Said report defines STM as: “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 radiofrequency interference.” Another proposed definition of STM is: Space Traffic Management covers activities related to surveillance, coordination, regulation and promotion of activities (including Space environment protection) during several separate mission stages, such launch, Space operations and return from Space.

As pointed by experts, data for STM must be appropriately gathered, processed, stored, managed, adjusted, used and disseminated. Particular caution must be exercised when issuing final messages, and presumptions which are not confirmed by the gathered information must be avoided. Many observers are able to reconstruct events and trajectories but few can predict them because prediction requires knowledge and understanding of many variable data [Jah 2021].

Discussions on this topic mention three possible management regimes: high, medium and low. In the case of the high regime, a superior authority with a range of operational and penal authorisations (among others, prohibition to act in orbit and levying fines) must be established. The medium regime takes into account the national laws and standards, focuses on consensus and soft law. The low regime is based on the national law and its institutions. STM is supposed to be exclusively civil while SDA and, to a lower extent, SSA – military in nature. A question arises whether operators will understand the requirements of both these domains and be able to act for the benefit of them both.

The United States has long regarded Space as an integral part of its strategic and geopolitical programmes. Successive American administrations consistently included Space in their policies, and the other way round. Although the approaches and priorities differed over the years in line with the political colour of different administrations, the general direction remained rather consistent around the primary strategic goal being the achievement

of the US leadership in Space. This goal applies to all aspects of the domain of Space, namely:

- 1) economy and trade in Space; the United States supports the development of its leading global Space industry, in particular by means of an ambitious technology and innovation policy, a beneficial regulatory system and an assertive trade diplomacy;
- 2) defence of Space and national security; Space is the key asset of the military advantage of the United States and a potential weakness of the national security. Given the objective being achievement of full supremacy in the full spectrum, the United States strives for maintaining the dominance and control in the domain of Space. This entails development of the capability of containing, counteracting and defeating hostile threats, as well as of mitigating the problems related to security and sustainable development which affect the Space infrastructure and the operational environment;
- 3) cooperation in the field of Space and foreign policy; acknowledging the importance of cooperation for promotion of division of burdens and for reaction to threats and the value of the international environment that facilitates trade in Space, the United States tries to ensure that bilateral and multilateral agreements protect and support its interests.

As part of the “America First” policy, Trump’s administration additionally confirmed the leading role of the United States in Space. The national Space Traffic Management policy of the United States constitutes a link connecting security, trade and foreign policy and is supposed to be an instrument that supports the American leadership in Space. The policy states clearly that “through this national policy for STM and other national Space strategies and policies, the United States will enhance safety and ensure continued leadership, preeminence, and freedom of action in Space”.

The US STM policy aims to support the leadership of the United States through three complementary goals being: protecting the US vital interest in Space, providing unrestrained access to and freedom to act in Space, and remaining the world leader in creating the conditions for a safe, stable, and operationally sustainable Space environment.

It is stated subsequently that as Space is becoming increasingly congested and contested, and that trend poses a challenge for the safety, stability, and sustainable development of US Space operations, a new approach to Space Traffic Management (STM) must be developed that would address the current and future operational risks. Another goal of the policy of the United States is to “encourage and facilitate U.S. commercial leadership in Science and Technology, Space Situational Awareness, and Space Traffic Management.” This goal matches the efforts of the United States



to “prioritize regulatory reforms that will unshackle American industry and ensure [the United States] remain the leading global provider of Space services and technology.”

Beyond the primary role of the USA in science and technology, SSA and STM, the policy aims to guarantee favorable safety and regulatory conditions for the creation and development of new commercial Space undertakings and activities related to, for example, in-orbit servicing, debris removal, manufacturing in Space, Space tourism, small satellites or very large constellations.<sup>11</sup> The American policy repeatedly underlines the principle of responsibility of countries for their actions in Space, respect for other countries acting in Space, and skillful, professional collaboration (i.e. avoiding Space pollution and disturbance of others’ work, by communicating and reporting potential threats to one another in order to increase Space security and safety).<sup>12</sup>

A pilot programme of the US STM is supposed to be prepared by the Office of Space Commerce (OSC) being part of the Department of Commerce of the United States. The legal basis for the project is the National Space Policy Directive no. 3 of 18 June 2018 and the mandate from the US Congress. Above all American private Space companies insist on the preparation of a new STM programme [Jah 2021].

## 5. STM IN OTHER COUNTRIES

Although no national STM policy framework comparable to that applicable in the United States has been formally introduced in any country, most countries have already taken various measures which are part of the STM concept. Three primary areas of activity should be mentioned among them:

1. Establishment and operation of Space traffic surveillance functions by creating local SSA capabilities or exchanging data in order to obtain more precise and up-to-date information and to increase own capabilities. While the United States still maintains the most robust SSA system worldwide, other countries, such as Russia, China, Japan and India, are at the stage of preparation of their own Space surveillance programmes.
2. Preparation, implementation and review of STM-relevant regulations (on an international or national level): e.g. contribution to the preparation of guidelines for measures to reduce the quantity of waste, preparation

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<sup>11</sup> ESPI Report 71, pp. 31-33.

<sup>12</sup> PSSI Space Security Roundtable April 22, 2021 – Strategic Competition for International Space Partnerships and Key Principles for a Sustainable Global Space Economy, [https://www.pssi.cz/download/docs/8609\\_pssi-space-security-roundtable-participants.pdf](https://www.pssi.cz/download/docs/8609_pssi-space-security-roundtable-participants.pdf) [accessed: 29.04.2021].

of a national system of statutory and implementing provisions, standards, licence granting procedures etc. There are more and more countries that are equipped with special regulatory frameworks or special national regulations concerning Space, which ensure safe and responsible behaviour in Space.

3. Intensification of efforts in the area of Space traffic coordination, including in particular measures based on bilateral and multilateral exchange of information. In 2015, UNCOPUOS member states agreed for the first time to enter STM to the agenda of the Legal Subcommittee. Over the first three years of discussions, 11 countries took an active part in the sessions devoted to the legal aspects of STM (Austria, Germany, Indonesia, Japan, Morocco, the Netherlands, Pakistan, Russia, the United Arab Emirates and the USA). It was stated as a result of the sessions that numerous components of STM were already present and that the current international Space law already had relevant provisions concerning this programme and the LTS guidelines contained significant recommendations in this regard.

For example, guideline B.1 recommends to “provide updated contact information and share information on space objects and orbital events,” while guideline B.2 is to “improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects.” Also Europe reports its interest in the preparation of a civil Space Traffic Management project, which might govern, among others, the field of Space communication, access to and action in Space, and return to Earth. Taking all three above stages into account will be a response to a possible future situation in which state and private Space airlines will act next to each other [Rathgeber 2008].

Although many components already exist and constitute a solid base for developing a more integrated and operational approach to Space Traffic Management in Europe, the progress in this domain will pose a serious political and technical challenge. Thus, it is necessary to:

- a) strengthen European cooperation and reach a required political consensus regarding the objectives and rules of a European STM policy and regarding a suitable governance (i.e. leadership, division of responsibility and cooperation arrangements);
- b) develop European capabilities and best practices to mitigate the present and future operational threats and find an acceptable compromise between the strive for strategic autonomy and the necessity to achieve demanding technical objectives at effective economic conditions;

- c) contribute to the progress of international attempts in the area of Space Traffic Management, at the same time continually promoting the European standpoint and protecting European interests.

Every effective approach to STM involves an enhanced coordination and collaboration among various entities due to the interdependent nature of a given operational risk and collaborative dimension of risk mitigation solutions. A global framework would be perfect to best achieve the goals related to Space safety and sustainability and therefore multilateral efforts in the domain of STM should be supported. As regards Europe, it would be most desirable to develop a “regional” approach, based on already well-established cooperation arrangements between governmental and industrial entities. Preparation of a joint policy and framework for the safe and sustainable management of European Space traffic and operations requires in particular:

- a) tapping the potential, expertise and added-value of all relevant European public and private stakeholders;
- b) dividing the financial burden among respective parties and maximising cost effectiveness by avoiding duplication of efforts;
- c) harmonising and updating the best practices and safety standards applicable to Space activities in Europe;
- d) enhancing the European contribution to multilateral efforts by promoting clear, common and consistent European standpoints in the international arena.

The preparation of a joint European STM policy and framework implies reaching a broad political consensus among member states regarding:

- common goals and principles, which must be set for European efforts in the area of STM;
- mechanisms ensuring an effective and efficient coordination among the stakeholders;
- an appropriate separation of roles, division of responsibilities and activities. Reaching consensus regarding a framework satisfying the needs, interests and limitations of numerous stakeholders will probably prove difficult and will require reconsidering certain arrangements. Designed to accommodate the interests of various stakeholders, the present European structure allowed to achieve considerable progress in the case of many technical and cooperation challenges. However, questions emerge on its ability to overcome future operational threats. From a purely practical point of view, two immediate threats appear: 1) a risk of diverging interests among stakeholders, which make it difficult to implement a coordinated policy. This risk is intensifying because stakeholders’ concerns and standpoints on STM related issues tend to progress faster than

European integration and leadership; 2) a risk of duplication of efforts and decrease in cost effectiveness, if motives to develop specific national capabilities surpass the willingness (and readiness) to concentrate on distribution and complementarity across Europe.<sup>13</sup>

Congested and contested, and that trend poses a challenge for the safety, stability, and sustainable development of US Space operations, a new approach to Space Traffic Management (STM) must be developed that would address the current and future operational risks. Another goal of the policy of the United States is to “encourage and facilitate U.S. commercial leadership in Science and Technology, Space Situational Awareness, and Space Traffic Management.” This goal matches the efforts of the United States to “prioritize regulatory reforms that will unshackle American industry and ensure [the United States] remain the leading global provider of Space services and technology.”

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<sup>13</sup> ESPI Report 71, p. 35.

<sup>14</sup> PSSI Space Security Roundtable April 22, 2021 – Strategic Competition for International Space Partnerships and Key Principles for a Sustainable Global Space Economy, [https://www.pssi.cz/download/docs/8609\\_pssi-space-security-roundtable-participants.pdf](https://www.pssi.cz/download/docs/8609_pssi-space-security-roundtable-participants.pdf) [accessed: 29.04.2021].

<sup>15</sup> See <https://trumpwhitehouse.archives.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/> [accessed: 23.02.2022].

## CONCLUSION

The elements of the STM regime are the two dimensions of space traffic (in the scientific and technical and regulatory domains) and the three phases of space traffic: the launch phase, the on-orbit operations phase and the return phase. Examples of traffic regulations include safety regulations for launches, a specific regime for space between air and space, safety regulations for manned vessels, regulations governing debris removal, traffic laws for orbital phases, safety regulations for returns (e.g., descent corridors), frequency use and avoidance of interference, environmental regulations, etc.. Implementation and control mechanisms are primarily national regulations for licensing, arbitration and enforcement, operational assessments, coordination, and civil-military cooperation. The German space agency DLR has conducted expert studies on, among other things, priorities for European STM and the implementation process for a system that would become operational between 2030 and 2035.

A number of non-governmental organizations are addressing the issues of developing a space traffic rule. Thus, for example, the International Association for the Advancement of Space Safety (IAASS) has developed a six-point manifesto on this issue. It proclaims the need to protect citizens of all countries from risks caused by the launch, flight and return of space devices, as well as from chemical and radioactive contamination (caused by falling debris). The document proposes establishing international regulations for launches, operations of satellites in orbit and their return to Earth to avoid collisions or interference with other space systems and aviation. The manifesto also proposes establishing common regulations for emergency assistance for space missions.

In addition to government and international programs, there are also commercial programs aimed at reducing threats to the safety of space operations. The most notable is the formation in 2010 of an association that set as its goal the reduction of collisions and radio interference in GEO318 orbit (Space 315 “Space Traffic” is defined as the totality of projects that make it possible to determine, relative to a designated space-time reference system, the position of various objects on the basis of observations and measurements of the position of celestial bodies and space objects).

The authority whose responsibility it is to allocate GEO slots and internationally coordinate AMOS (Advanced Maui Optical and Space Surveillance Technologies Conference), radio frequency spectrum is the ITU. ITU regulations are an independent legal regime, albeit embodied in UN treaties and principles. The ITU has a “first come first serve” principle.

SDA was founded by private operators (including INTELSAT and INMARSAT). These collisions and disruptions cost commercial operators millions of dollars a year. SDA is also concerned with the issue of space debris. The organization is supported by the Satellite Users Interference Reduction Group (SUIRG), which represents industry. Another private sector initiative is the working committee of the International Satellite Operations Group (ISOG) of the UITC World Union. All these initiatives are very needed in case to respond to the increasing congestion of orbits due to the growing interest of states in exploring outer space. Therefore STM formula as guidelines proposed by LTS UNCOPUOS can be useful as a first step to protect the activities of states and their assets in space.

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