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European Union Space Surveillance & Tracking (EU SST) – State of Play and Perspectives

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Abstract

The European Union has put in place a unique multilateral governance model for its EU Space Surveillance & Tracking (EU SST) capability, which reconciles the need for increased autonomy in ensuring the resilience of space-based infrastructure for the European community with the requirements posed by sovereign security concerns. Implemented by a consortium of currently eight EU member states in cooperation with the EU Satellite Centre, EU SST has been in operation since 2016, and today serves a growing user community of over 90 European organizations with SST services including Collision Avoidance. The partners channel diverse contributions into an operational sensor, data sharing and service provision framework, while integrating the European ecosystem of industry and research and development. From the perspective of the EU SST partners, this paper reports on recent governance and operations, and highlights emerging developments in light of the proposed European space programme, including intersections to the contemporary debate on Space Traffic Management.

Keywords: Space Security, Space Safety, Space Situational Awareness (SSA), Space Traffic Management (STM), European Union Space Programme

Acronyms/Abbreviations

CDM	Conjunction Data Message
EU	European Union
HIE	High Interest Events
MS	Member State
STM	Space Traffic Management
SSA	Space Situational Awareness
SST	Space Surveillance & Tracking

1. Introduction

For the past decades, key actors in Europe have been actively engaged in contributing to global endeavours of fostering safety of space operations, space security, the resilience of space-based infrastructure, and the overall sustainability of the orbital environment. Cooperative efforts across national, intergovernmental, and supranational realms have sought to address the challenge posed by the increasing scale and complexity of space utilisation, by advancing operational, technical, and normative approaches to detecting, describing, understanding, and mitigating risk posed by a surging number of objects in orbit.

One of the central initiatives in this domain is the European Union Space Surveillance & Tracking (EU SST) initiative. Set up by the European Union, EU SST is a European support framework – and soon programme – for a multilateral capability in Space Situational Awareness (SSA). EU SST fuses existing sensor capabilities otherwise operated separately in Europe, in order to safeguard European space assets. Its overarching rationale is to support the protection of space infrastructure, attain a higher level of autonomy for Europe in the area of SSA, and thus in turn also to contribute to global burden-sharing. The initiative has been implemented through a consortium of eight member states since 2015, who pool their existing SSA sensors, share data through a dedicated platform, and provide operational SST services free of charge to a growing European users.

From the perspective of the EU SST consortium partners, this paper outlines background and recent developments in governance operations, the maturation as part of the proposed European space programme, and its resonance with Space Traffic Management.

2. Governance

The overall goals of EU SST were set out in a legal basis passed by the European Parliament and the European Council in 2014, which mandates and describes three major functions of the SST capability – sensor, data processing, and service provision – as well as a unique multilateral governance model for space cooperation in Europe [1]. By employing a model of member state cooperation through a consortium or partnership, EU SST addresses the need for greater European autonomy in SSA by allowing a relatively swift operational partnership of existing sensor assets to

be put in the service of the greater European community, while allowing partners to observe the requirements and constraints posed by sovereign security concerns.

2.1. Governance in the EU Context

Based on the provisions set out in the legal basis of 2014, an initial consortium formed in 2015 after formal application and selection process facilitated by the European Commission. The participating member states are represented through the space agencies – or their equivalent – of France, Germany, United Kingdom, Spain, and Italy. In 2019, the Consortium was enlarged based on a new accession procedure overseen by the Commission, and an additional three EU member states – Poland, Portugal, and Romania – joined the effort. Since its inception, the consortium has been cooperating (SST Cooperation) with the EU Satellite Centre. The partners are organised in formal committees on decision-making level for strategic, security and technical matters, and in dedicated technical teams for project management and operations in a distributed setting across member states [2].

In joining national sensor assets and allowing the services resulting from this sensor data to benefit a wider user community without these capabilities, the Consortium finds itself at the intersection between the national entities of individual participating member states who contribute their own investments and expertise, and on the other side the supranational body of the European Commission. The latter oversees the implementation of the technical work of the SST Cooperation, and liaises on – respectively observes – policy- and security-related matters.

2.2 Security Aspects

While fostering multilateral cooperation, the member state-driven governance enables its participants to preserve fundamental sovereign concerns. Although EU SST is an exclusively civilian framework, given the current landscape of SSA actors in Europe, it is situated, and must be able to function, at the civil-military intersection. For this purpose, military and security stakeholders are formally included across the internal governance for decision-making, and by default in many operational aspects through the contributions of national SSA operations centres and sensors. This set-up allows the inclusion of a wide range of varied SSA assets within the perimeter of the consortium's modus operandi, without touching sovereign interests. To this end, the Consortium has a dedicated internal body addressing security, which drafts and further refines the data policy, provides classification guidance, and develops requirements for information security [3].

3. Operations

From an operational and capability perspective, the foundation of EU SST is to bring SST sensors together from different EU member states. Currently, operators in Europe still rely to a large part on data provided by the US Space Command, i.e. conjunction data messages (CDM) provided by the 18th Space Control Squadron in Vandenberg Air Base.

3.1 Sensor Architecture

However, in order to complement US CDMs, or where possible fully draw on European data, the consortium partners have since 2016 begun to establish a growing network of sensors owned or accessed by European actors. This currently comprises of overall 50 assets for surveillance and tracking, including radars, telescopes, and lasers (Fig. 1). These range from legacy systems that have a solid operational track record and heritage, to more recently commissioned assets.

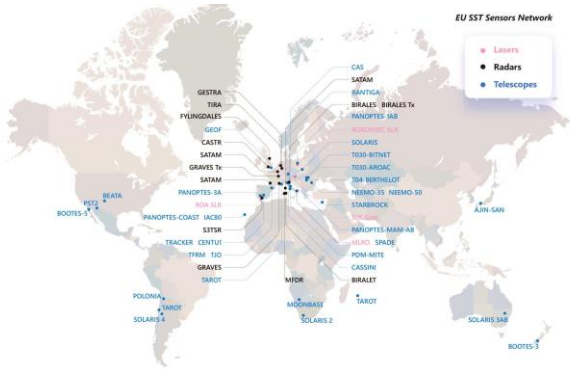

Fig. 1. Sensor Network

This bottom-up architecture is today mainly concentrated in Europe. It has been enriched with selected overseas locations, and is set to be augmented by further sensors beyond the European landmass as the result of dedicated architecture studies and optimization performed internally (cf. [4]). The resulting geographical coverage will allow higher level of independence of measuring space objects in certain orbital regimes, as a function of financial resources provided in the short- and mid-term and geographical opportunities, and in view of complementarity with the space surveillance network of the US.

3.2 Service Provision

EU SST has been providing operational services since 2016, and today serves a growing user community of over 90 organizations in 20 European Union member states with Collision Avoidance, Fragmentation Analysis and Re-Entry Analysis services. The partners combine diverse operational legacies while integrating contributions from the European ecosystem of industry

and research and development across the service provision value chain [4].

The Service Provision Model (Fig. 2) is rooted directly in the three functions of sensors, data, and services described in the framework's legal basis. This arrangement facilitates a division of labour or internal burden-sharing, where the partners are responsible for different elements of operations.

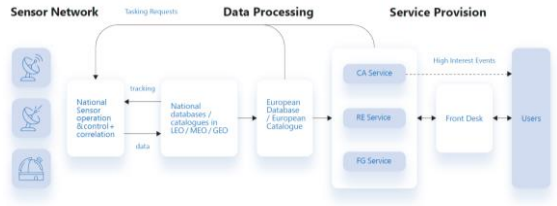

Fig. 2. Service Provision Model

Sensors are contributed by all partners, and include assets that are civilian, military, civil-military, from commercial private industry, or public research institutions. The data from these sensors feeds into a shared platform for data exchange (database), which is handled by one of the partners and forms the basis for an upcoming EU SST catalogue of space objects. The data are then used to compute products for the three SST services Collision Avoidance, Fragmentation and Reentry Analysis, which are provided by two operations centres in hot redundancy. These are then passed on to the users via the Service Provision Portal operated by the Front Desk (EU SatCen). Direct interaction between users and responsible operations centres is afforded for High Interest Events (HIE) for the Collision Avoidance Service. In order to gain access to the SST services, users – currently limited to European Union satellite owners and operators, civil protection authorities, and other interest parties and bodies of the EU [1] – can register on the service provision portal (cf. also Service Portfolio [5]).

4. Perspectives: EU Space Programme & STM

In view of the immediate future, the European Union is currently in the process of finalising the space budget for the next financial period, and the legislative draft for a new consolidated EU Space Programme from 2021.

4.1. EU Space Programme

The proposed EU Space Programme will consolidate the large navigation and earth observation programme components (Galileo/EGNOS and Copernicus), and, as a third programme next to governmental satellite communications (GovSatCom), will also include an SSA component [6]. The SSA component will be composed mainly of an SST sub-component as successor to the current EU SST initiative, complemented by smaller scale initiatives in Space Weather and Near Earth Object.

As EU SST matures into a fully-fledged programme, it is proposed to be fleshed out with tailored activities in service provision based on the existing baseline SST capability. Furthermore, it will likely accommodate additional member states to join the effort, retain its governance model also in view of dedicated security mechanisms, and continue to refine its internal governance along the guiding principle of functional specialisation of the different contributions by member states [6].

4.2 Space Traffic Management

While EU SST programme will continue to underpin the resilience of space infrastructure, space safety and space security, it is also explicitly understood by European Union stakeholders as an operational precursor for future Space Traffic Management (STM) efforts in Europe [7, 8].

This idea resonates closely with developments on STM in the US, as a result of US Space Policy Directive 3 for Space Traffic Management [9]. The policy foresees the transfer – and transformation – of the civilian element of the SSA mission from the US Department of Defense to be implemented by the Department of Commerce. In SPD-3's distinction of operational, regulatory, technical and global engagement provisions, particularly the technical and operational element resonates considerably with ongoing activities on the European side, with regards to drawing on diverse sensors (including military assets) and sharing data through a platform (EU SST database and US Open Architecture Data Repository). The SST Consortium partners have been maintaining a regular dialogue with the above and other key stakeholders in the US for the past years.

6. Conclusions

As a multilateral cooperation since 2015 and operational capability 2016, EU SST serves a broad community of users in Europe, and is set to mature into a critical component of the planned EU Space Programme. In employing a unique overall governance model mandated by its legal basis, and having designed an internal governance model of specialised contributions for operations and dedicated mechanisms for security, the framework allowed for a swift formation of a bottom-up, operational architecture of hitherto separate existing capabilities.

In bringing diverse actors together, EU SST can serve as a blueprint and sounding board for future operations in other multilateral settings to ensure the safety, security, and sustainability of operations in the orbital environment.

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References

[1] European Parliament and European Council (2014) Decision No 541/2014/EU of the European Parliament and of the Council of 16 April 2014 establishing a Framework for Space Surveillance and Tracking Support, Official Journal of the European Union, 27.5.2014, Brussels.

[2] Peldszus, R. & Faucher, P., European Space Surveillance and Tracking Support Framework, in Handbook of Space Security: Applications and Programs, K.-U. Schrogl et al (Eds), Springer Nature, New York/ London, 2019, 1-22, https://doi.org/10.1007/978-3-030-22786-9_104-1.

[3] Becker, M. & Faucher, P., Recent Developments in the Implementation of European Space Surveillance & Tracking (EU SST) – Security and Data Policy, 71st International Astronautical Congress, Joint Session A6.8 E9.1, 12-14 October 2020.

[4] Faucher, P., Peldszus, R. & Gravier, A., Operational Space Surveillance & Tracking in Europe, Journal of Space Safety Engineering, Special Issue 'Space Debris: The State of Art', 7(3), (2020), 420-425. https://doi.org/10.1016/j.jsse.2020.07.005

[5] EU SST, EU Space Surveillance & Tracking: Service Portfolio, 2020. Available online https://sst.satcen.europa.eu/idp/Acct/ServicePortfolio (accessed 24 September 2020).

[6] European Commission, Proposal for a Regulation of the European Parliament and of the Council establishing the space programme of the Union and the European Union Agency for the Space Programme, European Commission, Brussels, 2018.

[7] European Commission, 12th Annual Space Conference, Closing Speech by Commissioner Thierry Breton, Brussels, 22 January 2020, available online https://ec.europa.eu/commission/commissioners/2019-2024/breton/announcements/12th-annual-space-conference-closing-speech_en (accessed 27 August 2020).

[8] Moranta, S., Hrozensky, T., Dvoracek, M., ESPI Report 71 – Towards a European Approach to Space Traffic Management – Full Report, European Space Policy Institute, Vienna, 2019.

[9] Whitehouse, Space Policy Directive-3, National Space Traffic Management Policy. Office of the President of the United States, Washington D.C., 2018.