SPACE TRAFFIC MANAGEMENT (STM): AN OPPORTUNITY TO SEIZE FOR THE EUROPEAN SPACE SECTOR

EUROSPACE MANIFESTO FOR A EUROPEAN GLOBAL ANSWER ON STM

CONCEPT DEFINITIONS

The concept of Space Traffic Management (STM) has not yet a commonly-agreed, single definition. **Most importantly, no existing STM definition has yet a legal value.**

The concept of Space Traffic Management cannot be fully apprehended without defining and understanding the notions of Space Traffic Coordination (STC), **Space Situational Awareness (SSA), Space Domain Awareness (SDA), Space Surveillance & Tracking (SST).**

Therefore, the European space industry has deemed necessary, for the understanding of all, to define these notions as commonly accepted terms of reference for any subsequent discussion amongst stakeholders. They do not correspond to strictly delineated areas of responsibilities to be distributed amongst stakeholders in order to deliberately avoid entering into institutional turf wars.

Space Traffic Management (STM):

Space Traffic Management shall mean the planning, coordination, and on-orbit synchronisation of activities to enhance the safety, stability, and sustainability of operations in the space environment.[1]

- It is worth noting that this definition promoted in the US still remains contentious in Europe because it mixes a regulatory approach with an operational outlook. Because of its political importance, it should be promoted as the definition of choice.

Space Traffic Coordination (STC):

In opposition to the regulatory approach promoted under the definition of STM, the concept of Space Traffic Coordination has emerged to promote first and foremost non-regulatory cooperation as a mean to ensure safety, stability, and sustainability of operations in the space environment.

Space Situational Awareness (SSA):

[1] *As defined in the "US Space Policy Directive-3, National Space Traffic Management Policy" https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/*

Space Situational Awareness shall mean the knowledge and characterisation of space objects and their operational environment to support safe, stable, and sustainable space activities.[2]

In the European Space Programme Regulation, it is defined as "a holistic approach towards the main space hazards, encompassing collision between satellites and space debris, space weather phenomena, and near-earth objects."[3]

- It is worth noting that the US definition does not differentiate between a purely surveillance and tracking element focused on collision prevention (cf. ESA's SST definition below) and a wider knowledge and characterisation aspect which is currently the purview of national military users in Europe under the term "SSA".

Space Domain Awareness (SDA):

Space Domain Awareness is the effective identification, characterisation, and understanding of any factor, passive or active, associated with the space domain that could affect space operations and thereby impact the security, safety, economy, or environment of a nation (US Space Force definition).

- It is worth noting that this military definition was introduced in October 2019 by the US Air Force/US Space Force to replace the use of SSA inside US military doctrine. It supports the development of space operations and effective space battle management through the dynamic integration of intelligence data into legacy-SSA data. It seeks to differentiate military SDA under Department of Defence (DoD) leadership from civilian SSA under Department of Commerce (DoC) responsibility.

Space Surveillance & Tracking (SST):

Space Surveillance and Tracking is the capability to monitor space objects and to predict and alert about risks of collision. It is comprised of the operation of space surveillance sensors (radar, telescopes, passive RF) to survey, track and catalogue space objects, and the processing and analysis of orbital data to provide information and services such Conjunction Analysis, analysis of space objects re-entry and analysis of space objects fragmentation (ESA definition[4]).

In the European Space Programme Regulation, SST data is defined as "physical parameters of space objects acquired by SST sensors or orbital parameters of space objects derived from SST sensors' observations in the framework of the space surveillance and tracking ('SST') component."[5]

- It is worth noting that the ESA definition presents SST as a purely civilian tracking and monitoring subset of SSA, seen by ESA as being composed of three different missions: Space Surveillance & Tracking (SST), Near-Earth Objects (NEO) and Space Weather (SW).

RATIONALE FOR ACTION AT EUROPEAN LEVEL

Space Traffic Management has **gained increased visibility in the light of two main trends** that are intertwined, and the consequence of the evolving nature of the Earth Orbit from a state to a commercial resource:

[2] *As defined in the "US Space Policy Directive-3, National Space Traffic Management Policy" https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/*
[3] *Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing the space programme https://eur-lex.europa.eu/resource.html?uri=cellar:33f7d93e-6af6-11e8-9483-01aa75ed71a1.0003.03/DOC_1&format=PDF*
[4] *https://www.esa.int/Safety_Security/Space_Surveillance_and_Tracking_-_SST_Segment*
[5] *Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing the space programme https://eur-lex.europa.eu/resource.html?uri=cellar:33f7d93e-6af6-11e8-9483-01aa75ed71a1.0003.03/DOC_1&format=PDF*

- First, the Earth orbit is today populated by a large amount of space objects (whether they are operational satellites or space debris – as defined by the EU Space Programme Regulation as "any space object including spacecraft or fragments and elements thereof in Earth's orbit or re-entering Earth's atmosphere, that are non-functional or no longer serve any specific purpose, including parts of rockets or artificial satellites, or inactive artificial satellites"[6]). The trend towards an **increase of space activities** (e.g., CubeSats, deployment of large constellations in LEO) will eventually **lead to a congestion of the space environment**, thus increasing **collision and interferences** risks and the complexity of decision-making processes concerning the evasion and collision avoidance manoeuvres (See Annex 1);
- Second, some countries (i.e., the US) have already paved the way for **a national STM regulation that will eventually have an impact on European actors and jeopardise European sovereignty** as an overarching objective of the EU for space (e.g., GNSS, development of secure connectivity infrastructure) (See Annex 2).

POTENTIAL CONSEQUENCES OF THESE TRENDS FOR THE EUROPEAN SPACE SECTOR

Global initiatives and decisions regarding STM are likely to **create a challenging environment for European actors**.

The reforms undertaken by the US administration could indeed potentially have a very significant impact on:

- The **sustainability of the European model of autonomous access to space and its use:**
  - Because of the inherent dependency to the US, especially in light of a possible introduction of stringent requirements only reachable through the use of data exclusively available from the US;
  - Because of the need to comply with a set of guidelines and best practices defined by and for US bodies operating in space, potentially affecting EU sovereignty, interests and needs.

- The **competitiveness of the European space manufacturing industry**:
  - Insurance companies will most likely push for the adoption of the highest level of services, in order to better manage their financial risk, thus promoting the use of US-defined and US-provided "enhanced" services:
    - The European satellite manufacturers' **competitiveness on exports markets** could be threatened if forced to resort to US SSA data, or even having to file for a US STM license with the possibility to having it denied;
    - The European launch service providers could suffer from a competitive disadvantage of not having their **launch window and collision launch avoidance certified by US authorities** (and potentially subject to an extra fee as non-US companies).
  - SSA data sharing agreements with the US could potentially be subject to the fees, under the pressure from US taxpayers, determined by the secretary of Defence;
  - The European industries might fall behind the US companies when acquiring critical market shares, as **US companies are likely to dominate the bidding SSA/STM market** thanks to anchor contract with the Department of Commerce in order to develop a fee-based "enhanced" level of services supplementing the basic level of service provided by the Department of Commerce:
    - The US being already the leading global provider for SSA data and STM services, it will create a **competitive advantage for US companies as they will be in charge of providing this 'enhanced' service for the Department of Commerce;**
    - This enhanced service is subject to be exported outside the US, thus limiting the competitiveness of European industries in the domain.

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

- STM is strongly influenced by and depending on SSA capabilities which are still way more developed in the US than in Europe, particularly when taking into account their strong dependency on military endeavours;
- Main **industrial initiatives on STM**, even if open to European actors, are also led from the US (e.g., the Space Safety Coalition);
- On standardisation, **ISO is already developing standards strongly pushed by the US**. Indeed, a standard for "Rendezvous and Proximity Operations (RPO) & On Orbit Servicing (OOS)" will soon be at the stage of Committee Draft and another for "Launch collision avoidance (LCOLA)" will start soon (See Annex 3). If Europe is side-lined or not actively contributing to standardisation activities, as it can become an international reference, European industry could be affected:
  - European industries and Space Agencies have recently refused ISO's proposed standard for Space Traffic Coordination and Management and have proposed to develop a new standard with all the interested parties, starting from scratch.

- It will thus **hamper the European industry's ability to compete on a level-playing field, its sustainability,** and further **jeopardise European sovereignty** as an overarching objective of the EU for space.

WAY FORWARD FOR AN EUROPEAN APPROACH

The European Union has an **opportunity to seize to be at the forefront of the discussions on the topic of Space Traffic Management and provide the grounds to protect key European space infrastructures and their associated services**.

By being proactive, the European Union will allow the European space sector to **use agreed rules and procedures at its advantage**. Furthermore, the European approach may be seen as more neutral in the worldwide community than the US approach. More precisely, the European Union should:

REGULATION AND STANDARDISATION

COORDINATION OF EU MEMBER STATES NATIONAL EFFORTS

Coordinate the efforts of the EU Member States to address STM regulation and standardisation with a view to assessing the technical requirements needed to handle the STM issues while ensuring Europe's freedom of action, sovereignty and autonomy:

- Even if relevant steps have been performed in the frame of the EU SST support framework, Europe as a whole still strongly depends on US SSA data for collision avoidance purposes, manoeuvre validation and overall understanding of the day-to-day dynamics of the space environment:
    - As the US purposefully decides to create an STM regulatory environment aimed at enhancing US commercial competitiveness, **Europe should seek to protect the European space industry's ability to compete on a level-playing field, as well as protect its autonomy in conducting space activities:**
        - The recently launched Space Traffic Management Coordination & Support Action (CSA STM) Horizon 2020 initiative (EUSTM and SPACEWAYS Project)[7] is a useful first step in assessing the requirements needed to reach those objectives:
            - Eurospace, for instance through its STM TF, could act as a platform for information and exchanges within the industry.

- Encourage the development of a **legal framework at European level for STM** as isolated initiatives on STM will only result in an increase of competitiveness imbalances between countries and their respective space sector:
    - Counting on a diversity of legal frameworks at national level (e.g., French Space Operation Act) does not help the adoption of a European set of guidelines and best practices for STM:
        - **Provide the means to adopt these set of guidelines and best practices by all European bodies operating in space** (e.g., the EU SST consortium being a starting point).
    - Whatever the concrete form such a regulatory framework will take, it is clear that it will **have a direct and significant impact on the economic activities of the space industry and satellite operators**, and that it will create new opportunities for new services;
    - It is the view of the European space industry that this requires the **early involvement of the European space industry** by the European Union and its Member States, in the process of developing a regulation.

- **Promote the collaboration with the European Cooperation for Space Standardization (ECSS)**:

[7] *See Annex 4 for a description of the H2020 projects*

- A European position developed by the European Cooperation for Space Standardization (ECSS) is thus needed to **provide technical inputs and recommendation to develop a European position on standards within the ISO forum.**

- Furthermore, the **European Union's voice should carry further within the international regulatory bodies** addressing the sustainable use of the space domain, such as the UN Committee on the Peaceful Uses of Outer Space (COPUOS) or the Inter-Agency Space Debris Coordination Committee (IADC):
  - With the potentially emerging trend for space tourism, the protection of civil lives in outer space is also a dimension to consider when referring to STM.

DEPLOYMENT OF SERVICES AND MARKET DEPLOYMENT

CREATION OF AN INTERNAL EUROPEAN MARKET FOR SSA

Foster the creation of an internal European market for SSA data and services:

- As the number of active orbital objects increase alongside the need for a more sustainable use of the space domain, **timely and accurate SSA data is becoming a valuable asset of strategic and economic significance**:
  - However, there is **as of yet no purely commercially-driven market for SSA data**, as the regulatory and anti-collision imperatives remain under the purview of institutional bodies.
- There is thus a need for institutional anchor customers and contracts in order to **sustain the ability of industrial actors to develop SSA capabilities (i.e., ground infrastructure, sensors etc.) and services** answering to the strategic needs of institutional customers and those of the commercial market:
  - While US companies benefit from frameworks contracts with the DoD, the US Air Force and, soon, the Department of Commerce, **European SSA providers do not benefit from European public demand at such level.**
- As the congestion of the space, especially in LEO, is continuously increasing notably in the light of mega-constellations projects (already launched or in planning), the so-called "human in the loop" (i.e., defined as a model that requires human interaction) decision processes tend to become more difficult and riskier. Consequently, a new generation of services in support of decision making for manoeuvres and collision avoidance actions is needed. **This will be an accessible business for European companies as long as SSA data is also accessible in a sovereign way and without intermediaries**.

SET-UP & SUPPORT FUNDED PROGRAMME LINES FOR STM

Set-up and support the establishment of funded programme lines to further develop European STM capabilities.

Member states are today the primary owners and operators of existing space surveillance systems, which involve both military and civil players. Moreover, the capability to monitor space traffic, to predict and alert about collision risks is considered under SST and SSA programmes addressed by EC and ESA. However, space traffic monitoring capabilities currently available in Europe are not enough to answer the increasingly dense space traffic and are not adapted to deliver the level of performance required by a full operational monitoring space traffic within the current critical set timeframe.

At the ESA Space19+ conference, Member States confirmed the role of ESA in space safety both in the promotion of a safe and sustainable approach to space activities and in the development of pioneering STM-related technologies (e.g., Automatic Collision Avoidance, Active Debris Removal…). However, further development and support in these areas and a more coordinated effort between the Horizon Europe, the EU SSA programme and the Space19+ programmes related to STM would be needed to ensure a coherent and consolidated European

output.[8] Measures should include the emergence and profitability of a market of technologies and services in support to institutional assets.

Areas for further R&D identified by industry are:

- **Prevention Capabilities:**
  - In order to prevent any misuse of space and allow for an optimised space traffic management, **monitoring capabilities** are very important:
    - These include ground-based sensors (e.g., radars, telescopes, passive RF, laser stations) to monitor not only space objects but other critical elements such as frequencies; and might also eventually need the use of space-based sensors.
- **Protection Capabilities:**
  - Protection capabilities include all those related to STM services, such as e.g., collision avoidance, active debris removal, "Cleanspace" initiative, fragmentation analysis, re-entry analysis etc.
- **New designs to enhance safety:**
  - Promoting new designs and use of materials that offer a more sustainable use of space should be also one of the key elements in the mid-long term for Europe:
    - New processes and satellite and mission designs (active systems e.g., ADS-B, beacons);
    - New materials, components.

THE PROMOTION OF A STRONG INDUSTRIAL INVOLVEMENT IN THE EU SST CONSORTIUM

Promote the existing EU SST Consortium as the foundational element of a future civil European SSA architecture:

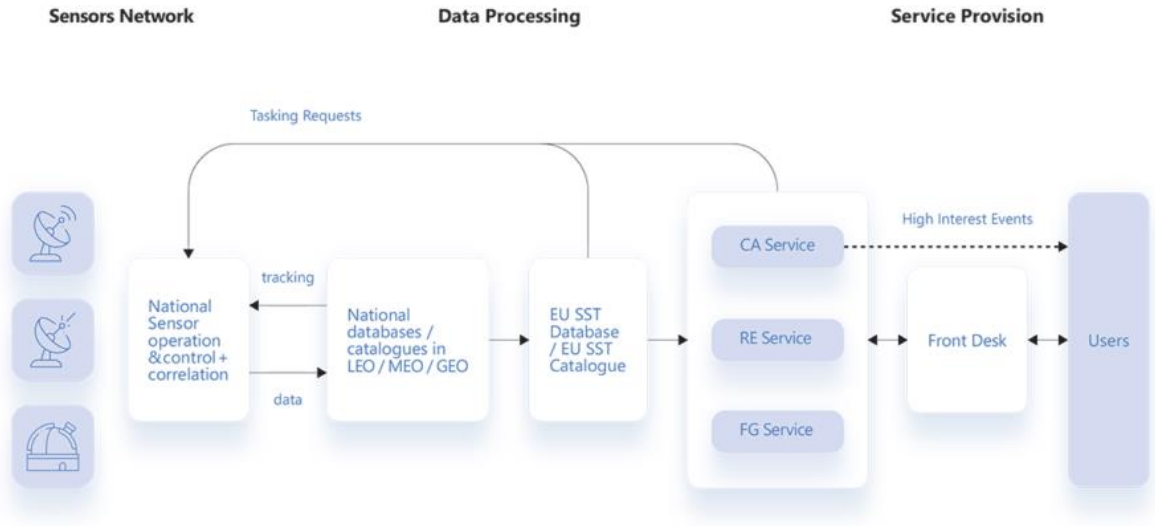
- **Current situation:**

The Space Surveillance and Tracking (SST) Support Framework was established by the European Union in 2014 with the Decision 541/2014/EU of the European Parliament and the Council[9]. This Decision foresaw the creation of an SST Consortium of, initially, five EU Member States – France, Germany, Italy, Spain and United Kingdom – and then eight with the addition of Poland, Portugal and Romania in 2018, now reduced to seven with the removal of the UK following the Brexit process.

  - Since 2016, the SST Consortium and the European Union Satellite Centre (SatCen) have worked together to develop a European SST capability, and formed the SST Cooperation. The Consortium's Member States (MS) have networked their assets to provide, through the SST Service Provision Portal[10] operated by SatCen, a set of SST services to all EU countries, EU institutions, spacecraft owners and operators, and civil protection authorities;
  - The system is managed in a federated manner. Each Member State within the EU SST consortium (currently: France, Germany, Italy, Poland, Portugal, Romania and Spain) uses its own national SST system (sensors and processing infrastructure), with diverse capabilities;
  - The system is divided in three main functions, as described below:
    - The **Sensor function** consists of a network of sensors to survey and track space objects in all orbital regimes (LEO, MEO, HEO and GEO). The network currently comprises 51 sensors of the Member States of the SST Consortium (incl. radars, telescopes and laser ranging stations);

[8] *European Space Policy Institute (ESPI) Report 71 - Towards a European Approach to Space Traffic Management. January 2020.*
[9] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014D0541
[10] https://sst.satcen.europa.eu/

- The **Processing function** aims to coordinate between the OCs (Operation Centers), the data-sharing and processing & analysis of shared data to generate the EU SST database. Every day, for all orbital regimes, thousands of measurements from the sensors contributing to EU SST are shared via a common database accessible to the OCs. This data shall be used as the basis for the future EU SST Catalogue that will be used for the SST services. Germany is responsible for hosting the EU SST database and generating the future EU SST Catalogue;
- The **Service Provision function** is in charge of providing three SST services – **Collision Avoidance (CA), Re-entry Analysis (RE) and Fragmentation Analysis (FG)** – to entitled users through a secure portal, the **SST Service Provision Portal**, managed by the SatCen, which acts as Front Desk. More than 90 organisations are receiving these services and 140+ European satellites are safeguarded from the risk of collision. Currently, French and Spanish OCs are responsible for the CA service in hot redundancy, while the Italian OC is in charge of the RE and FG services.



- **Rationale for change:**

In the current set-up, most of the sensors used are purely institutional in nature. The individual OCs are responsible for providing the data to the joint EU SST database which will form the basis of the future EU SST objects catalogue (even if for the moment each individual MS maintains its own database and objects catalogue based on these data) using a pooling & sharing mechanism. The agreement also proposes a division of labor between the "main" contributing Member States:

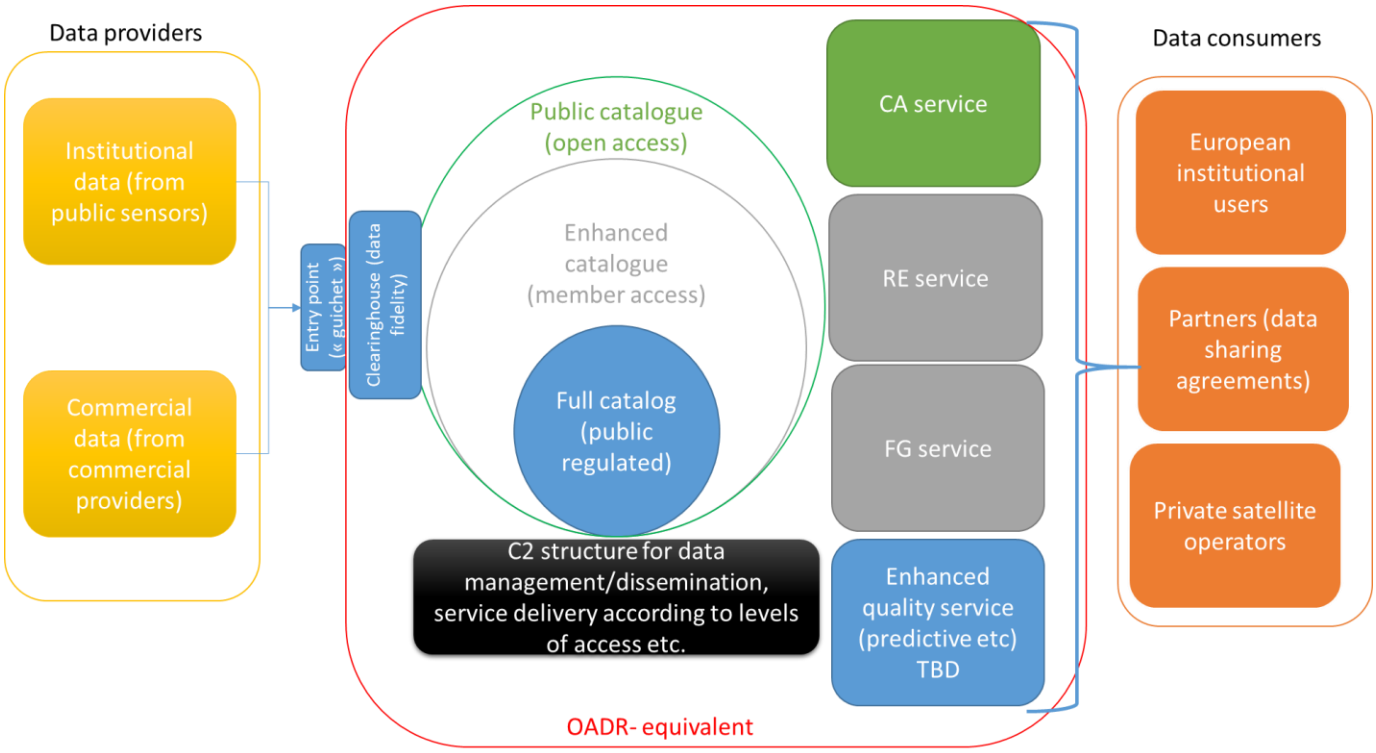
- Germany is in charge of the EU SST database and future catalogue;
- France and Spain share the CA service following a hot redundancy concept;
- Italy is in charge of the reentry and fragmentation analysis services.

This closed system currently does not allow industry to directly contribute to the future catalogue or complementary value-added services which could enhance the overall quality, reactivity and fidelity of the EU SST services. This approach artificially **hamstrings the ability of EU SST to leverage existing capabilities in Europe** (from a service and data provider's perspective), and **reduces the usefulness of EU SST as a service provision model for European satellite operators** (from a service and data consumer's perspective) and other **relevant European stakeholders**. This situation will even **worsen in case these (and future additional) services are also provided in the future to non-European bodies through dedicated data sharing agreements.**

Furthermore, the current set-up prevents the emergence of a domestic European market for SSA service and data providers, **further limiting the competitiveness of European players in this emerging market**. By comparison, the Open Architecture Data Repository (OADR) currently being proposed by the United States fully involves commercial SSA service and data providers with a clearly stated aim of creating institutional anchor contracts to foster the competitiveness of US companies in the open market.[11] As the US OADR approach is to be seen as a data-centric "search engine" approach, the necessity to protect the integrity of European data is therefore needed. In addition, the competitiveness of commercial SSA services and data providers shall be supported to avoid a monopolistic role of the EU SST consortium as provider of SSA services and data.

From a strategic point of view, **EU SST's prominently institutional set-up also purposefully limits Europe's ability to negotiate on equal footing with other relevant actors daily involving commercial entities on the establishment of long-term STM guidelines or shorter-term, pragmatic SSA data sharing agreements supporting European strategic autonomy objectives.**

- **Proposed evolution:**



The goal would be **to extend the current EU SST concept into a European OADR-like construct**, always run under the umbrella of the EU SST, able to ingest institutional as well as commercial data and manage it as a Command & Control (C2) architecture handling governance and data protection (levels of access, data management/dissemination/security).[12] One possibility would be for the integrated commercial data to be covered by a license agreement to limit their dissemination only to paying entities, thus avoiding competition between industrial and institutional supplier.

[11] *NAPA for the United States Department of Commerce, Space Traffic Management, https://www.napawash.org/uploads/NAPA_OSC_Final_Report.pdf*

[12] *Please note that the "Full catalog (public regulated)" is to be understood as the most restricted one in terms of data access hence its relative size in its illustration on the scheme.*

Several levels of services could then be provided depending on the nature of the end user (whether European, non-European ally or other; whether institutional, research, military or commercial; whether paying or not; etc.). The **commercial data would form the basis of the enhanced services to be delivered to paying users**. Moreover, basic services could include commercial data when these are of higher quality (e.g., in terms of precision, coverage, availability), and thus being considered as basic services to be delivered to paying users. Privileged access could of course be negotiated, possibly through data sharing agreements. This would **fulfil the requirement for autonomous surveillance according to European needs, as well as creating an anchor institutional market for European service and data providers, enhancing the overall effectiveness for all European "consumers" of SSA data and services.**

ANNEX 1 – KEY FACTS OF SPACE ACTIVITIES AROUND THE EARTH ORBIT

The Earth orbit is today populated by a large amount of space objects. Indeed, according to ESA's Space Debris Office[13]:

- Since the start of the space age in 1957, about 6,000 rockets were launched (excluding failures):
  - These rocket launches have placed into Earth Orbit about 9,600 satellites
    - As of October 2020, around **6,000 satellites are still in space**
      - About which **3,200 are still operating.**

Debris objects large enough to be tracked (i.e. including non-functional spacecraft, abandoned launch vehicle stages, mission-related debris and fragmentation debris) by Space Surveillance Networks are considered to be **in the order of 28,000**.

However, according to statistical models, **space debris are far more widespread**. Indeed, as of October 2020, the number of pieces estimated to be in orbit around the Earth are:

- More than 128 million pieces of debris smaller than 1 cm;
- About 900,000 pieces of debris between a 1cm and 10cm in size;
- And around 34,000 of pieces larger than 10cm.

It has to be noted that **the phenomenon of space debris mostly concerns the Low-Earth Orbit (LEO), where most of the manmade objects in outer space are located. However, also the Geostationary (GEO) orbit is remarkably congested.**

An increase in congestion around the Earth orbit

As explained above, the space sector is today evolving in a new paradigm characterised by an increasing number of space activities. As a result, the Earth orbit is experiencing – and will continue to experience - an increase its congestion, especially in LEO.

- The European Space Policy Institute (ESPI) estimates that the **number of operating satellites will grow by 10-16% per year in the next 5 years to reach between 3200 and 4200 active satellites in 2024** (mostly in LEO where mega constellations are deployed);
- More launches and more satellites in orbit eventually mean more collisions (i.e. the so-called **Kessler syndrome**: cascading effect on the space debris population theorised by NASA scientist David Kessler in 1978) and interference risks.

[13] *ESA. Space Environment Statistics. October 2020 data provided by ESA's Space Debris Office at ESOC, Darmstadt. https://sdup.esoc.esa.int/discosweb/statistics/*

ANNEX 2 - A TOPIC SEIZED BY THE U.S. ADMINISTRATION

Because of the need to face an increased congestion of the Earth orbit, STM has recently **gained visibility on the political scene.** Indeed, aware of the opportunities STM can represent for their national industry, the **USA has initiated key developments in favour of an STM national policy**.

In the USA, the Trump administration, through its National Space Strategy, demonstrates the **will to ensure and maintain the US dominance in space** (e.g. National Space Council, Space Force, US executive order paving the way for the exploitation of off-earth resources etc.). In this context:

- **Space Situational Awareness and Space Traffic Management are seen and used by the US as levers of strategic and economic importance**.[14]
    - The **US Space Policy Directive-3** signed by US President Donald Trump on 18 June 2018 focus specifically on STM.
        - This directive aims at developing 'a new approach to space traffic management that addresses current and future operational risks';
        - The Department of Commerce will notably have the responsibility to provide basic Space Situational Awareness (SSA) data and basic Space Traffic Management services to the public, based on the publicly releasable portion of the Department of Defence catalogue.
            - DoC will rely on a 15 million $ budget for 2021.
        - This service is likely to be supplemented by fee-base 'enhanced' services from US commercial providers.

- The guiding principle behind this directive, and more broadly behind all policy decisions and regulatory reforms, is to **support the growth of the US commercial sector, both at home and abroad, and the US leadership and superiority in space**.

[14] *US Vice-President Mike Pence emphasized the importance of Space Traffic Management and reaffirmed the intention of the US to be a leader in space at the occasion of the 2019 IAC in Washington D.C.*

ANNEX 3 – ECSS ACTION TOWARDS ISO

European Cooperation for Space Standardization (ECSS) regularly monitors other Standardization organisations' efforts in space standards.

In this regard, the technical body of the ECSS (i.e. Technical Authority) was made aware at the end of 2019 of a new work item proposal at the International Organization for Standardization (ISO) on « Rendezvous and Proximity Operations (RPO) and On Orbit Servicing (OOS) -- Programmatic principles and practices ». This work item proposal was promoted by the US Consortium for Execution of Rendezvous and Servicing Operations (CONFERS)[15] under DARPA financing. The proposal was ultimately adopted by ISO in its Working Group-3 "Operations and Support Systems".

Eurospace, as participating entity to the ECSS, discussed with its members the implications of this standard and the need to influence it at its Standardisation WG. It was agreed that Eurospace would follow the Technical Authority recommendation that would see the creation of an ECSS Space Traffic Management Mirror Working Group (ECSS STMWG). This WG would coordinate European industries' and Space Agencies' positions and interests into this new ISO standard.

More precisely, it would:

- Help plan, develop and review specific standards, harmonizing inputs and contribution of the ECSS STMWG members organizations on Space Traffic Management related issues;
- Provide technical inputs and recommendation to ECSS to develop a European position on standards within the ISO forum.

This will ensure that the ECSS needs on Space Traffic Management standards are understood and taken into account at ISO level. This will also help European representatives to be project leader, when appropriate, on new standards in this domain.

This was ultimately approved at the level of the ECSS Steering Board (i.e. policy body of ECSS) in December 2019. The ECSS STMWG has been created during the first half of 2020. The ECSS STMWG purpose is to provide ECSS contribution to the development of worldwide STM implementation standards in the framework of the ISO TC20/SC25 WG 3 (Operations & Support Systems).

[15] *The Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) is an industry-led initiative with initial seed funding provided by the Defense Advanced Research Projects Agency (DARPA) that aims to leverage best practices from government and industry to research, develop, and publish non-binding, consensus-derived technical and operations standards for OOS and RPO*

ANNEX 4: H2020 SPACE TRAFFIC MANAGEMENT COORDINATION & SUPPORT ACTION (CSA STM)

EUROPEAN WAYS FORWARD FOR SPACE TRAFFIC MANAGEMENT – SPACEWAYS[16]

SPACEWAYS intends to create a common understanding of the guidelines and standards necessary to develop a Space Traffic Management (STM) concept for the European Union (EU). It also aims to assess European technical available and required capabilities (notably in the field of SSA/SST technologies) with respect to STM requirements; and to provide a set of STM best practices and recommendations in line with EU interests. This includes the preservation of a safe, secure and sustainable space environment as well as the reinforcement of European sovereignty and competitiveness.

Over its 18-month duration, SPACEWAYS' first objective will be to analyse the policy, legal and economic context of STM. It will aim to better understand the STM concept's dynamics worldwide and its consequences for Europe. While key space powers may attempt to create norms and regulations for future STM, SPACEWAYS intends to provide guidelines to support European policy making thereupon.

In parallel, another goal will be to assess European capabilities and technology gaps with respect to future STM requirements. SPACEWAYS will identify stakeholders and users' needs by associating them to the project through a networking platform. It will also proceed to a complete analysis of technical needs defined by future STM possible regulations. Both SSA/SST capabilities and technological developments related to new space missions and functions will be analysed. Here, specific attention will be devoted to mega constellation management, on-orbit operations or launch and re-entry future activities.

These parallel lines of work will converge to produce a set of STM guidelines and best practices fully compatible with EU interests. They will be disseminated to relevant communities, to support the EU, as a major space and economic actor, to address future STM challenges.

- Start date:1 January 2021
- End date: 30 June 2022

Coordinator and Partners:

- Fondation pour la Recherche Strategique (Coordinator)
- Airbus Defence and Space GmbH
- Airbus Defence and Space SAS
- Arianegroup SAS
- Deimos Engineering and Systems SLU
- Europaisches Institut Fur Weltraumpolitik European Space Policy Institute
- Indra Sistemas SA
- Istituto Affari Internazionali
- Katholieke Universiteit Leuven
- OHB System AG
- European Union Satellite Centre
- Thales Alenia Space France SAS
- Telespazio SpA
- Telespazio France SAS
- Universiteit Leiden

SPACE TRAFFIC MANAGEMENT FOR XXI CENTURY SPACE OPERATIONS - EUSTM[17]

Space activities have increased impressively in the last decades. New actors and concepts are raising new challenges to ensure the security, safety, sustainability and stability of space operations. Initiatives on national and international level aim to tackle this issue through promotion of prevention, understanding the situation,

[16] https://cordis.europa.eu/project/id/101004208/fr
[17] https://cordis.europa.eu/project/id/101004319

active collision avoidance operations as well as active debris removal. To ensure autonomy and leadership in the field whilst reducing the dependability on U.S. SSA data, the EU started to work on an independent SSA/SST capability.

EUSTM is an end-to end activity towards the definition of a future STM capability:

- Counting on the main experts in all applicable domains within the team
- Consulting the main stakeholders worldwide in relevant domains
- Defining the needs in terms of organisation and responsibilities, technology, policy, laws, guidelines, best practices and standards
- Elaborating detailed specs, a preliminary design, a reference roadmap and a ROM cost analysis
- Developing an innovative collaborative platform for exchange of information inside the team and with external stakeholders
- Creating a community of interest on STM be active beyond the duration of the project
- Organising workshops and a dedicated European STM Conference anchored to a space event

EUSTM is coordinated by GMV, the main European industrial player in the SSA/SST domain supported by European …

- industrial players and research institutes from all across Europe
- experts in SSA/SST-related technologies
- current and future (NewSpace) users (EUTELSAT and many others)
- experts in the policy (ESPI), governance & security (SatCen) and legal domains (IDEST), professionals for impact assessment and cost benefit analysis (PwC) and key actors in the air traffic management domain (ENAIRE)

EUSTM is supported by 20+ additional stakeholders including operators, industry, emerging NewSpace players and institutions, as well as the Secure World Foundation.

- Start date:1 January 2021
- End date: 31 August 2022

Coordinator and Partners:

- GMV Aerospace and Defence SA (Coordinator)
- Spacetec Partners SRL
- European Union Satellite Centre
- Eutelsat S.A.
- Europaisches Institut Fur Weltraumpolitik European Space Policy Institute
- Pricewaterhousecoopers Advisory SAS
- Enaire
- Universitaet Bern
- Clearspace SA
- Office National D'Etudes et de Recherches Aerospatiales
- Safran Data Systems
- Avio SpA
- Weber-Steinhaus & Smith
- Gomspace AS
- Iceye Oy
- Payload Aerospace SL
- Qinetiq Space NV
- Sceye SA
- Université Paris-Saclay