EU SatCen Annual Report 2019

EUROPEAN UNION SATELLITE CENTRE

Analysis for decision making

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"(…) 'On security-related matters, the European Union Satellite Centre in Torrejón, Madrid, has helped to deliver key geostrategic intelligence analysis to the European Union and Member States, contributing to monitoring the crisis of conflict areas and supporting the EU advisory operations. When we are planning what to do in Libya, it immediately comes to our mind that we have a powerful tool observing what is happening there and guiding the operations on the ground.' (…) ".

(Opening speech by High Representative/Vice-President Josep Borrell
at the 12th European Space Conference, 21 January 2020)

Photos: (top left), HR/VP Borrell highlighting SatCen's unique role during his opening speech at the European Space Conference, 21 January 2020; (top right) Visit of Mr Christos Stylianides, European Commissioner for Humanitarian Aid and Crisis Management, Mr Fernando Grande-Marlaska, Spanish Minister for Home Affairs, and Mr Luis Planas, Spanish Minister for Agriculture, Fisheries and Food, 9 July 2019; (bottom left) Visit of the Director of the Civilian Planning and Conduct Capability (CPCC) and Civilian Operations Commander of the European External Action Service, Lieutenant-General Vincenzo Coppola, and Mr. Giorgio Porzio, Senior Policy Advisor at the CPCC, 21 June 2019; (bottom right) Visit of a delegation from the Italian Ministry of Defence, headed by Lt. General Nicolò Falsaperna, Secretary General of Defence and National Armaments Director, 13 March 2019; (background) SatCen staff and building.

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Foreword by the Director

Amb. Sorin Ducaru
Director

In June 2019, I took office as Director of SatCen, after the selection process conducted by the SatCen Board and the appointment by the EU High Representative for Foreign Affairs and Defence Policy & Commission Vice-president (HRVP) Federica Mogherini. I started my mandate with a high level of ambition and a strong sense of responsibility and accountability towards SatCen's stakeholders, leveraging on the achievements of my predecessor Pascal Legai and of the highly competent SatCen staff.

I took over the leadership of a highly dynamic and user-oriented Agency, striving to fulfil the increasing demand for faster and compressive geospatial products and services to its customer community, which is primarily composed by the Council, the High Representative for Foreign Affairs and Defence Policy, the European External Action Service (EEAS), EU crises management missions and operations as well as the Member States. In line with its mission, the Centre successfully cooperates with the Commission, EU agencies and international organizations, maximizing synergies and complementarities on the full spectrum of SatCen activities, including the cooperation with OSCE and OPCW, under the Foreign Policy Instrument framework. All in all, SatCen is an operational entity engaged in the implementation of EU policies for the protection of the European Union and Member States, having the ultimate goal of serving European citizens.

For SatCen, 2019 has been quite a complex year, marked by a fast growing user demand, against the background of an unprecedented delay in the approval of the SatCen Budget, also determined by the Brexit context. This has put an important strain upon SatCen operational and human resources. The 2019 SatCen annual budget was only adopted by its Board in July 2019, and as a consequence a highly positive user-demand driven dynamic in SatCen's output of products and services in the first months of the year was flattened in June and July due to lack of necessary operational resources. Luxembourg generously contributed to alleviate this situation with a voluntary national contribution allocated for data acquisition and IT infrastructure. In

spite of the uneven level of monthly production, due to this complex resourcing situation, by the end of 2019 SatCen achieved a major increase in its support to the EU Common Foreign and Security Policy and the implementation of the Global Strategy, as demonstrated by a remarkable 30 % production growth compared to 2018. This was driven by user demand and made possible by increasing efficiency of SatCen activity, through the employment of modern "home grown" Big Data and Artificial Intelligence tools and through the professionalism and intense work of SatCen staff.

The Centre is continuously adapting its processes to a changing environment in terms of data provision, situational awareness production, and heterogeneous, faster and comprehensive user demands. SatCen is implementing advanced solutions in the fields of product and service dissemination, thanks to the classified network EU OPS WAN, and the increasing operational use of open sources data and artificial intelligence tools, which are also made available to Member States.

SatCen contributes as front desk to the EU Space Surveillance and Tracking Support Framework (EU SST), in direct contact with the operational users and the SST Consortium, which aims at increasing European security in space (e.g. more than 130 European satellites are subscribed to the Collision Avoidance service).

The Centre strives to remain at the cutting edge of technological development and continues to develop state of the art capabilities through research and innovation and training. The former being conducted mainly with the European Commission, the European Defence Agency and the European Space Agency, and the latter for the Centre's staff, the Member States and other European institutions.

The year 2019 has also been, in spite of the complex context described above, a year of increased visibility, interest and attention by Member States, reflected at political level by a number of important visits and contacts and in particular at the level of the Political and Security Committee (PSC). The fast growth in demand of core users - EEAS and Member States – as well as of the extended range of users reflected a validation of SatCen's value and utility.

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A strategic analysis on the future of SatCen has been consolidated during the last year, through substantive and valuable discussions in the SatCen Board, benefiting from the strategic political guidance received from the PSC which, under the responsibility of the Council, exercises political supervision over the Centre's activities. In parallel, Federica Mogherini, as former HR/VP, submitted a report on the SatCen functioning with recommendations for further development of the Centre.

This strategic evaluation is fuelled by three key driving forces;

- The EU increased level of ambition in the fields of foreign policy, defence and space;
- User demand increase, in terms of quantity, quality, complexity and speed of delivery;
- The opportunities offered by the revolutions in Big Data, Artificial Intelligence and Space technologies.

The analysis and strategic discussion resulted in three interlinked and multiplicative strategic goals that will shape the Centre's future:

- Strengthening and optimizing SatCen mission in support of all its users;
- Enhancing SatCen synergies & complementarities with other EU activities and further developing partnerships in exploring new application fields and relevant EU budget lines;
- Continuously upgrading SatCen capabilities at the cutting edge of technology and innovation and to consolidate the EU autonomy.

The first draft of a plan with implementation options for the development of SatCen in the medium and long term was presented in June 2019. I look forward to the constructive outcome of the ongoing debate on the implementation options corresponding to the level of ambition of Member States and the evolving user demand for SatCen products and services.

The year 2019 has also witnessed essential transitions on the European institutional landscape. EU citizens have voted their new representatives in the European Parliament (EP). A new Commission team has received the vote of confidence from the EP, and a New Directorate General for Defence Industry and Space was established, reflecting increased attention to these aspects.

Josep Borrell is the new EU High Representative for Foreign Affairs and Defence Policy / Vice President of the Commission (HRVP) exercising the operational direction over SatCen. Along with other EU leaders, Josep Borell has been an outspoken supporter of a European Union with a geo-political role, supported by political will and the right instruments. He has already shown special interest for SatCen as a unique asset of European Strategic autonomy and a distinctive enabler for an informed and credible European external action. Discussions on the next multiannual financial framework 2021-2027 have started in 2019 and will continue in 2020 having a key impact on shaping the future of the Union.

As I write these lines, SatCen - as much as all of Europe - is facing the unprecedented crisis resulting from the spread of the Covid19 disease. It is important to highlight that SatCen has demonstrated significant resilience and capacity of adaptation in the challenging context of the current Covid19 crisis.

It has continuously provided valuable geospatial intelligence to its all its users, making best use of synergies and complementarities with other EU activities like Copernicus SEA or the support to Frontex. The lessons learned from SatCen's fast and effective business continuity adaptation in the context of the Covid19 crisis, should inform the future debate related to the implementations of the relevant recommendations reflected in the HR report.

As Director since June 2019, I would like to extend my gratitude to SatCen's key stakeholders, the Member States, to PSC ambassadors for their availability and valuable strategic guidance at the very start of my mandate; to the SatCen Board members for their highly competent and dedicated engagement in the debates that led to important decisions in a difficult year; to the European External Action Service colleagues, the Chair of the PSC, the Chair of the SatCen Board and colleagues, as well as SatCen's valuable partners within the Commission, EU Agencies, missions and operations, to our international institutional partners, as well as to all our users. Last but not least, I would want to express my appreciation and gratitude to my predecessor, Pascal Legai, for his outstanding achievements as Director of SatCen, to Deputy Director Giuseppe D'Amico, who also undertook the role of Acting Director, the month before my arrival, to the highly competent management team and the remarkably qualified and dedicated SatCen staff.

Sincerely,
Amb. Sorin Dumitru Ducaru
SatCen Director

1. Fulfilling a broadening mission

As a unique operational asset in the field of space and security, SatCen serves a variety of users. They range from high-level decision makers, such as the Council, the High Representative of the Union for Foreign Affairs and Security Policy and Vice President of the Commission (HR), or the crisis management and situational awareness structures of the European External Action Service (EEAS), to personnel on the ground involved in missions and operations. Within the EEAS, the main users are the EU Military Staff (EUMS), the Intelligence and Situation Centre (INTCEN) and the Civilian Planning and Conduct Capability (CPCC).

Furthermore, EU Member States (MS), the European Commission (EC), EU Agencies and International Organisations are increasingly benefitting from the Centre's support - not only in CFSP but also in other Union activities such as Space Surveillance and Tracking (SST), border management, irregular migration and homeland security. The HR, in the Report on the functioning of the Centre issued in June 2019, recommended that SatCen's mission 'should be pursued and reinforced in order to guarantee the highest level of quality and European autonomy in the assessment of internal and external threats.

SatCen's Mission
(Art. 2 of the Council Decision)

1. SatCen supports the decision making and actions of the Union in the field of the CFSP and in particular the CSDP, including European Union crisis management missions and operations, by providing, at the request of the Council or the HR, products and services resulting from the exploitation of relevant space assets and collateral data, including satellite and aerial imagery, and related services.

2. In the framework of SatCen's mission, the HR shall also, upon request and if the capacity of SatCen so allows and without prejudice to its core tasks set out in paragraph 1, direct SatCen to provide products or services to:
   - a Member State, the European External Action Service (EEAS), the Commission, or Union agencies or bodies with which SatCen cooperates;
   - third States having agreed to the provisions set out in the Annex on the association with SatCen's activities;
   - if the request is relevant in the field of the CFSP, in particular of the CSDP, international organisations such as the United Nations, the Organisation for Security and Cooperation in Europe (OSCE) and the North Atlantic Treaty Organisation (NATO).

3. SatCen may also, without prejudice to its core tasks set out in paragraph 1, cooperate with the Commission and with Union agencies, bodies or Member States, with a view to maximising synergies and complementarity with other Union activities that have a bearing on SatCen and where SatCen's activities are relevant to those Union activities.

Visit of Mr Christos Stylianides, European Commissioner for Humanitarian Aid and Crisis Management, Mr Fernando Grande-Marlaska, Spanish Minister for Home Affairs, and Mr Luis Planas, Spanish Minister for Agriculture, Fisheries and Food, 9 July 2019 (© SatCen)

1.1. Operational Context

The Centre operates under the political supervision of the Political and Security Committee (PSC) and the operational direction of the High Representative.

SatCen's primary source of satellite data are commercial providers. It also benefits from agreements with Member States for access to high quality governmental satellite imagery. The increase of data acquisition from government satellite providers remains an important priority for the future. Collateral data (i.e. essential additional information underpinning and complementing the imagery analysis) are acquired from open sources and from users of SatCen services.

Senator M. Ronan Le Gleut, Foreign Affairs, Defence & Armed Forces Committee, France, 30 Oct. 2019 (© SatCen)

The picture above shows the visit on 30 Oct. 2019 of French Senator M. Ronan Le Gleut, Foreign Affairs, Defence & Armed Forces Committee, and author of 'European Defence – the Challenge of Strategic Autonomy' – an information report by Mr Ronan Le Gleut and Senator Hélène Conway-Mouret on behalf of the Foreign Affairs, Defence and Armed Forces Committee. SatCen represents, indeed, a key asset for EU Strategic Autonomy, was the conclusion of the Senator during the visit.

Reactivity and consolidated products are the main pillars that ensure the operational chain's efficiency. Thus, generic tasking (e.g. allowing direct contact between the SatCen and the end-user in a defined framework) and anticipatory measures (e.g. a solid partnership with data providers) contribute to the Centre's high level of responsiveness.

IMINT versus GEOINT

IMINT (Imagery Intelligence)
describes the exploitation of information from satellite and aerial imagery. Analysis of this imagery by specialists turns the information into intelligence for further use.

GEOINT (Geospatial Intelligence)
embraces the comprehensive analysis of geospatial information to describe, assess and visually depict physical features and geographically referenced activities on Earth. GEOINT data sources include imagery and mapping data as well as collateral data, using all spatial skills and disciplines, including photogrammetry, cartography, imagery analysis, remote sensing and terrain analysis.

SatCen products, handled at various levels of confidentiality, are delivered both to central operational entities (e.g. EUMS and INTCEN) and to operations' headquarters (OHQs). Every single product is systematically distributed to all Member States, facilitating cooperative decision-making in the field of Common Foreign and Security Policy (CFSP), including the Common Security and Defence Policy (CSDP).

1.2. User needs as a driving factor

The SatCen executes its mission in close cooperation with the crisis management structures of the EEAS under the operational direction of the HR/VP. The strengthening of links with these bodies in order to collect operational needs, as well as to support and refine tasking, continued to be a primary undertaking in 2019. This implied enhancing user awareness through exchanges of expertise and the collection of requirements. SatCen regularly receives visits from stakeholders and users of SatCen products. This is key in order to make sure they are aware of all the possibilities offered by the Centre and also for SatCen to get information on the specific needs, so that products and services can be tailored accordingly. SatCen products are very diverse, serving from high-level decision makers to people deployed in EU mission and operations. Below the visit of the Director of the Civilian Planning and Conduct Capability (CPCC) and Civilian Operations Commander of the European External Action Service, Lieutenant-General Vincenzo Coppola, and Mr. Giorgio Porzio, Senior Policy Advisor at the CPCC, on 21 June 2019. Lt. General Vincenzo Coppola appreciated the opportunity to have a first-hand experience of SatCen's operational activity and expressed a clear interest for an increased use of SatCen services for EU civilian missions. 'What SatCen does is extremely important for us', he said to SatCen Director Amb Ducaru, who emphasized that increasing its support to EU missions and operations is a key priority for the Centre.

Member States and other concerned entities were engaged in SatCen operational briefings of future-oriented strategic or technical debates, at the level of the Political and security committee, through Board meetings, Technical Working Groups, Expert Users Fora, the Governmental Imagery Forum, bilateral meetings and other events. From 11 March to 12 April 2019, SatCen organised an exhibition in the

EEAS building, showing 36 examples of SatCen analyses in support of EU external action and its Member States, from battle damage assessment and contingency planning to products created within the Copernicus Security Service and Space Surveillance and Tracking.

HR/VP Federica Mogherini emphasized SatCen's unique role for European strategic autonomy and thanked staff for their professionalism and dedication during the official opening of the exhibition on 1 April 2019 emphasizing the value of SatCen services. Also present was the Chairman of the EU Military Committee, General Claudio Graziano.

CPCC Director and Civilian Operations Commander of the EEAS, Lt. General Vincenzo Coppola, and Mr. Giorgio Porzio, Senior Policy Advisor at the CPCC, 21 June 2019 (© SatCen)

Ambassador Sorin Ducaru was introduced as newly selected SatCen director at the SatCen Exhibition in the EEAS on 1 April 2019 in the presence of High Representative Federica Mogherini and outgoing Director Pascal Legai
(© SatCen)

SatCen was present in numerous events, such as, for example, the 11th Summit on Earth Observation Business, where SatCen Director Amb. Sorin Ducaru organized by EUROSATORY in Paris (October 2019) and spoke during the panel 'New threats, new requirements: Harnessing new technologies in a changing world' underlining that SatCen is an EU asset for European Strategic Autonomy and that being at the cutting edge of technology is key. Participation in this panel was shared with Carine Claeys, EU Special Envoy for Space and Head of the EEAS Space task Force, who outlined the EU role and priorities in the international debate related to Space and called for responsible behaviour for Safety, Security and Sustainability for Outer Space (3xSOS).

SatCen is a concrete example of pooling and sharing of know-how and services within a high profile and sensitive field of work. Each Member State, paying a fraction of contributions to the SatCen budget, but receiving 100% of the output, directly benefits from the Centre's operational work and internally developed IT tools, as well as from financial optimisation and savings.

SatCen Director Amb. Sorin Ducaru and Carine Claeys, EU Special Envoy for Space and Head of the EEAS Space task Force, at the 11th Summit on Earth Observation Business

This specific role requires a tailoring of the Centre's Geospatial Intelligence (GEOINT) and Imagery Intelligence (IMINT) products and services to support and enable SatCen users in their specific undertakings, ranging from diplomatic, economic and humanitarian efforts, to mission planning or intervention.

Also within the framework of the Copernicus Service in Support to EU External Action, delegated by the Commission to SatCen in 2017, contact with users was key in 2019. The Copernicus Service in Support to EU External Action (Copernicus SEA) provides geospatial intelligence based on the analysis of satellite imagery to assist the EU and its Member States in their operations and promoting their initiatives and projects outside the EU territory for European and global security. Copernicus SEA mainly provides services in the following areas: support to humanitarian aid; rule of law; stability and resilience for development; security of EU citizens abroad; crisis, conflict and critical assets; cultural heritage.

SatCen Deputy Director giving a keynote speech at the opening of the 4th Copernicus SEA Workshop on 30-31 October 2019, Sorrento, Italy (© SatCen)

Since the beginning of 2019, a campaign to inform national ministries and relevant institutions about the potential and benefits of the Copernicus SEA service was conducted. These increased contacts, interactions and visits to Member States will continue in 2020, in order to build on 2019's success.

Furthermore, Copernicus SEA hosted and took part in many events, thus contributing with SatCen's relevant expertise and experience to more than 10 events with participants from over 20 countries. These events also provided opportunities to engage and meet current and potential users. Such was the case at the 4th Copernicus SEA User Workshop which took place in October and was the perfect setting to meet new users and renew the EU and the Member States' willingness to work together towards a more peaceful, secure and prosperous Europe.

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2. Sustaining and developing a unique instrument for security

The EU Global Strategy, issued in 2016, identified the three strategic priorities for EU security and defence: responding to external conflicts and crises; building the capacities of partners; and protecting the Union and its citizens. It also emphasized the need for the EU to pursue strategic autonomy, and the link between internal and external security. At the same time, demand is growing in the EU for more security and closer cooperation among Member States with the ultimate aim of protecting the Union and its citizens.

The Council constantly reiterated its support to foster cooperation in maritime security, border security, irregular migration and human trafficking. It also promoted EU civil-military intelligence-based situational awareness, notably through the cooperation with SatCen. The Council also underlined the importance environmental issues and climate change have for security and defence.
In addition, the Commission formally encouraged the possible contribution of SatCen to relevant EU security-related policy areas.

Security is also among the EU Parliament's concerns. In fact, in its report on the implementation of the Common Security and Defence Policy issued in 2019, noting 'the lasting deterioration in the Union's security environment', made worse in particular by climate change, instability and unpredictability on the Union's borders, and stressing 'the inextricable link between internal and external security', it considered that space-based services should be fully operationalised in order to provide high-resolution satellite imaging in support of CSDP missions and operations.

SatCen has developed into a valued user-oriented organization, recognized as a dual-use, civ-mil reference provider of state-of-the-art services. The demand for these services is continuously growing in volume and in terms of speed, complexity, flexibility and interactivity. With the increase of requests and the consequent peaks in the GEOINT production in 2019, SatCen continued being a central actor in the EU GEOINT field (*security from space*).

SatCen provides a wide range of GEOINT analyses (©SatCen)

SatCen also progressed in contributing to Space Situational Awareness - SST (*security in space*) by coordinating the civ-mil service in which eight Member States share capabilities in order to preserve space assets and avoid damage if they re-enter.

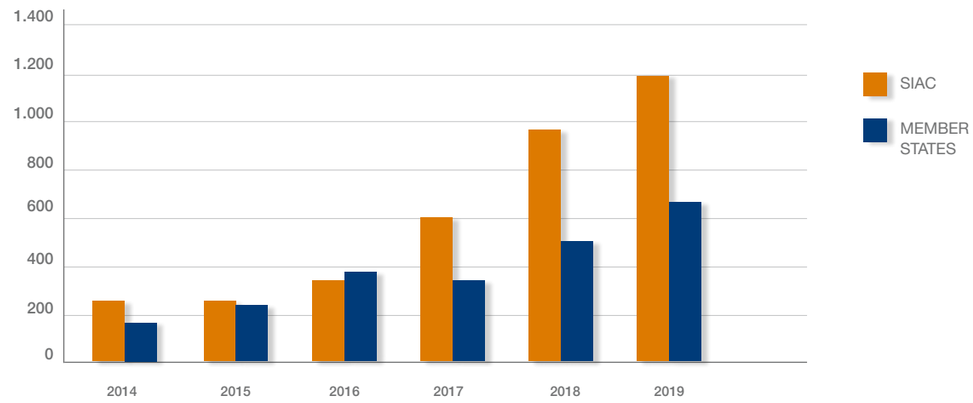
Today, SatCen faces fast and disruptive change factors, which are placing it at a crucial inflection point in its evolution. These factors include the increased level of ambition of the EU for space and security, the fast growing trend of user demand and the significant technological developments in Earth Observation (EO) services and associated data processing technology.

2.1. User Demand

The trends in SatCen user demand over the last years indicate a continuous increase in terms of quantity, quality and speed of delivery. This growth trends are not only continuing, but also accelerating.

SatCen's operational output to the EEAS/SIAC and Member States has significantly increased in the last years, while the contribution of Member States to the SatCen Budget was flat over a decade. This output increase was achieved through more efficient management, introduction of Artificial Intelligence and the remarkable dedication of staff.

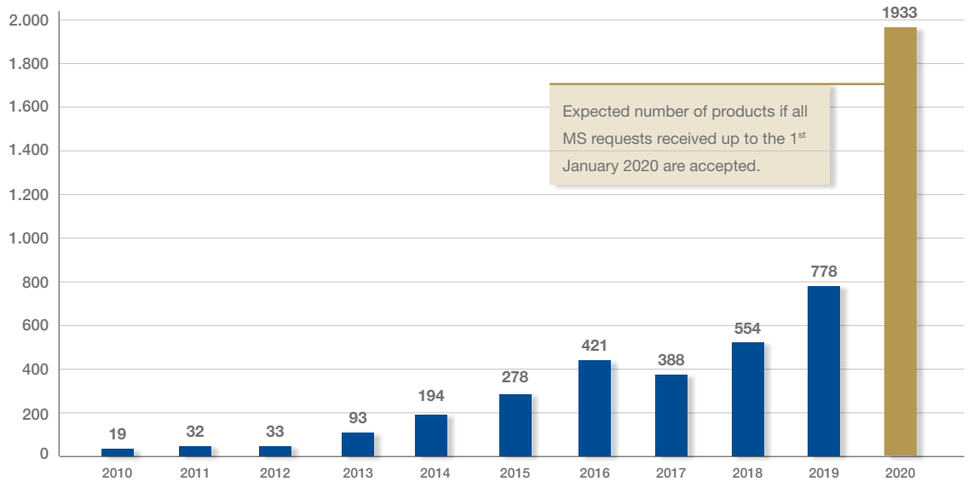
Production for EEAS/SIAC & Member States 2014 - 2019



In 2019 the demand from both the EEAS/SIAC and Member States was much higher and SatCen operational output would have increased much more, had adequate resources been allocated.

While the data presented above reflects the quantitative increase in demand, it is important to highlight that the characteristics of demand evolution reflects requests for increasing speed of delivery, quality and interactivity. For example, demand for fast response products has already reached over 85%, while the demand for comprehensive products, also includes user-tailored and interoperable services.

Evolution of Production for Member States



Between 2010 and 2019 the prduction for MS increased more than **40 times**.
Received requests from MS for 2020 would require to, at least, **double the production** of 2019.

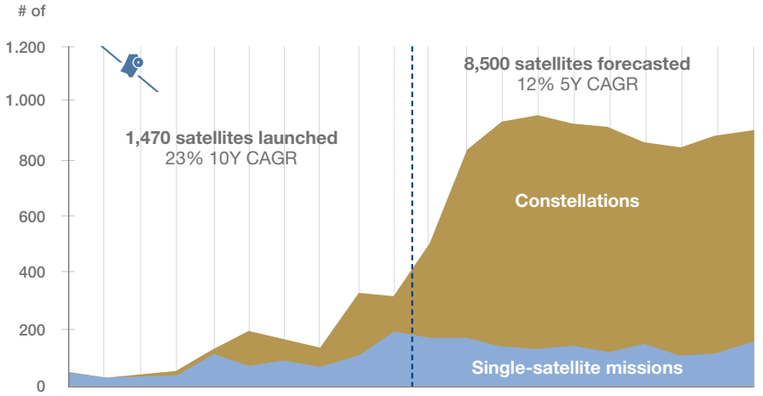
2.2. The "New Space"

The Earth Observation (EO) domain is now facing an unprecedented and challenging phase. As a consequence, GEOINT is also undergoing significant developments.

The emergence of new technologies applied to EO data, the explosion of new acquisition systems accompanied by the continuous availability of large amounts of open data are reshaping the market and creating an offer of new services and applications boosted by the progresses in the field of software tools based on artificial intelligence and big data techniques.

At the same time, the broadening spectrum of security threats and user needs generate demand for higher operational efficiency and relevance.

Some 8,500 satellites with a launch mass of 500 kilograms of less stand to launch between 2019 and 2028, according to Paris-based Euroconsult.



2.3. SatCen Tomorrow

For the benefit of its users, SatCen must be able to meet these new challenges. All main stakeholders expressed the need to develop SatCen's capability in order to make it able to face these challenges while pursuing EU's autonomy and credibility in its space-based security actions.

The HR/VP Report on the functioning of the EU Satellite Centre issued in October 2019 recognizes that SatCen *'has performed well and achieved significant efficiency gains. However, it highlights that several issues hindered the SatCen from further developing its capability, the root cause being in most cases insufficient long-term structural funding'*.

Furthermore, the new HR/VP, Josep Borrell, in an address to the European Parliament on 14 January 2020 stated: *"Here I would like to highlight, (…), that the European Union Satellite Centre will require relevant structural funding, especially from the European Union budget, to maintain its contribution to our actions. It is becoming quite impossible to believe that we can develop actions all over the world if we are not able to observe how the world is. We have a satellite centre that cannot be lacking resources in order to fulfil its mission"*.

Tasked by Member States and based on their specific recommendations, SatCen, jointly with the EEAS Space Task Force, outlined an implementation plan for the development of SatCen in the period 2021-2027, also considered for the next Multiannual Financial Framework. Implementation options corresponding to different degrees of achievement of the strategic goals and timelines and different cooperation activities in policy areas covered by different funding sources are identified in the plan. These have been presented to the PSC for its consideration before the Council's final endorsement.

Given the growing need and relevance of SatCen's products and services, and the context provided by the key driving forces highlighted above, SatCen looks forward to positive decisions shaping the level of ambition and pace of SatCen's evolution supported by a long-term commitment for a sustainable resourcing framework.

3. Core business: geospatial and imagery intelligence

In 2019, SatCen continued to respond to the user demand in a fast changing political and operational environment, tailoring its products and services accordingly.

3.1. A challenging year

The EU SatCen was under severe financial and human resources constraints during the year 2019, and at the same time continued to deliver its operational output to the highest quality standards. The 2019 SatCen annual budget was approved by its Board, with an unprecedented delay, in July 2019, imposing on the Centre a limitation of its monthly expenditure to one-twelfth of the 2018 budget, having undesired consequences in terms of production levels as well as updating of its technical capabilities.

After a continuous increase of the monthly production during the five first months of 2019, the Centre's production remained flat during the summer, due to the uncertainty on the availability of budget for imagery acquisition, including a forecasted reduction of the access to the Copernicus data warehouse for SatCen products not linked to the delivery of Copernicus Services. This led to prioritisation and some delays of tasks. During the autumn, the production increased to its previous levels and even above due to high demand. However, at the end of the year, the growing output trend of SatCen could not be sustained, due to the limited human resources available. It was a consequence of the non-possibility to fulfil vacant posts, as well as the need for staff to take mandatory leave, which was postponed for operational reasons.

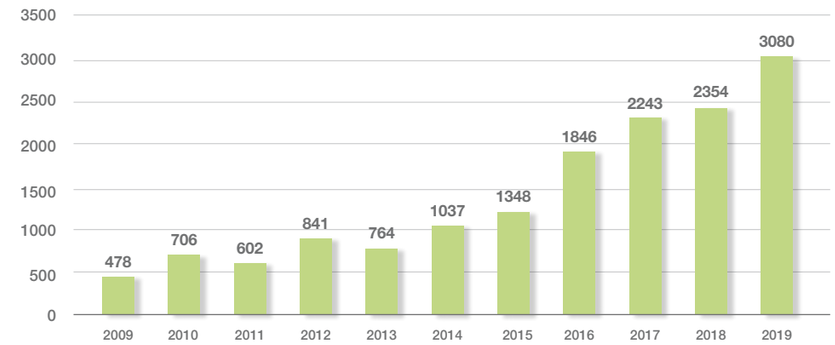
The late adoption of the Centre's budget affected additional areas of activity of the Centre, including training and IT, due the delay in recruiting personnel, limitations to fulfil maintenance duties and required developments, e.g. to increase secure connectivity between the Centre and its core customers.

The above situation was partially alleviated thanks to the generous contribution of Luxembourg allocated for data acquisition and data IT infrastructure.

3.2. Production highlights in 2019

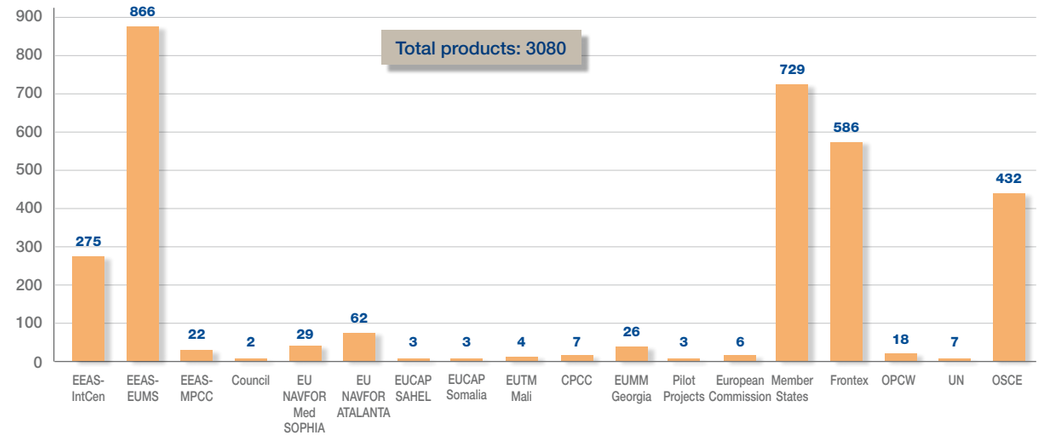
Over the course of the year, SatCen delivered a total of 3080 products, representing a 30% increase compared to 2018, despite the zero-growth budget not approved until July.

Production increase from 2009 to 2019



The EEAS, EU Member States, Frontex, the OSCE, and EU missions and operations were the main users, as shown below.

Distribution of products by requester in 2019



Support to the EEAS

In 2019, the Centre continued to support the EEAS with the provision of on-demand GEOINT products and a set of services to support decision making and operational support during crises.

This example shows a density study illustrating the weapon impact craters per square km. It shows which areas have suffered most impacts and provides an idea of the type of targets that were focused upon.
(© SatCen)

Non-proliferation of Weapons of Mass Destruction

SatCen monitored possible proliferation of weapons of mass destruction and the development of nuclear technology in several countries.

The Centre analysed suspected facilities in areas where ballistic missiles are possibly being developed, as well as test and launch facilities.

Further to this, the development of nuclear facilities was analysed by monitoring uranium mines, uranium conversion facilities, heavy water reactors, nuclear power plants and yellow cake production facilities.

Example of SatCen analysis of rocket launchers
Pléiades ©CNES (2015 and 2017), Distribution AIRBUS DS
GeoEye-1 ©Digital Globe (2015) supplied by European Space Imaging

Support to EU Operations

SatCen supported the EU NAVFOR Somalia Operation Atalanta by monitoring known pirate bases and anchorages along the Somali coastline, as well as searching for militia groups inside suspicious towns. The infrastructure and activity inside identified pirate bases were monitored, as was evidence of preparations for pirate attacks. Furthermore, the identification and accurate location of hijacked merchant ships were ascertained. SatCen support to EU NAVFOR MED operation SOPHIA consisted of the surveillance and assessment of human smuggling and trafficking networks.

Example of support to EU NAVFOR Med Operation Sophia. Analysis of potential smuggling activity WorldView-4 ©European Space Imaging (2018) GeoEye-1 ©Digital Globe (2018) WorldView-4 ©Digital Globe (2018) WorldView-2 ©European Space Imaging (2019)

Support to the Organisation for Security and Cooperation in Europe

SatCen products for the OSCE included analysis of military activity and equipment to support the OSCE Special Monitoring Mission to Ukraine (SMM Ukraine) in the verification of the Minsk Agreement.

SatCen field visit to OSCE SMM to understand how to best support the Mission (© SatCen)

Support to the Organisation for the Prohibition of Chemical Weapons

On 8 March 2018, the Organisation for the Prohibition of Chemical Weapons (OPCW) and the European Union Satellite Centre signed a Service Level Agreement implementing Council Decision (CFSP) 2017/2303 supporting the OPCW Fact Finding Mission in Syria.

Capitalizing on OPCW's experience of SatCen support provided in 2014 and 2015, the Centre carried out tasks in 2019 related to the assessment of the road network, facilities and site surroundings, the verification of Syrian reports and the reinforcement of situational awareness provided to deployed inspection and verification teams.

The Hardened Aircraft Shelter in Syria used to store chemical products has been destroyed and debris have been cleared GeoEye-1 ©Digital Globe (2014) supplied by European Space Imaging Pléiades ©CNES (2015), Distribution AIRBUS DS

Support to EU Missions

SatCen supported EU Monitoring Mission (EUMM) Georgia, EU Capacity Building (EUCAP) Mission Sahel Niger, EU Capacity Building (EUCAP) Mission Somalia and EU Training Mission (EUTM) Mali with both ad hoc requests and monitoring tasks. The resulting products provided imagery analysis of important infrastructure and activities in the region, as well as constant situation awareness over the areas of interest.

EUMM Georgia's mandate consists of stabilisation, normalisation and confidence building; EUCAP Sahel Niger assists Niger against terrorism and organised crime; EUCAP Somalia enhances the country's maritime civilian law enforcement capacity and implements additional assistance to broader police development; and the mandate of EUTM Mali is to provide military and training advice to the Malian Armed Forces with a view to enabling them to conduct military operations aiming at restoring Malian territorial integrity and reducing the threat posed by terrorist groups.

In order to make sure that SatCen products are as useful as possible, SatCen staff pay field visits to the different operations and missions that use its products to discuss with the people on the ground. Below is a picture of a field visit to EUMM Georgia. Discussing with the mission personnel is vital for SatCen to understand how to support the Mission in the best possible way.

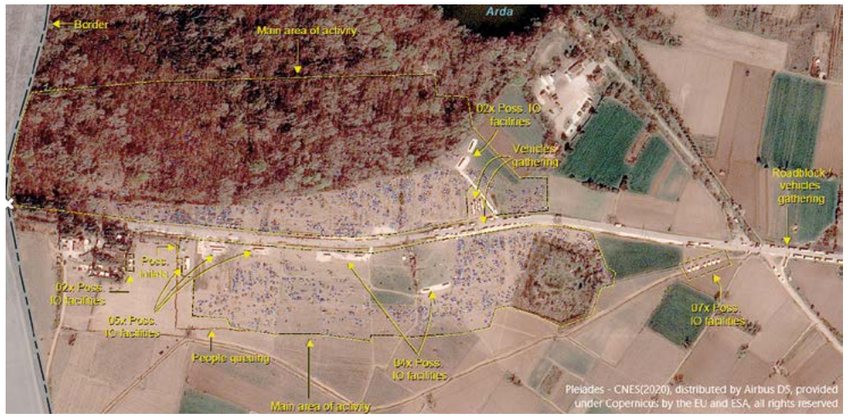
SatCen field visit to EUMM Georgia to understand how to best support the Mission (© SatCen)

In order to facilitate the use and sharing of geo-information within the mission, SatCen continued providing support to EUMM Georgia through the GeohuB, connecting the OHQ with the field offices.

Copernicus Services

Copernicus is the European Union's Earth Observation Programme.

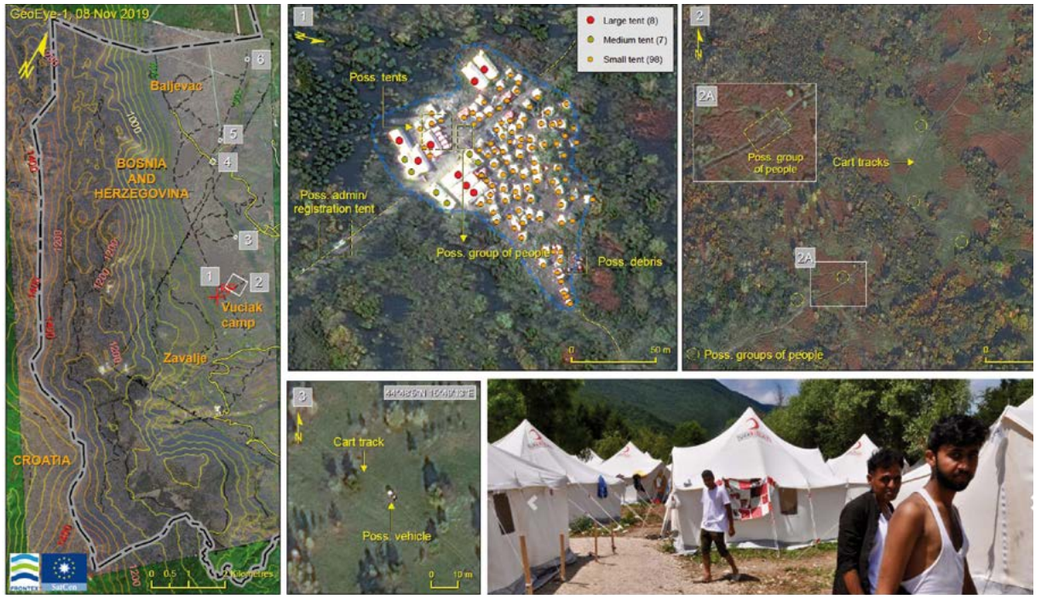
As part of the Copernicus Border Surveillance Service, SatCen started its operational support to Frontex in March 2015. Within the Border Surveillance Service, the main objectives are to reduce the number of illegal immigrants entering the EU undetected, to reduce the death toll of human lives at sea and to increase internal security of the European Union as a whole by contributing to the prevention of cross-border crime.



Satellite imagery analysis for pre-frontier monitoring at the EU External Borders (Border Crossing Point) © Pleaides-CNES (2020), distributed by Airbus DS, provided under Copernicus by the EU and ESA, all rights reserved

In 2019, 586 products were made for Frontex and 1953 issues reached since the start of operations. The analysis of satellite imagery was used to identify routes, means of transportation, patterns of launch and landing operations and border-crossing activities.

Tasking from Frontex increased by 50% compared to the previous year. The main part of these tasks were related to the Pre-frontier monitoring (110 tasks) and Coastal Monitoring (89 tasks) services, with an increase in demand on Cross Border Crime related tasks compared to previous years.



Example of SatCen support to Frontex – Refugee camp assessment
GeoEye-1 ©Digital Globe (2019) provided under COPERNICUS by the European Commission, ESA and European Space Imaging

In the context of the Service Level Agreement signed with Frontex, apart from the normal products, service evolution is also provided, enabling the continuous improvement of SatCen's service provision to Frontex, based on further developing the existing technical capabilities or exploring new ones and matching these with the end user requirements (Member States' National Coordination Centres and Frontex), designing new services in the short term.

The Copernicus Service in Support to EU External Action[1] (SEA) became operational in May 2017. SatCen is the Entity entrusted by the European Commission for this Service, which assists the EU and its Member States in their operations outside EU territory, providing decision makers and other relevant actors with geo-information on remote areas, which are difficult to access, and where security issues are at stake. The Service resulted in 292 products over the course of 2019 and reached 544 issues since the start of operations until the end of 2019. SEA Tasking increased by more than 80% compared to the previous year.

In 2019, 23% of requests were from the EEAS and 26% by Member States, 45% by missions and operations, 3% by the Commission and 3% by the UN.

3.3. Training

In line with its strategy, SatCen continued to empower its own analysts with skills and knowledge, as well as the analysts of Member States and institutions. Training enables SatCen to exchange experience and knowledge, as well as to create cohesion in the sensitive GEOINT domain between different stakeholders, developing a common culture and common methods. Specific courses are also designed for non-specialists to better understand the possibilities and limitations of imagery.

[1] https://sea.security.copernicus.eu/

Training at SatCen
(© SatCen)

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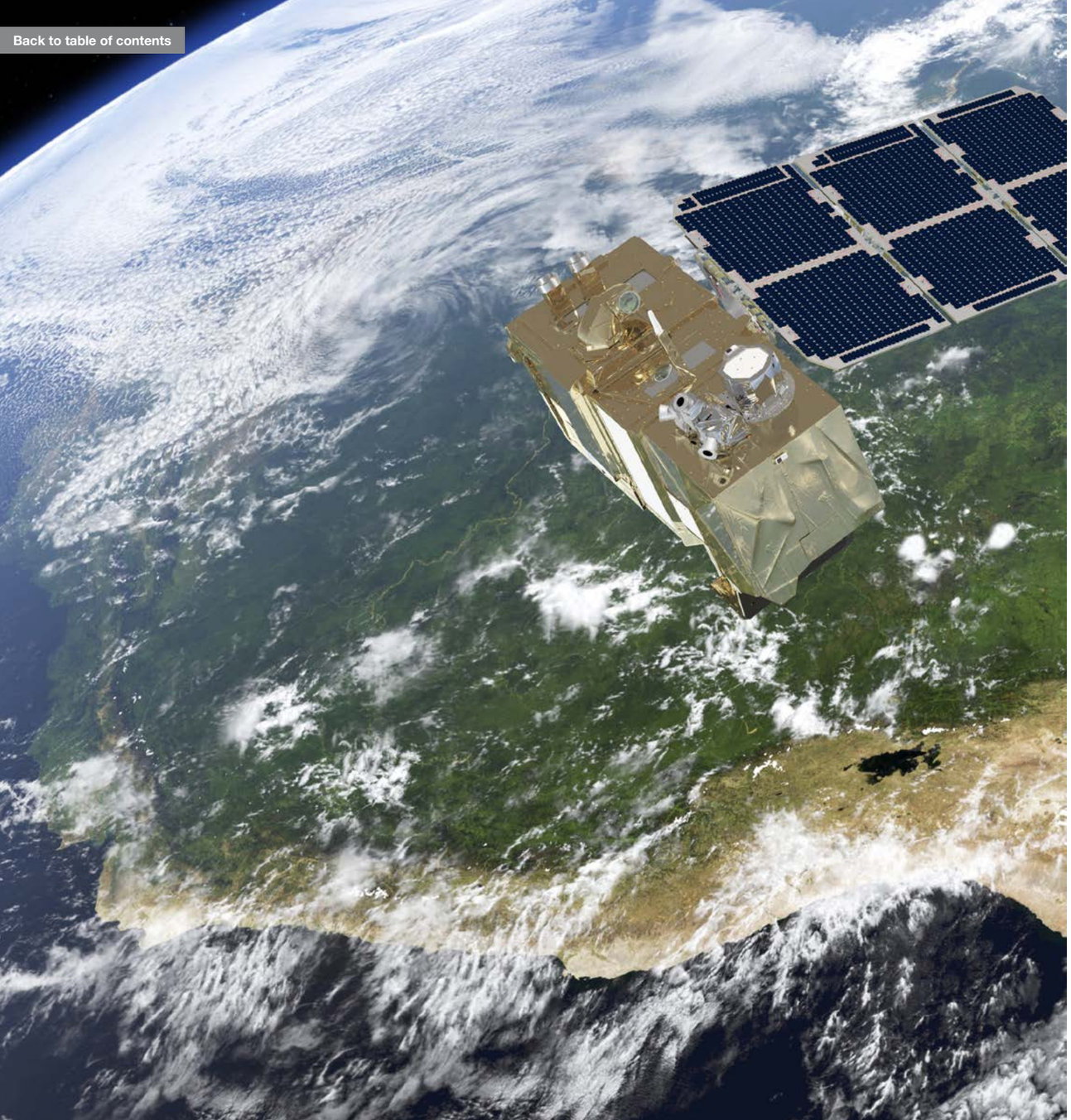
In 2019, SatCen delivered in-house training courses and coordinated training for SatCen staff delivered by numerous external providers, including language training and software courses. In-house imagery analysis training included the delivery of a Data Processing Course, IMINT and GEOINT introduction courses, as well as SAR (Synthetic Aperture Radar) I and II, the Nuclear Fuel Cycle I and II courses and a course on industrial installations. A guest instructor from the Belgian Satellite Centre and a senior engineer from Electricité de France provided specific lectures, and representatives of the main European countries' SAR imagery providers - Cosmo SkyMed, SAR-Lupe, Hisdesat-PAZ - gave lectures related to the specificities of their satellites. For the IMINT course, three guest speakers from the Belgian and Italian Ministries of Defence collaborated in the delivery of lectures and tutorials.

Several in-situ courses were provided in 2019. Training for Frontex took place at its premises in January, March and November and at SatCen in October. In May, a SatCen instructor and two image analysts delivered an in-situ course for EUMM Georgia. Twenty-four monitors and other staff working for the Mission attended the course.

Within the framework of Copernicus SEA, ad-hoc training was provided during the 4th SEA User Workshop held in Sorrento (Italy, 30-31 October 2019) and at the first workshop on imagery analysis organised by United Nations Peace Operations in Brindisi (Italy, 29 April – 3 May 2019).

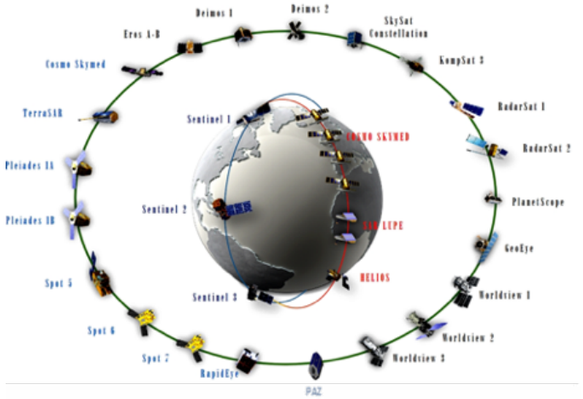


4. Improving Capabilities

SatCen continued to improve internal processes and to develop support tools in order to optimise the workflow and the use of resources. As in previous years, Seconded National Experts (SNEs) were a channel for the mutual exchange of expertise between SatCen and Member States and an effective way of reinforcing the Centre, as well as strengthening operational ties with Member States.

4.1. Data Provision Services

SatCen does not have direct control over, or access to, satellite sensors. Although its primary sources of data are commercial satellites, governmental providers are also used on a case-by-case basis. SatCen continued its efforts vis-à-vis contributing to the development of an autonomous European capability in the field of IMINT/GEOINT. In this context, and with the objective of improving the use of European governmental imagery for EU decision making, SatCen organised the ninth Governmental Imagery Forum with the participation of those EU Member States that provide SatCen with data (DE, FR, IT, ES, BE, EL). The Helios 2 community has decided to look into practical procedural changes in order to shorten the current request-delivery process loop.



Space sensors accessible by SatCen. In red: governmental, blue: European, black: commercial (© SatCen)

The SAR-Lupe classified link between SatCen and the German ground segment, operational since 2013, is used to place requests and downloading SAR-Lupe classified imagery. Several improvements have been made since then, broadening the use of SAR imagery.

The classified COSMO-SkyMed link between SatCen and Italian authorities has been operational since 2016. SatCen can order and download classified COSMO-SkyMed products in an easy, secure and fast manner.

Since its launch, Pléiades imagery has been increasingly used, contributing to SatCen's operational capacity. The tri-stereo capability of the Pléiades and Spot 6 / 7 sensors has led to an enhancement of SatCen's analytical capacity by making it possible to generate Digital Elevation Model products with a 1 to 5 m post spacing ideal for 3D modelling and 3D analysis. Furthermore, Airbus continued to adapt its tasking procedures to meet SatCen's developing needs.

In 2019, the Earth Observation data quota granted to SatCen by the EC through the Copernicus Data Warehouse was of great importance and significantly contributed to the SatCen's analytical capability.

The increase in tasking over recent years has not only led to a subsequent increase in products, but has also had an impact on the production process, with SatCen adapting its workflows in response to the high volume of images.

SatCen liaised further with commercial providers with the aim of improving access to satellite resources and capabilities. Negotiations with the most relevant providers are a continuous process and lead to improved contractual conditions, financial optimisation and better service. In this context, SatCen made use of annual subscription services from DigitalGlobe (Secure Watch service) and followed up its participation in the Airbus OneAtlas 'Early Adopter Program' testing phase.

Depending on the nature of some task requests, the Centre also obtained very high resolution 3D textured Digital Surface Models.

SatCen provides ESA and the European Commission with requirements for Security Applications for the Copernicus Data Warehouse with the aim of constantly improving data acquisition.

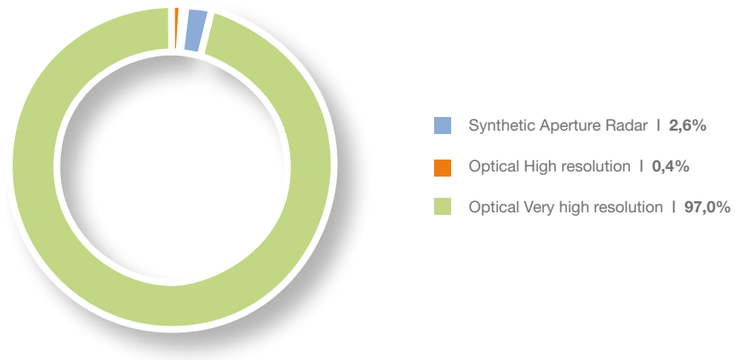
Below is the distribution of imagery acquired in 2019 split by sensor type. The vast majority of imagery was very high-resolution optical imagery, in line with the nature of tasking requirements.

Sensor	Images	Square km
Synthetic Aperture Radar	123	36,712
Optical High resolution[1]	20	19,706
Optical Very high resolution[2]	4627	579,800
Total	4770	636,218

[1] Between 1 and 15 metres

[2] Below 1 metre

IMAGES ACQUIRED IN 2019 BY SENSOR NATURE & RESOLUTION

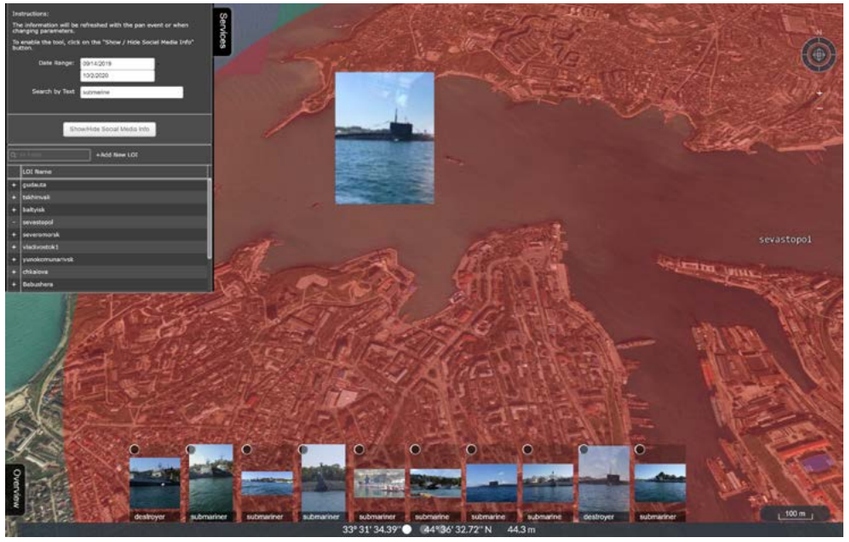


4.2. Innovation in Information and Communication Technology

SatCen continued to develop its business intelligence infrastructure in support of its activities. This process, which involves business owners and the user community in the implementation of improvements and the innovation of processes and tools, makes the Centre a de facto pooling and sharing hub in the EU.

Development of tools for acquisition, sharing and analysis of data

The operational use of artificial intelligence progressed constantly in 2019. A service to automatically detect small ships and cars used in migration related activities was deployed. Also, a web based labelling tool was developed in order to accelerate the creation of training datasets for GEOINT artificial intelligence applications. The 3D Catalogue was improved to consume and visualize artificial intelligence geospatial services.



Use of artificial intelligence to browse open social media (© SatCen)

An automatic process was deployed, which ingests open street map data, converting it to the SatCen data dictionary and making it available to SatCen analysts. Also, a tool to automatically ingest and present ship transponder signals (AIS signals) to analysts in their working environment was developed and deployed.

Infrastructure and services

Classified services were adapted to support external authentication, and tests were conducted with the EEAS to provide interactive classified services to the EUMS and INTCEN. The next steps will be to provide those same services to the Member States connected to EU OPS WAN.

The new version of the SPACE (SAR Planning And Collection Element) application from the REACT (Radar imagEry Applications supporting ACTionable intelligence) project was deployed and is now available through the internet for use by Member States and internally by analysts.

The GISMO GeohuB developments continued. During 2019, EUMM Georgia and Operation Sophia have been benefitting from its geospatial information sharing capabilities. Deployment at Operation Atalanta is planned for 2020.

The development of the Copernicus SEA Service Management Infrastructure (SMI) started. It is a platform providing a broad set of functionalities and integrated tools to support the entire operational workflow and the service management (Task Building, Workflow Management, Document Management, Business Intelligence, Data Storage). At the end of 2020, the first release will be available for testing from the Users.

4.3. Capability Development in Space, Security and Defence

In compliance with the framework provided by the Council Decision of 26 June 2014 and following the decisions and recommendations of the Board and the Council, the Centre continued to participate in EU programmes and relevant initiatives. Involvement in such activities has provided valuable tools and services in support of the SatCen core business, thereby contributing to the protection of space assets, supporting EU external action, border and maritime surveillance activities, as well as developing innovative Earth Observation solutions. It also constitutes an important source of additional tools and resources for the benefit of SatCen, its stakeholders, users and the European Commission.

Cooperation with the European Commission

SatCen cooperation with the Commission ranges from the involvement in a number of R&I initiatives up to the participation in the operational implementation of the Copernicus programme and SST SF of the Union with all its components.

SatCen continued its collaboration with DG-DEFIS, mainly in the framework of Copernicus. As Entrusted Entity for the implementation of the Copernicus Service in Support to EU External Action (SEA), SatCen participated to the Copernicus governance bodies (i.e. Copernicus Committee, Security and User Forum).

Cooperation with DG-ECHO for the Copernicus Emergency Management Service (EMS) was strenghtened and resulted in new tasks for the SEA Service, in addition to the routine coordination regularly in place between SEA and EMS.

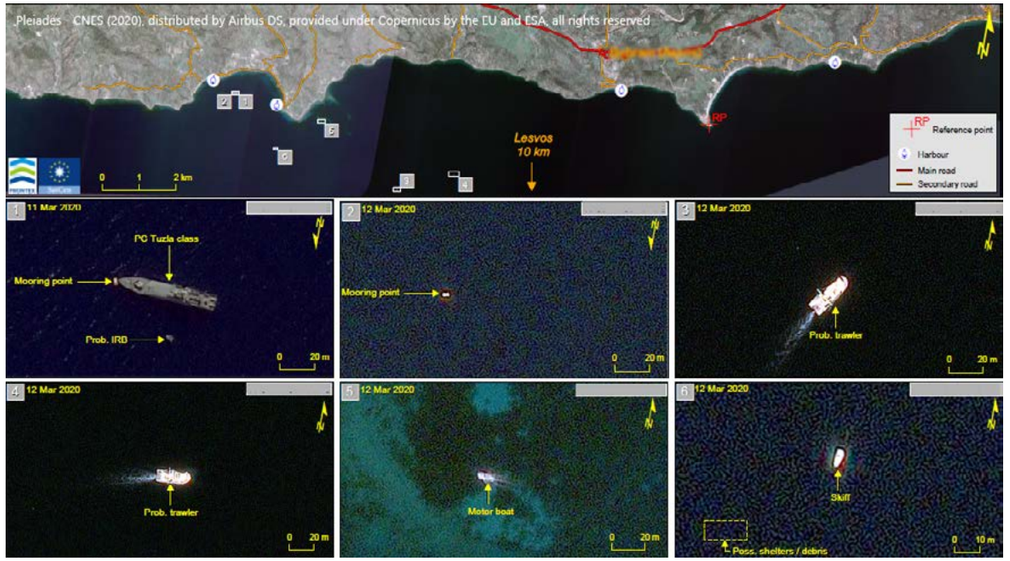
Close contacts with DG RTD and DG CNCT also continued, mainly in the framework of SatCen participation to GEO and as a result of RTDI activities related to Big Data.

SatCen and EFCA started exploring areas for possible interagency cooperation, as well as in the frame of Copernicus.

SatCen participates in The Common Information Sharing Environment (CISE) for maritime surveillance in full coherence with EU Maritime Security Strategy (EUMSS), and its revised Action Plan adopted in June 2018 by the Council.

Additionally, SatCen contributed to the expression of requirements for SEA to the Copernicus In-Situ activities in cooperation with the European Environmental Agency (EEA), managing this component.

In the frame of the Inter-Agency cooperation and Copernicus Border Surveillance, SatCen continued its support to FRONTEX with the service provision and started the preparation of the next Service Level Agreement.



Coastal monitoring on EU External Border (analysis and classifications of ships in the Location of Interest)

The Copernicus programme

The implementation of the Delegation Agreement for Copernicus SEA and the Service Level Agreement with Frontex increases the operational capacity of SatCen (reflected in a 30% increase of production). The Copernicus related activity includes support to innovation, such as Service Evolution, where pilot projects are conducted together with users to create new and innovative products.

R&I initiatives through the H2020 Programme strongly contribute as well to the cooperation with the Commission. Work on five projects continued in 2019: CivilNext, MEDEA, NextGEOSS, BETTER and E-SHAPE, covering areas from Gathering of User Requirements to Technological Development. R&I contributes to the enhancement of SatCen core activities for the benefits of its users.

The Copernicus programme

As Entrusted Entity of the Copernicus Service in Support to EU External Action (SEA) and provider to the Frontex Copernicus Border Surveillance Service, SatCen continued to be involved in the security dimension of the Copernicus programme.

The Delegation Agreement with the Commission and the Service Level Agreement with Frontex are key instruments that increase the Operational Capacity of SatCen. Greater capacity allowed users of the SatCen to satisfy their needs for facing increasing and emerging scenarios in external action and border surveillance as illustrated in some examples below.

In order to contribute to wider EU efforts to disrupt the business model of human smuggling and trafficking networks in the Southern Central Mediterranean, and to prevent the further loss of life at sea, EUNAVFOR MED operation Sophia is undertaking systematic efforts to identify, capture and dispose of vessels, and disenabling assets used or suspected of being used by migrant smugglers or traffickers.

During 2019, Copernicus SEA provided Activity Reports to its users, to be exploited in combination with their own intelligence for appropriate decision-making. The products delivered used Very High Resolution imagery, allowing a comparative analysis of maritime and ground based commercial activities. This type of products underpins the generation of the intelligence necessary to identify hot spots of illegal activity in the area and to help predict activity at sea.

Activity Analysis on Benghazi.

EU Missions and Operations also required actionable products to support their operational decision-making. For example, operations on land need a thorough knowledge of the available routes and the terrain to conduct safe logistics in the field.

Humanitarian Action is a fundamental pillar of the EU's external action. The EU is the world's largest donor of humanitarian aid, providing assistance to crisis zones, countries facing post-conflict instability and countries dealing with 'forgotten crises'.

Photo credit: EU/ ECHO/Caroline Gluck

DG-ECHO, the EC department for humanitarian aid, has staff deployed permanently in the field. During 2019, Copernicus SEA has supported staff in the field by providing products to support Evacuation Planning in Bangui and Khartoum. Using the latest satellite imagery, Copernicus SEA is able to create up-to-date urban maps on urban areas where existing cartography is normally outdated. This urban information is then processed to calculate optimal evacuation routes in terms of speed and safety, from designated rally points to the identified evacuation points.

In order to fight against crime, and in particular cross-border crime, Law Enforcers need quick and extensive monitoring on the routes used by smugglers. SatCen continued its provision of EO based intelligence to Frontex for the Copernicus Border Surveillance.

This example shows the illicitly organised transport of humans. Inserting collateral pictures inside a product helps the customer to better understand what is shown (©SatCen)

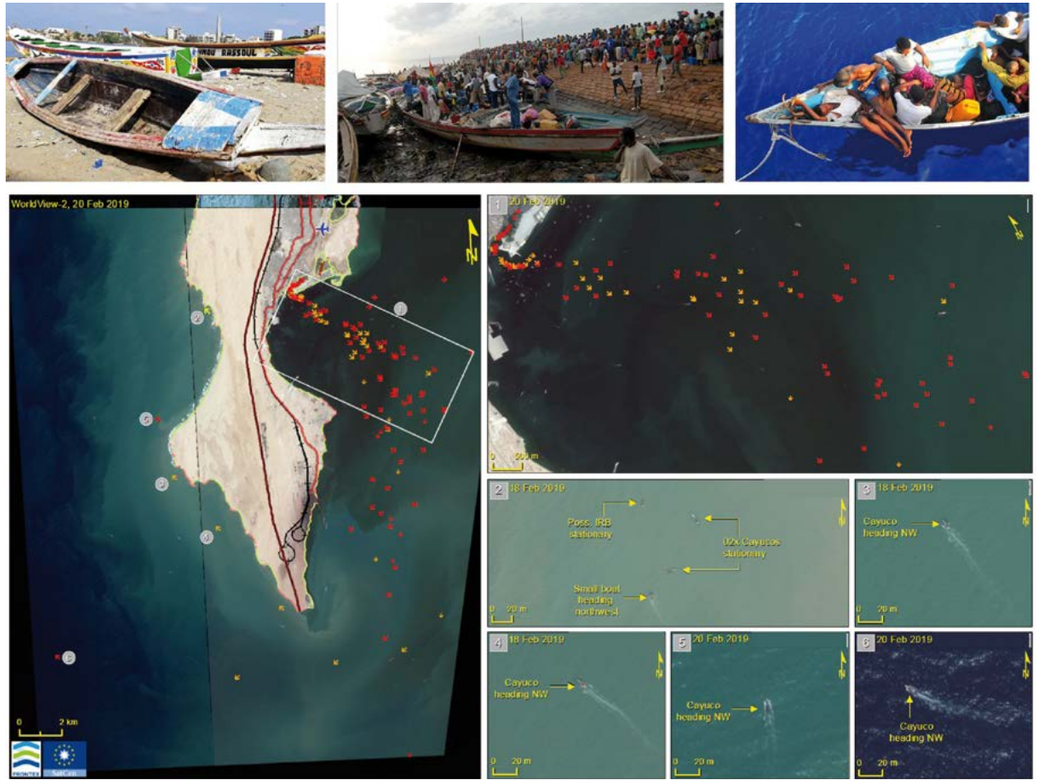
Pilot projects were implemented addressing new topics, such as environmental crime, with the objective to develop comprehensive solutions for new services and products to be included in the Portfolio. Pilot projects were conducted in cooperation with users expressing emerging or challenging needs. For the case of environmental crime, a successful pilot was produced together with Slovakian law enforcers, demonstrating the capacity of Copernicus SEA to provide support in the field of illegal waste monitoring.

Moreover, innovation activities focus on aspects other than the creation of new products, such as innovative access and exploitation of Sentinel satellites. In cooperation with ESA, SatCen tested a service of exclusive tasking of Sentinel-1 imagery in StripMap mode to provide service to security applications exploiting the current orbit idle time of a satellite originally planned for climate change applications.

A contract for the provision of services for the development and maintenance of a Service Management Infrastructure (SMI) was awarded in June 2019. The SMI consists of a platform providing a broad set of functionalities and integrated tools, fully supporting the operational workflow and the service management, connecting the different stakeholders involved in the SEA service.

As for the Service Level Agreement with Frontex, in the frame of the Copernicus Border Surveillance service evolution, SatCen validated the results obtained from a demonstrator research project on Artificial Intelligence for the detection of vessels and vehicles, awarded to the Katholieke Universiteit Leuven and LUCIAD NV. Further developments and improvements have been proposed to Frontex.

SatCen also delivered a report on the use of Sentinel-1 imagery to Frontex and developed a cloud-based platform to assist the analysis of Sentinel-1 StripMap images. The operational use of the platform was validated and used to support Frontex tasks.



Coastal Monitoring: Potential irregular migration towards the European Union.
Vessel Analysis: Cayucos sailing out of and away from the harbour (Africa)
WorldView-2 ©Digital Globe (2019) provided under COPERNICUS by the European Commission, ESA and European Space Imaging

As for SEA User Uptake, SatCen continued user engagement activities e.g. through training to the UN, organised upon request, and through the organisation of visits to Member States and Copernicus Participating Countries (EU28 + Norway and Iceland). The main objective of these visits was to increase awareness about the possibilities of the Copernicus SEA Service for its users and to engage new national users. This enabled progressive extension of the Copernicus SEA User Community (i.e. more users from Member States) and the identification of new areas for action such as environmental compliance, specific intelligence for Maritime Security, cultural heritage and security of international events (G7, Summit, etc.).

The 4th SEA User Workshop took place on 30-31 October 2019 in Sorrento, Italy. Representatives from the European Commission (DG-GROW, DG-ECHO DG-ENV, DG-JRC), the European External Action Service, EU Agencies (FRONTEX, EFCA, EDA, EU ISS), Space Agencies (ESA, ROSA, CNES), 11 Member States (with representatives from different ministries) and the UN (Geospatial Information Section) from New York OHQ participated in the workshop. It included a day dedicated to user experience of the service (Training sessions in 5 languages) and some interactive sessions to give the users the opportunity to discuss with SatCen experts.

4th Copernicus SEA Workshop, 30-31 October 2019 in Sorrento (© SatCen)

Space Situational Awareness (SSA)

SSA and **Space Surveillance and Tracking** (SST) activities aim to protect space-based assets, and the related space-based services our economies, societies, and citizens in Europe greatly depend on, such as earth observation, navigation and communication.

SST activities protect space-based assets from the risk of collision against other satellites or space debris, detect and characterize fragmentations in space, and predict the re-entry of space objects that may cause damage on the ground.

Space Situational Awareness (SSA)

In the context of SSA activities, and specifically in the EU Space Surveillance and Tracking Support Framework (SST), managed by the European Commission, SatCen continued to cooperate with the SST Consortium, composed by eight Member States (DE, ES, FR, IT, PO, PT, RO, UK).

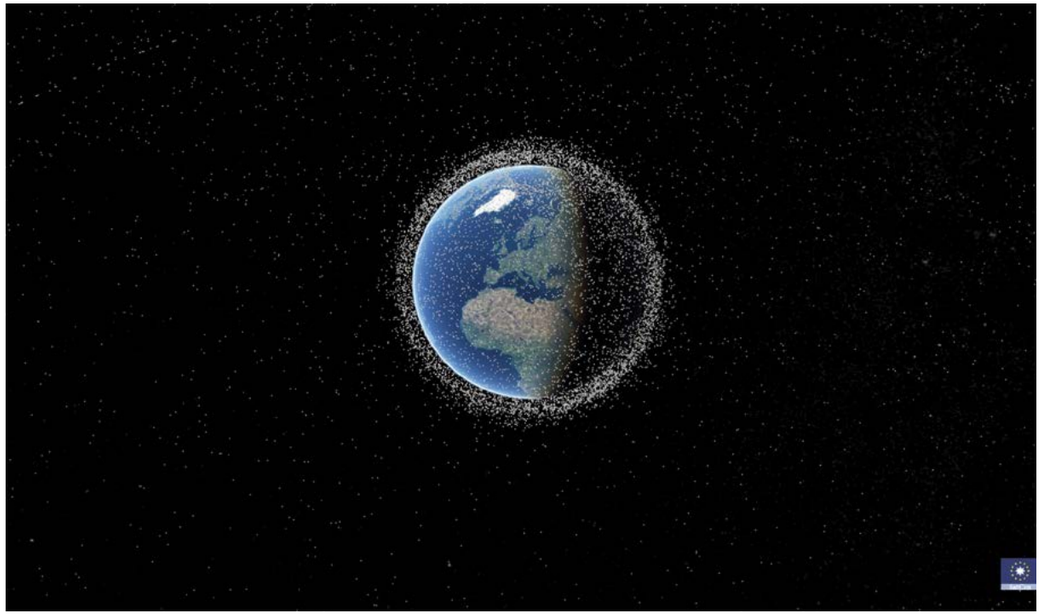
SatCen continued to develop its role in the EU SST endeavour, as the EU SST Front Desk, focusing on the provision of SST services i.e. collision avoidance, re-entry prediction and fragmentation analysis, through its Service Provision Portal (https://sst.satcen.europa.eu) and Helpdesk. In addition, SatCen is responsible for leading the user coordination activities, supporting, promoting and encouraging the use of SST services, as well as gathering feedback from users for the continuous improvement of the EU SST capability.

In 2019, important progress was made in terms of the performance, coordination and promotion of the SST services. Services are provided to approximately 110 users from 64 different organisations, such as satellite operators, and civil protection entities, with roughly 130 European satellites safeguarded by the Collision Avoidance service. With respect to the Fragmentation Service, a notable event was the ASAT (Anti-Satellite) missile test conducted by India at the end of March. EU SST committed to confirm, detect, track, identify, and catalogue the break-up fragments and to mitigate the risks generated by this cloud of space debris.

The 1st EUSST Webinar took place on 27 November 2019. (© EUSST)

In the scope of the user interaction activities lead by SatCen, the 1st EU SST Webinar took place, aiming to provide an overview of the EUSST capability and its SST services (https://www.eusst.eu/news/webinar).

In addition, SatCen participated in several activities contributing to the evolution of the EU SST capability, in particular defining the activities to be carried out in the next SST projects, where SatCen will evolve its EU SST Service Provision Portal, lead the User Interaction, the Dissemination and the Key Performance Indicators project tasks and activities.



Representation of man-made objects orbiting the Earth larger than 10 cm (© SatCen)

Research, Technology Development and Innovation

RTDI unit focuses on R&I, capitalizing on technological research activities at SatCen, with the objective of enhancing the operational capabilities of SatCen and its stakeholders. It also coordinates cooperation with key entities in the EO domain such as ESA and GEO, as it is essential to be aware of the latest developments and steer efforts towards the most adequate activities.

Research, Technology Development and Innovation (RTDI)

Space and IT technologies are today advancing at a hectic pace, incrementally delivering improved capacities across the complete EO data value chain.

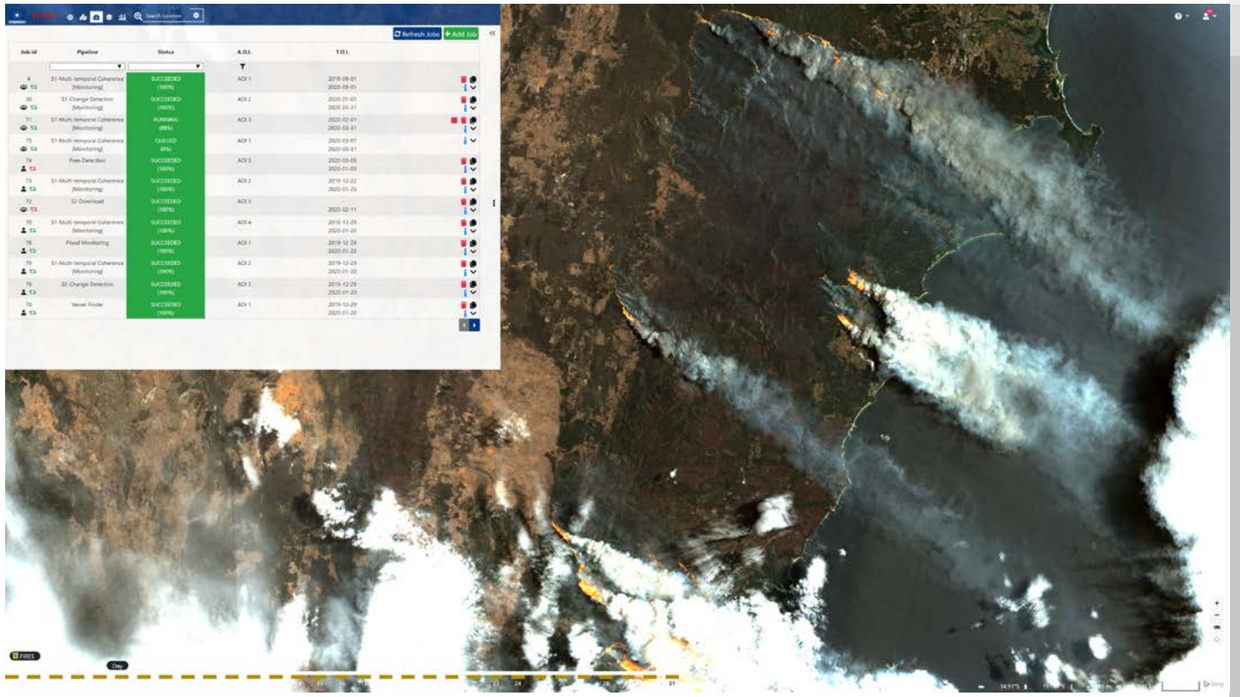
To maintain SatCen capabilities at the state-of-the-art, it is crucial to ensure that appropriate Research and Innovation (R&I) activities are put in place. In this respect, RTDI focuses its activities in developing solutions that implement advanced technologies and cutting-edge applications to satisfy the growing needs of Space and Security stakeholders.

In 2019, the first stable version of the GEOspatial Data Management Platform (GEO-DAMP) was released. This platform provides SatCen with an environment to access and visualize data from heterogeneous sources (e.g. satellites and AIS) as well as to launch processing services and analyse the results. GEO-DAMP is conceived to be a platform to develop and validate prototype services resulting from R&I projects participated in by SatCen before going to the operational environment, to guarantee a smooth transition between R&I outcomes and operations. A particular effort was put in implementing and exploiting new applications relevant for Security using Sentinel-1 and 2 data.

RTDI activities are built around the SatCen participation in a number of R&I projects implemented in the framework of the EU Horizon 2020 Programme, supporting relevant policies such as the EU Common Foreign and Security Policy, the EU Green Deal and the UN Sustainable Development Agenda.

The NextGEOSS project made the first version available of a multi-domain EO platform to access, discover and share results in different fields of expertise, conglomerating more than 15 pilot applications. Within the BETTER project, six processing pipelines were implemented by SatCen, covering a wide range of applications using Sentinel-1 and 2 data, including monitoring of fires and burnt areas, illegal mining and illegal deforestation activities. The E-SHAPE project is gathering 27 cloud-based pilot applications addressing societal challenges to showcase European capabilities and to support the GEO engagement priorities as the UN Sustainable Development Goals.

In addition, a new H2020 project called ENTRUSTED was awarded to a consortium formed by EU Member States representatives and EU agencies (including SatCen) to work on the user segment of the future EU GOVSATCOM initiative, and to establish a solid and trustful network of governmental users.



Monitoring of the evolution of fires in Australia using Sentinel-2 data through the GEO-DAMP platform (© SatCen)

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Finally, the 4th edition of the Big Data from Space Conference (jointly organised by ESA, SatCen and JRC, and hosted by DLR) took place on 19-21 February 2019 in Munich. BiDS'19 focussed on 'Turning Data into Insights', giving much attention to new artificial intelligence and machine learning techniques.

Over 500 participants from all around Europe attended 42 high-level presentations at BiDS'19
(© DLR)

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Cooperation with the European Space Agency (ESA)

The Administrative Arrangement signed in 2018 between ESA and SatCen established a framework to foster cooperation in activities of common interest for both entities. On 22 January 2020, ESA EOP Director Mr Aschbacher and SatCen Director Amb. Ducaru met in Brussels to agree on a number of common joint activities for the coming years.

During 2019, cooperation activities continued in line with the annual priorities established, among which SatCen is providing user requirements to ESA contracts with Industry for the definition of future services that could enhance SatCen capabilities and, in general, EU capacities in the field of EO for Security. Specific activities were performed within the ESA ARTES and EO programmes to support the development of services based on High-Altitude Pseudo Satellites and satellite constellations considering the delivery of innovative imaging capabilities or on-board advanced processing. Moreover, technical cooperation was initiated with the ESA ϕ-lab to develop Artificial Intelligence applications aiming at automatically detecting specific features in Sentinel-1 images.

With the aim to further promote the contribution of innovative technologies and cutting-edge applications in the Space and Security domain, SatCen organised the session "Space 4.0 for Secure Societies", together with JRC, within the ESA Living Planet Symposium 2019, as well as a side event on "AI 4 Secure Societies" within the ESA ϕ-week 2019.

Cooperation with the Group on Earth Observations (GEO)

GEO is an intergovernemental organisation that has as engagement priorities the support to the UN Sustainable Development Goals, to the Paris Agreement and to the Sendai Framework. Moreover, the GEO community is creating a Global Earth Observation System of Systems (GEOSS) to better integrate observing systems and share data by connecting existing infrastructures using common standards.

SatCen actively participates in GEO since 2014, when it joined as a Participating Organisation, and therefore endorses the multi-annual Strategic Plan and supports the engagement priorities. SatCen is currently a member of the European GEO High Level Working Group and of the EuroGEO Coordination Group, contributing to deliver a coordinated and valuable European contribution to GEO.

As leader of the Space and Security Community Activity, SatCen defined and submitted the implementation plan for the 2020-2022 period, establishing lines of actions and priorities for the partners of the community, with the goal of increasing the interaction and contributions to GEO along this period.

With regard to 2019 key events, SatCen actively participated to the GEO Symposium in Geneva and to the EuroGEO Workshop in Lisbon, and contributed to the GEO Week, that was held together with the Ministerial Conference in Canberra (Australia), with presentations and videos showing the results of a SatCen pilot on Civil Security.

Cooperation with the European Defence Agency

SatCen pursued its collaboration with EDA through different projects in line with the common framework agreement established between the two agencies in 2016 . EDA Chief Executive, Mr Domecq, and the SatCen Director, Amb. Ducaru, met on 1 July 2019 to discuss their agencies' cooperation and the updated EDA-SatCen Roadmap.

In 2019, this cooperation included activities such as the Maritime Surveillance (MARSUR) Management Group meeting held at the EDA premises on 30-31 January. The meeting resulted in a list of actions, which involved further SatCen contribution. SatCen has been participating in the MARSUR project since 2008, at working level and within the context of its cooperation with EDA, providing its expertise for potential applications of satellite imagery analysis for maritime situational awareness.

The MARSUR network, originally designed by the EDA, comprises the navies of 17 EU Member States and Norway, and facilitates the exchange of operational maritime information and services between its Members. In 2017, SatCen joined the MARSUR Users Network and is an observer in the Management Group. It has access to maritime information, coming directly from Member States' Navies, applicable to its IMINT and GEOINT analysis.

SENTINEL Hub

MARSUR
Maritime Surveillance Networking

Over the Mediterranean Sea, the combination of radar (left) and optical (right) data from Sentinel Satellites enables the confirmation of presence Vs AIS Data, even in bad weather conditions, illustrating here the case of drilling operations. The use of the SatCen GEO-DAMP Tool allows the almost real time comparison of heterogeneous data from different sources.
(© SatCen)

In relation to the REACT2 (Radar imagEry Applications supporting ACTionable intelligence) project, the contractor, e-GEOS, delivered the SPACE (SAR Planning And Collection Element) tool and SatCen hosted in January the stage 1 training with 20 participants from six Member States and SatCen staff. Stage 2 of REACT2 was presented by EDA to Member States at a dedicated session

at the SatCen Technical Working Group meeting held in February. In December, SatCen hosted the REACT2 Stage 2 Interactive Operational Manual (IOM) training session with the presence of five Member States, Frontex, EU NAVFOR Atalanta and SatCen staff, at which e-GEOS demonstrated the combination of the SPACE tool and the IOM tool for the best usage and exploitation of SAR. The kick-off meeting for REACT2 stage 3, dedicated to the implementation of another tool named the Feasibility Management Layer tool, was also held at this occasion.

SatCen also hosted at its premises the EDA 10th Space Based Earth Observation Working Group (SBEO) and the METEOR 1 Mid-term Review (Military EO requirements study) in March.

In April, the EDA Deputy CEO and the SatCen Director gave a joint presentation to the PSC to present the complementary roles and activities of the two Council Agencies within the space-based domain, with focus on the objectives and the deliverables of the cooperation between the agencies, namely GISMO, MARSUR, and REACT.

EU NAVFOR ATALANTA in Rota and Spanish and Italian authorities requested the installation of the GeoHub software at their premises (EU OHQ in Rota, ES, Dirección General de Política de Defensa - Centro de Sistemas Aeroespaciales de Observación, ES and Centro Operativo Interforza, IT). The GeoHub is the operational geospatial web application developed in the frame of the GISMO initiative, specifically designed to help produce, share and manage large amounts of geospatial data and products. These deployments will be addressed in the frame of the extension of the GISMO4 project. A new, shared initiative between the two agencies, GEONAW (Geographic Navigation Warfare), was set up consisting of a feasibility assessment for the visualisation and the simulation of Positioning Navigation Timing threats on a digital map using the GeoHub interface.

5. A secure context

The EU Satellite Centre, following the EU Security Regulations and as an agency working in field of CFSP and CSDP, requires its entire staff to be cleared up to and including EU SECRET. SatCen staff therefore systematically undergoes a vetting procedure according to its respective National Security Authority indications and SatCen has always enhanced the communication with the Member States' National Security Authorities for this purpose. In this context, BREXIT was a key point, requiring intensifying and reinforcing this communication with relevant National Security Authorities in 2019 to be able to deal with the different uncertainties and doubts created.

Member States' National Security Authorities continued their transition to new digitalised processes giving the SatCen Security Office the opportunity to communicate more efficiently and providing more flexibility in the ongoing processes.

The reception and security rooms were refurbished so that the security guards could carry out their work in optimal conditions and the physical security was even further reinforced and prepared for the next extension of the building.

As agreed with the Spanish Ministry of Defence, SatCen has a secure space assigned where it will be possible to store classified information in case of an emergency in which physical security cannot be guaranteed in the SatCen facilities. This secure space is also necessary to regularly deposit a copy of the SatCen IT data, so that the latest updated information can be recovered if the servers break down in case of an accident or if the security cannot be guaranteed for any other reason. SatCen is waiting for final authorization by the Spanish authorities in order to proceed with the technical-logistic aspects.

A theorical-practical firefighting course was held at the Base fire brigade facilities and SatCen staff was trained by firefighters.

SatCen's operational classified network and its interconnection with the EU Operational Wide Area Network (EU OPS WAN) have been successfully reaccredited to EU SECRET LEVEL after a thorough inspection by the Spanish National Security Agency that once again provided great support to SatCen in the process.

This allowed the deployment of new classified geospatial services over EU OPS WAN providing Brussels and Member States interactive access to SatCen's database.

An automatic replication of all SatCen's unclassified data within another EU Institution's data centre has been put in place, providing remote backup for SatCen in case a disaster would occur.

Finally, a cybersecurity exercise involving all staff was conducted that demonstrated higher awareness of the Staff than a couple of years before.

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6. Resource management

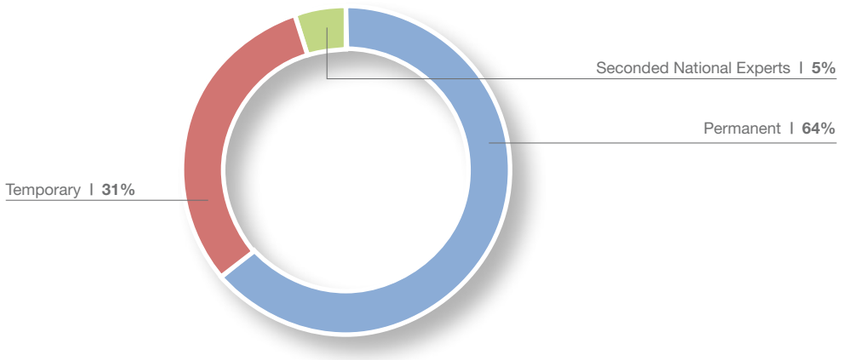
6.1. Personnel

SatCen's highly qualified and dedicated personnel are considered the Centre's main asset. Given the specificity of SatCen's activity, with high level of expertise, reactivity to urgent tasks and being continuously at the cutting edge of technological developments, the permanent access to the newest techniques and technologies and well as consistent and updated training are key for upholding the essential added value of SatCen's human resource pool.

In 2019, SatCen was composed of 140 staff: 90 permanent posts, 43 temporary posts and 7 seconded national experts who complemented the pool of imagery analysts and the Directorate staff.

The breakdown by type is illustrated below.

EU SatCen Personnel, 2019



The Centre hosted SNEs from France, Hungary, Poland, Romania and Slovenia, reinforcing SatCen's analysis capability while at the same time strengthening operational ties with Member States.

SNEs not only reinforce the operational capacity and widen the spectrum of services, as recommended by the High Representative, but also help foster transparency and a fruitful exchange of knowledge. The hosting of SNEs is also an efficient means of spreading awareness of SatCen capabilities and of achieving a common approach.

During the first semester of 2019 those that had volunteered to become confidential counsellors went through specific training in order to fulfil the role. Confidential Counsellors assist individuals who feel they have suffered psychological or sexual harassment at work.

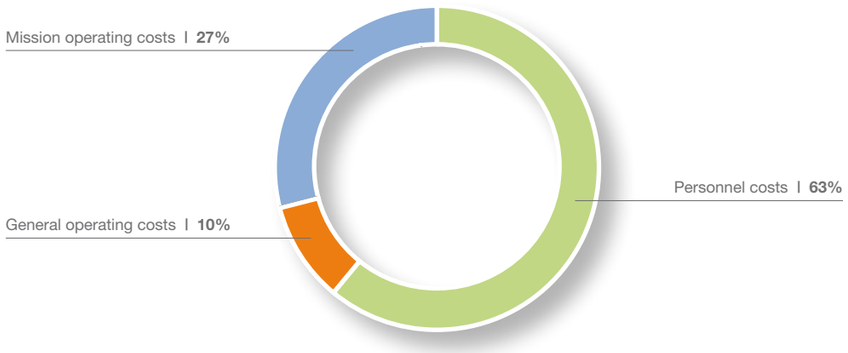
6.2. Finance

6.2.1. EU SatCen Budget

Extraordinarily, the operational budget for 2019 was approved by the SatCen Board under the silence procedure on 19 July 2019, as MS could not reach an agreement before. Due to the late approval of the Budget, Art 6.12 of the Financial Rules needed to be enforced and the expenditure during almost the first half of the year was restrained. The approved expenditure was € 21.526.279. This represents an increase of € 1.531.759 (7,49%) compared with the Budget for 2018. Out of this, € 12.830.887 was financed through Member States' contributions, representing a decrease of € -8.110 (2,31%) compared to the 2018 approved figure.

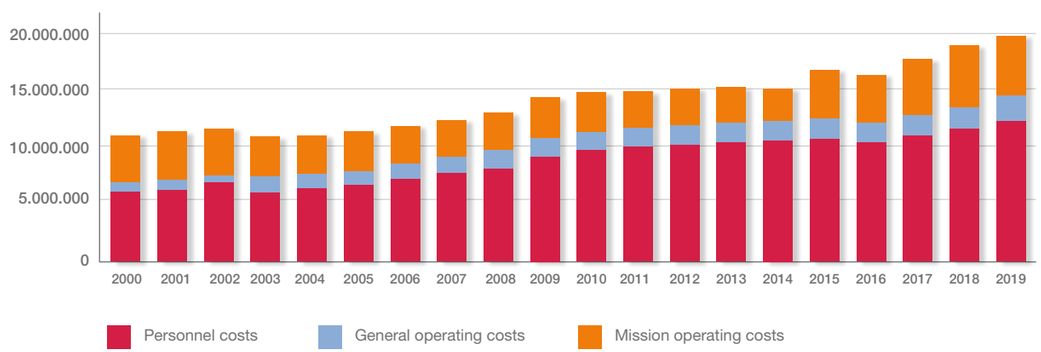
The following chart illustrates the SatCen Budget for 2019 by expenditure chapters. It reflects the fact that SatCen's activity is human capital intensive, since it is the high-level expertise and dedication of specialised staff, further empowered by state of the art IT support and dedicated applications, mostly developed in-house, that enabled SatCen's 30% increase in output in 2019 while national contribution to the Centre's budgets did not increase:

EU SatCen Budget 2019 by cost categories



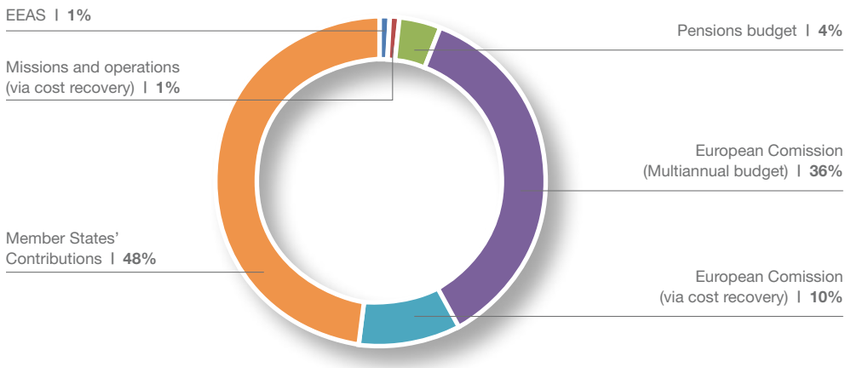
The following chart compares the evolution of these expenditure categories from 2000 to 2019.

Budget expenditure evolution 2000-2019



The income sources of the SatCen Budget 2019 are depicted below.

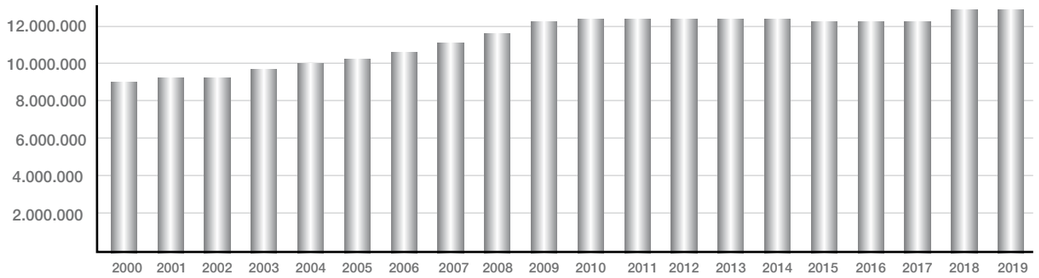
EU SatCen Budget 2019 by funding source including Pensions Budget and Multiannual Budget



The following chart compares the evolution of the Centre's approved budgets (Member States' contributions) in nominal and in real terms from 2000 to 2019:

SatCen budget evolution

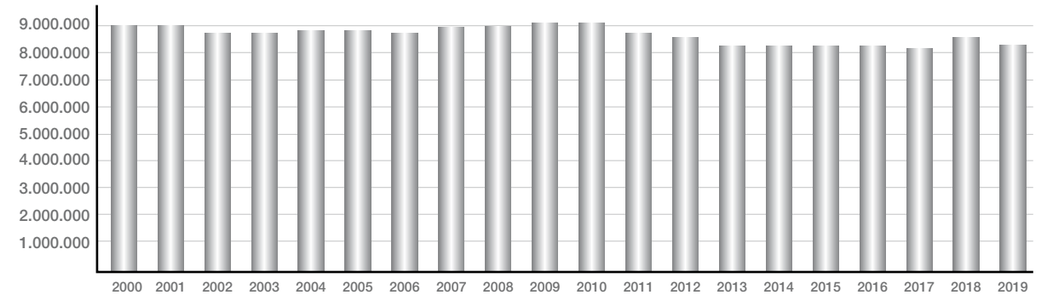
(Member States' contributions)



Despite the impression that the budgetary trend is one of slight growth followed by stagnation (nominal Euro values), a very different trend emerges when comparing the different budgets in a constant, year-2000 Euro value (real terms):

SatCen budget evolution

SatCen Budget in fixed 2000 Euros



6.2.2. Financial Management

The Budget 2019 was approved in the context of important uncertainties produced by the prospective withdrawal of the UK from the European Union. The Centre presented its requirements for the execution of the operational work as well as support and development activities, even reduced to the most economical cost. Paradoxically, despite the permanent increase of operational workload and number of SatCen users, the condition for its approval was, after months of debate, the zero increase of the funding from the Member States.

Funding provisions needed to be supported by the additional income in terms of cost recovery of services requested by EU missions and operations, the European Commission, Union agencies or bodies and international organisations. Of particular importance in this period was the amount of cost recovery based on the agreement for the support to the OSCE Special Monitoring Mission in Ukraine.

This income has resulted in an effective temporary solution since 2015. However, it does not constitute a sustainable funding system.

Apart from the current scenario of operational increase, the Centre's cooperation activities with the Commission and with Union agencies, bodies and Member States are increasing. 9,7M€ were financed by the European Commission in the frame of Copernicus (SEA and Border Surveillance support to Frontex), SST and R&I projects. An important factor affecting resources needed was the announcement made by the Commission in mid-2019 that the Centre would lose its assigned quota of the access to the Data Warehouse (DWH) for other tasks than those linked to Copernicus. This quota was granted to SatCen during the initial phase of implementation of the Copernicus Programme. The value of data received under the DWH quota was approximately 2M€ per year.

Furthermore, in view of the increasing activity, the extension of the Centre's premises is becoming an urgent requirement. Budget funding provisions for 2018 included funding for the first phase of the future building extension and provisions for 2019 included funding for the second phase, approved by the Board. The foreseen date for the works to start is mid-2020, as all administrative processes seem to be progressing well. Construction works are estimated to last 18 months.

7. Conclusions - Looking into the future

The year 2019 has been a complex "test year" for SatCen's capacity to deliver in line with its mission, to increase its visibility and pursue an important, future-oriented process of strategic evaluation and projection of visionary developments, along with associated potential implementation options. The strategic analysis, carried out by SatCen jointly with the EEAS's, STF's and the Centre's stakeholders, is based on the trend of continuously evolving user demand as well as on important developments in terms of data offer and advanced analysis techniques and tools. The outcome calls for a substantial upgrade of the SatCen business model with the key goal of enabling the Centre to continue to support the growing user needs and to sustain the increasing EU level of ambition in terms of security and strategic autonomy, as also reflected in the multiannual financial perspectives 2021-2027.

Already the HR report on the functioning of SatCen, delivered to the Political and Security Committee in 2019, pointed out the broadening spectrum of security threats and the resulting increase in SatCen user demand. This augmentation applies to both quantity and quality as well as to frequent requests for sharply reduced response times. Against this background, the need to assure a sustainable funding to support SatCen's growing user demand and role is key.

The High Representative/Vice President Josep Borrell concluded his SatCen visit in early 2020 by stating that the Centre deserved to be more visible and present on the "political orbit" of the EU and Member States' decision-making. From the perspective of his role as Chair of the SatCen Board, he expressed the interest to chair a ministerial level Board meeting, with the aim of deciding on the future level of ambition and associated resourcing for the future of SatCen.

The year 2020 has started as even more complex and testing, due to the impact of the Covid19 pandemic over the whole world and in particular over Europe. Notwithstanding the direct impact of the pandemic upon SatCen staff and "modus operandi" it is important to highlight the resilience and ability to adapt of the SatCen team, proven by the capacity to assure business continuity and to serve the HRVP, EEAS, Member States, EU missions and operations, other EU bodies or agencies, as well as international partners.

On the basis, of the valuable work conducted so far and the lessons learned from the Covid19 crisis, the strategic discussion on the future of SatCen will continue in 2020, in close consultation with Members States, the EEAS, the Commission and other relevant actors, with the view to identifying a viable way ahead in line with the growing role and relevance of SatCen's activities and level of ambition the EU and its Member States.

Visit of HRVP Josep Borrell to SatCen on 24 February 2020

Annexes

Annex I

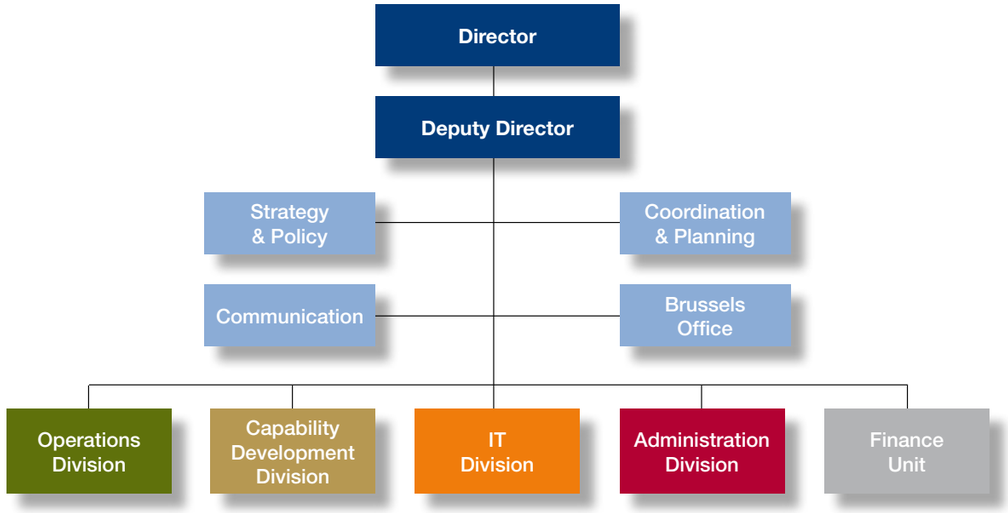
ABBREVIATIONS

ARTES	Advanced Research in Telecommunications Systems
BETTER	Big-data Earth observation Technology and Tools Enhancing Research and development
CFSP	Common Foreign and Security Policy
CMPD	Crisis Management and Planning Department
CNES	Centre National d'Études Spatiales (French National Centre for Space Studies)
CPCC	Civilian Planning and Conduct Capability
CSDP	Common Security and Defence Policy
EC	European Commission
EDA	European Defence Agency
EEAS	European External Action Service
EO	Earth Observation
ESA	European Space Agency
E-SHAPE	EuroGEO Showcases: Applications Powered by Europe
ENTRUSTED	European Networking for satellite Telecommunication Roadmap for the governmental Users requiring Secure, inTeroperable, InnovativE and standardiseD services
EUMM	European Union Monitoring Mission
EUMS	European Union Military Staff
Frontex	European Border and Coast Guard Agency
GEO	Group on Earth Observations
GEO-DAMP	GEOspatial DAta Management Platform

GEOSS	Global Earth Observation System of Systems
GEOINT	Geospatial Intelligence
GISMO	Geospatial Information to Support decision Making in Operations
HR/VP	High Representative of the Union for Foreign Affairs and Security Policy / Vice President of the European Commission
IMINT	Imagery Intelligence
INTCEN	Intelligence and Situation Centre
MARSUR	Maritime Surveillance
MPCC	Military Planning and Conduct Capability
NAVFOR	Naval Force(s)
NextGEOSS	Next Generation GEOSS for Innovation & Business
OHQ	Operations Headquarters
OSCE	Organisation for Security and Cooperation in Europe
PSC	Political and Security Committee
REACT	Radar imagEry Applications supporting ACTionable intelligence
RTDI	Research, Technology Development and Innovation
SAR	Synthetic Aperture Radar
SEA	Support to EU External Action (Copernicus)
SIAC	Single Intelligence Analysis Capacity
SMM	Special Monitoring Mission
SNE	Seconded National Expert
SSA	Space Situational Awareness
SST	Space Surveillance and Tracking
STF	Space Task Force

Annex II

ORGANISATIONAL CHART



Annex III

MEETINGS AND EVENTS

The Centre received and organised the following key visits and meetings in 2019:

10 January	Général Vincent Carré, Inspecteur Général des Armées-Air
6 February	43rd Technical Working Forum
7 February	44th Expert Users Forum
7 March	Delegation of the French Embassy in Spain
13 March	Lt. General Nicolò Falsaperna, Secretary General of Defence and National Armaments Representative, Italy
15 March	UN Panel of Experts on Libya
19 March	Mr Thierry Racaud, Chief Executive Officer, ESSP
21 March	Dr. Gerhard Conrad and Big. Gen. Lars Olof Corneliusson, Single Intelligence Analysis Capacity Dĭrĕctors
25 March	Latvian Delegation, Defence Intelligence and Security Service
26 March	Ms Isabelle Benezeth, Copernicus and GEO inter-ministerial coordinator, Ministry of Education, Research and Innovation and delegation
8 April	Admiral Eric Chaperon, French Military Representative to EU and NATO
24 April	114th SatCen Board Meeting
29 April	Mr Francisco Fonseca Morillo, Head of European Commission Representation in Spain
8 May	Delegation from the Finnish Ministry of Defence, headed by Mr. Janne Tommi Kuusela, Director General, Defence Policy Department
17 May	ESAC Director, Prof. Günther Hasinger
22 May	44th Technical Working Forum
23 May	45th Expert Users Forum

SatCen

21 June	Lt. General Vincenzo Coppola, Director, Civilian Planning and Conduct Capability, EEAS
2 July	H.E. Ambassador Ivan Jančárek, Embassy of the Czech Republic to Spain
3 July	CSDP Course
9 July	Mr Christos Stylianides, European Commissioner for Humanitarian Aid and Crisis Management; Mr Fernando Grande-Marlasca, Spanish Minister of Interior; and Mr Luis Planas, Spanish Minister of Agriculture
16 September	German Parliamentary Delegation
19 September	Delegation from the French Ministry of Defence headed by the Chief of the Euro Atlantic Division of the French Defence Staff, General Bruno Foussard
8 October	Romanian Military Intelligence Directorate
9 October	45th Technical Working Group
10 October	46th Expert Users Forum
22 October	H.E. Ambassador Marc Andries M. Calcoen, Embassy of Belgium in Spain and Andorra
24 October	H.E. Ambassador Christian Ebner, Embassy of Austria in Spain
31 October	Mr Ronan Le Gleut, Sénateur, membre de la Commission des Affaires Etrangères et de la Défense
4 November	Lt. Col. Marc Jacoud, Commander of the French CMOS (Le Centre militaire d'observation par satellites)
6 November	Maj. Gen. Clinton E. Crosier, Deputy Chief of Staff for Strategy, Integration and Requirements, U.S. Air Force Arlington
13 November	H.E. Mr Dold Wolfgang, Ambassador of Germany to Spain

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14 November	H.E. Ms Koula Sophianou, Ambassador of Cyprus to Spain
18 November	Mr Erzen Ilijazi, Chief, Technology Operations Service, Office of Information and Communications Technology, United Nations
13 December	Mr Giorgio Porzio, Senior Policy Advisor, Civilian Planning and Conduct Capability, EEAS

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