1992 - 2022

30 years serving
a European security endeavor

SatCen

ANNUAL REPORT **2021**

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> “SatCen is a very important asset for our institutions and agencies, for Member States, for our missions and operations, because it provides us with critical geospatial intelligence analysis. It also provides our partners an invaluable view of what is happening on the ground.”

HR/VP Josep Borrell

SatCen Ministerial Board, 6 May 2021

> “The Council underlines the valuable contribution of the EU Satellite Centre to CFSP and CSDP, through its geospatial intelligence support to the Union’s intelligence analysis community, the CSDP missions and operations, in particular Operation IRINI, and the EU’s external action, notably supporting the UN, the OSCE, the OPCW, as well as to Member States.”

EU Council Conclusions, Security and Defence,
Following SatCen Ministerial Board, 10 May 2021

SatCen Board at Ministerial Level

At the first SatCen Ministerial Board held on 6 May 2021, Member States explicitly appreciated 'the valuable contribution of the SatCen to the Common Foreign Security Policy (CFSP) and the Common Security and Defence Policy (CSDP), through its geospatial intelligence support to the Union's intelligence analysis community, the CSDP and missions and operations'.

At the same time, Member States expressed their determination to strengthen SatCen to continue fulfilling its key geospatial intelligence support mission by exploiting relevant space assets and collateral data, for the benefit of the Union and of its Member States, as well as for the benefit of its partners.

They also highlighted the importance of maximising synergies and complementarities with other EU policies, developing the nexus between internal and external security, while matching EU and Member States' needs to optimise the use of financial resources.

Cooperation with Member States was encouraged to share expertise and enhance SatCen capabilities and to maintain the level of services provided.

Member States agreed on a development scenario that enables SatCen to keep up with the EU level of ambition in the area of security and defence, growing CFSP user demand and fast-paced developments in space and information technologies, and tasked SatCen with further detailing the 'Baseline Augmented' option presented to the Member States.

SatCen's first Board Meeting at Ministerial Level, Chaired by HR/VP Borrell, 6 May 2021

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French Ministry of Defence and Foreign Affairs Delegation, 15 October 2021

Foreword by the Director

At the time of writing this report, the EU is facing its most severe security challenge since the end of the Second World War, with Russia's unprovoked invasion of Ukraine. In these critical moments, the SatCen has swiftly redoubled its efforts and work intensity towards fulfilling its key mission to support, with geospatial intelligence analysis, the decision-making and actions of the Union and its Member States.

In this challenging context, and after two years of analysis and deliberations, the EU has adopted the Strategic Compass for Security and Defence - For a European Union that protects its citizens, values and interests and contributes to international peace and security[1]. The Strategic Compass highlights the relevance of SatCen activity and the EU Member States' commitment to 'strengthen the EU Satellite Centre to boost our autonomous geo-spatial intelligence capacity.' For the Centre, these decisions reflect important development opportunities, as well as increased responsibilities and expectations in terms of the quality and quantity of its state-of-the-art services. With its 30 years of expertise, SatCen operates and develops in the conviction that its raison d'être ultimately lays on the value-added it is able to provide, in line with the level of ambition defined by its key stakeholders: the EU Member States.

The past year has been challenging but also rewarding for the Centre. The ongoing COVID-19 pandemic has continued to affect its personnel and their working conditions, which have been characterised by heavy teleworking requirements. Nonetheless, SatCen has again displayed remarkable operational resilience and delivered on its mission in the context of an increasingly complex security environment, fast growing user demand and an increased level of ambition of EU Member States in the field of security, defence and space.

Furthermore, 2021 has been a year of strategic relevance for the Centre, reflected by the deliberations and conclusions of the first Ministerial Level SatCen Board held on 06 May 2021. The ministerial took place at the initiative of HR/VP Josep Borrell, the Chair of the SatCen Board, who advocated 'pursuing and reinforcing SatCen in order to guarantee the highest level of quality and European autonomy in the assessment of internal and external threats'. As an outcome of this historical event, Member States expressed their determination to 'strengthen SatCen's key mission for the benefit of the Union and of its Member States, as well as for the benefit of its partners'. In this regard, they highlighted the importance of 'maximising synergies and complementarities with other EU policies, developing the nexus between internal and external security, including maritime surveillance'.

Concretely, the Member States expressed their agreement and support for a development scenario enabling SatCen to keep up with the EU's level of ambition in the area of security and defence, with growing user demand, in qualitative and quantitative terms, and fast-paced developments in space and information technologies. This development is a key element of SatCen's strategic evolution; it will make the Centre able to cope with the surge in heterogeneous data, to process and to host the portfolio of geospatial services and applications developed and owned by SatCen, to house future

1. https://data.consilium.europa.eu/doc/document/ST-7371-2022-INIT/en/pdf

governmental imagery, as well new tools based on cloud technology, big data, and artificial intelligence (AI). It will be directly accessible to analysts and end-users, enable end-to-end tasking processes, including real-time monitoring of activities as well as processing at scale through algorithms running on large areas and on wide databases.

Beyond its political and strategic significance for SatCen's development, 2021 was also a year of peak achievements in its operational activity, marking the highest level of geospatial intelligence analysis production in SatCen's history. This reflected the strong push in user demand requirements, as well as the versatility and adaptability of the SatCen team to continuously step out of 'comfort zones', increase operational synergies and efficiencies and embrace new IT tools developed by SatCen, as well as a streamlined operational tempo. At the same time, SatCen has introduced new and more refined production performance indicators that have evolved from reflecting nominal production, without differentiating between the different types of products, towards so-called 'normalised' performance indicators that reflect the value of SatCen's diverse production portfolio in terms of 'unit' production. Based on these refined performance indicators, SatCen's unit-production growth was 34% compared to 2020 (first pandemic year) and was 3.5% higher than the pre-pandemic year of 2019. This result is remarkable; especially considering that in 2021 SatCen continued to be affected by the pandemic's impact on staff health and operational planning, applying social distancing measures on-site and the continuation of teleworking measures for unclassified activity. This growth in output has been registered for all key SatCen users, namely the European External Action Service (EEAS)/the Single Intelligence Analysis Capacity (SIAC), EU missions and operations, Member States, Frontex, the Organization for Security and Co-operation in Europe (OSCE) and the United Nations Support Mission in Libya (UNSMIL). In line with the recommendations of the HR/VP, support to missions and operations increased to 16% of total SatCen production. Only two years ago, this share was 3% of SatCen output. Cooperation with Member States and complementarity between intelligence services achieved important levels in 2021, helping to share the workload and paving the way to further enhance such joint work.

The continued development of synergies and complementarities, especially with the Commission, brought not only additional operational capability but also significantly contributed to support the continuous development of SatCen's analytical capabilities through R&I initiatives, mainly within the framework of the Horizon 2020 programme.

The Copernicus Service in Support to EU External Action celebrated its 1,000th product since the service began and more than 3,000 products were downloaded by Member States in the frame of EUROSUR. In this context, the Centre continued to evolve and to amplify its offer, meeting new user needs in support of the security of EU citizens. Training activities, although severely constrained by the pandemic, continued with a mix of online and on-site training. Concerning Space Surveillance and Tracking, SatCen enriched its offer through a portal with new features and, after more than 10 years of service, proudly started preparing the transfer of the Front Desk function to the EUSPA in the context of the EU Space Programme.

In the context of the 'new space', characterised by a huge supply of data and related services, the Centre managed to cope with growing and diverse user demand in terms of volume, complexity and speed of delivery requirements. Today, 80% of the total data acquired by SatCen is European, compared to about 8% a decade ago; this reflects the significant development of European satellite data providers in terms of quality of imagery and associated services. Notably, the Copernicus Data Warehouse made an important contribution in feeding the Centre's analytical capability.

The extension of the SatCen's premises significantly progressed in 2021, allowing for the finalisation of construction works in the first part of 2022, the start of the technical equipping phase and the inauguration of the extended premises in the second half of 2022, along with marking the Centre's 30th anniversary. The extension will provide additional workspace for both operational and support functions, a modern conference hall, and other spaces configurable for training purposes, as well as high level or working meetings, relevant conferences and visits.

Numerous institutional and governmental stakeholders visiting and assessing the Centre acknowledge it as a concrete example of EU autonomy in action. Guided by the level of ambition set out by them, starting from the Member States, the EEAS the Commission, as well as users and cooperating partners, and relying on the professionalism and proficiency of its staff, SatCen will proudly and enthusiastically engage in its development path. 2021 marked the end of the six year mandate of Deputy Director Ret. Gen. Giuseppe d' Amico, who I would like to thank for his dedication to SatCen and its staff, as well as for the support and advice extended to me. In September 2021, the Centre welcomed its new Deputy Director, Navy Capt. Louis Tillier, whose professional experience, qualifications, skills and motivation have already proven to represent a value added to the SatCen management team.

In reflecting the intense activity, the challenges and accomplishments of 2021, I take it as my special duty of honour to extent my distinguished appreciation and gratitude to the remarkable effort, dedication and high-level professionalism of the SatCen staff, who continue to be the most valuable resource of the Centre. At the same time, I would also like to extend my gratitude to SatCen's key stakeholders. First and foremost to the EU Member States for their recognition of SatCen's role and value added, and for their trust and support for the Centre's future development, as well as to colleagues in the EEAS, in the Commission, in other EU bodies and other key users and partners, for their close and valuable collaboration.

Sincerely,
Ambassador Sorin Ducaru
SatCen Director

Warm welcome to Louis Tillier as new Deputy Director

The new Deputy Director, Navy Captain Louis Tillier, took up his duties on 1 September 2021, following the positive vote of the Board on his appointment.

Captain Tillier, a French national, strengthens the SatCen leadership with a broad range of professional experience, especially based on his previous responsibilities in Navy operations and his particular expertise in the fields of EU Security, Defence and Space.

Mr Tillier's professional background reflects a blend of both operational and space skills that have ultimately led him to the intelligence community. Through his career he has acquired extensive knowledge of the EU's institutional framework and its space programmes.

Prior to his current assignment, Mr Tillier held a variety of roles including a Communication and Information Systems (CIS) position in the Navy, Joint Staff Program Officer for the Defence's Satellite Communications Systems at the Joint Space Command and Commanding Officer of two Navy ships and the French Maritime Intelligence Centre in Brest. Throughout his postings he was an active member of the EDA and NATO SatCom working groups.

Captain Tillier has worked with the European External Action Service (EEAS) and its Space Task Force, and as a member of the SatCen Board. Director Ducaru on his appointment : *'I count on Mr Tillier's support and am confident that his valuable experience and skills will contribute to the fulfilment of SatCen's mission and development objectives in line with the level of ambitions reflected by the EU Member States at the Ministerial Level SatCen Board in May, this year'*.

Many thanks and best wishes to outgoing Deputy Director Giuseppe D'Amico

The former Deputy Director, Ret. Brig. Gen Giuseppe D'Amico, finished his six year SatCen assignment in July 2021. Mr D'Amico had served in the Italian Air Force in various national and international functions, before taking up his leadership role at the Centre in 2015.

Director Ducaru on the farewell occasion: *"It was a great pleasure to work with Giuseppe. His experience, good knowledge of, and care for SatCen staff, as well as, the close connections to our user community clearly served the Centre in executing its demanding operational mission. Giuseppe took over the responsibility of the Centre in the month after the departure of the outgoing director and before my arrival. I would like to thank Giuseppe for his dedication to the Centre and its staff, and for the support and advice he provided me during the first months of taking over the responsibility as new SatCen Director and beyond. His support was greatly appreciated, in particular in managing the impact of Brexit and the pandemic"*.

SatCen headquarters in Torrejón de Ardoz, Madrid, January 2021
SatCen operational activity and construction of the SatCen building extension continued amid COVID-19 restrictions

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1 PROVIDING ESSENTIAL SERVICES IN EXCEPTIONAL TIMES

The EU Member States have entrusted the EU Satellite Centre with the mission of providing analysis products and services, particularly from exploiting imagery data derived from space assets. As an autonomous capability, the agency strengthens EU situational awareness and thus its decision-making and actions in CFSP and CSDP.

SatCen is a unique operational asset in the field of space and security, serving a broad spectrum of users from high-level decision-makers, like the Council and the High Representative of the Union for Foreign Affairs and Security Policy and Vice President of the Commission (HR/VP), the crisis management and situational awareness structures of the European External Action Service (EEAS), as well as EU missions and operations.

Within the EEAS, SatCen's main users are SIAC (the EU Military Staff (EUMS) and the Intelligence and Situation Centre (INTCEN)), the Civilian Planning and Conduct Capability (CPCC) and the Military Planning and Conduct Capability (MPCC).

Additionally, the Centre supports EU Member States, the European Commission, EU agencies and international organisations with its services in the field of space and security, covering geospatial analysis products. It also supports other Union activities such as Space Surveillance and Tracking (SST), and the area of freedom, security and justice, in fields such as border management and irregular migration.

SatCen's Mission (Art. 2 of the Council Decision on the European Union Satellite Centre)

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 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 of 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.*

Read more about the
Council Decision/2014/401/CFSP

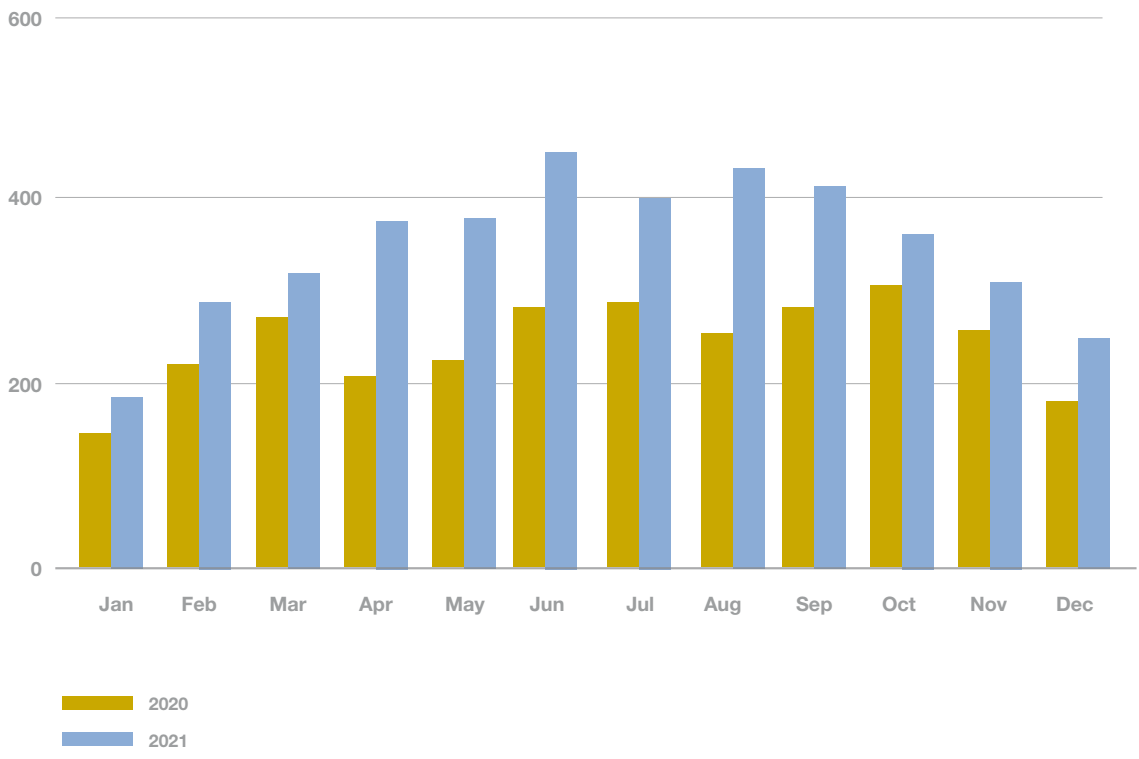
1.1 Increasing Output Despite the Ongoing Pandemic

The ongoing coronavirus pandemic continued to be the main factor of influence for SatCen operations in 2021. All activities had to be continuously adjusted to this drastic framework condition. However, the lessons learned from the onset of the pandemic in 2020, as well as continuous steps to improve various operational and administrative dimensions, enabled the Centre to increase its output even further.

SatCen clearly benefitted from the high level of professionalism as well as from the dedicated motivation of its expert staff to tackle this historic challenge.

The chart below reflects the Centre's increasing output (both classified and unclassified), demonstrating its strong operational resilience and its enduring capacity to deliver on its essential mission.

Monthly Nominal Production Output 2020 vs. 2021



“I am very happy to have the opportunity to visit SatCen today, as Romania highly appreciates the work of the Centre, in support of EU security and defence, under the able coordination of the Romanian diplomat, Ambassador Sorin Ducaru. The Centre has shown a remarkable capacity to deliver value for our invested resources, versatility and adaptability.”

H.E. Bogdan Aurescu,
Romanian Minister for Foreign Affairs,
30 September 2021

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> “The EU Satellite Centre is an excellent example of what strategic autonomy means in Europe. (...) What this Satellite hub of the EU does is provide credibility about the role of the EU as a strong actor in international relations, fostering peace, security and ensuring the defence of EU interests and values, all of this from Madrid, Spain.”

H.E. Arancha González Laya,
Spanish Minister for Foreign Affairs,
7 July 2021

“Thank you for this fascinating visit of SatCen. Congratulations to all the team working for SatCen and for the strategic autonomy of the European Union and its Member States.”

H.E. Amb. Charles Fries,
Deputy Secretary-General of the Common Security and Defence Policy and Crisis Response (CSDP-CR), 23 September 2021

Mr Giorgio Mulè, Undersecretary of State for Defence, MoD Italy, 28 June 2021

1.2 Firmly Embedded in the Political Framework

SatCen was originally founded in 1992 as a Western European Union body. It was incorporated into the EU in 2002 to support the Union in the areas of CFSP and CSDP through complex and actionable geospatial intelligence analysis. This activity takes place under the political guidance and supervision of the Member States and the operational direction of the High Representative.

The political environment in 2021 was primarily set by the 2016 EU Global Strategy, which establishes 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.

The concept of strategic autonomy as well as the link between internal and external security were also addressed by this strategy in line with the discussions throughout 2021 about the Strategic Compass.

With its 30 years of expertise, the SatCen is a concrete example of EU autonomy in action. In its various missions, SatCen is an operational entity with strong institutional and operational ties with Member States.

The core of SatCen's mission is to support EU crisis management through its geospatial analysis. The agency strengthens European resilience, reflected in its operational lessons learned during crises like the ongoing pandemic. The Centre helps reinforce EU partnerships through the mandated support for the UN, OSCE and the Organisation for the Prohibition of Chemical Weapons (OPCW).

In addition, SatCen continuously invests in capability development to remain at the cutting edge of relevant technological developments, such as AI and Big Data from space.

SatCen supports various Union policy areas beyond the CFSP/CSDP. The reliable and timely information provided by SatCen, based primarily on the unique expertise of its analysts, is intensively used by Frontex to support EU Integrated Border Management. It is also used to support Union policies in the framework of the Copernicus Earth observation programme (security from space).

Complementing this, SatCen acts as the Space Surveillance and Tracking (SST) Front Desk, thus supporting the monitoring of the situation in space (security in space). In all these areas, the agile and multidisciplinary expertise of SatCen staff facilitates cross-fertilisation.

SatCen is an operational agency supporting the EU's ambition to pool and share its expertise and services as part of a sensitive and high profile mission. Each Member State, contributing with a share of the SatCen budget, receives the full output of its products and services, thus benefitting from the Centre's operational work, training capabilities, research and innovation and from the IT tools it develops in-house.

Along this line, the Commission also supports various contributions made by SatCen to EU policy fields related to the security domain.

SatCen performs its mission in especially close cooperation with the crisis management structures of the EEAS, under the operational direction of the HR/VP and periodically reporting to the Political and Security Committee (PSC). The trustful and effective links to these partners on the policy level, as much as on the operational level, are an important foundation for the effectiveness of the Centre's services.

The cooperation with intelligence entities in the EU and Member States intensified further, supported by better IT interlinks through the EU OPS WAN secure connection.

This especially improved the already close collaboration with SIAC intelligence partners.

SatCen's increasing role and relevance to the EU and its Member States was reflected in 2021 by several high-level visits, such as those of H.E. Bogdan Aurescu, Romanian Minister of Foreign Affairs, H.E. Arancha González Laya, Spanish Minister of Foreign Affairs, H.E. Amb. Charles Fries, Deputy Secretary General CSDP-CR and General Claudio Graziano, Chairman of the EUMC, as well as other high level officials from the EU representatives and mission commanders.

At the same time, the SatCen Director and management team were constantly engaged in dialogue with Member States and EU officials through a limited, but important number of physical visits and a large number of online contacts.

“SatCen is a tremendous asset for our European sovereignty. It supports crisis management, CSDP missions, humanitarian assistance, border control and much more. We are lucky to have started developing this instrument providing security from space and security in space. The European Parliament will continue paying attention to the activities of SatCen and make sure that it is sufficiently funded and supported.”

Nathalie Loiseau,
Member of the European Parliament and Chair of the Sub-Committee on Security and Defence (SEDE), 22 September 2021

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“SatCen is a strategic tool at the disposal of the European Union, at the disposal of our security and defence. Its innovative approach in pooling and sharing can make a difference. We need timely information, timely intelligence - since the planning phase and after that - to man and run all the operations. We need satellite spatial information, and we need the analysis (…) for the good of our CSDP missions and operations (…) and to make our citizens safer.”

General Claudio Graziano,
Chairman of the EU Military Committee (EUMC), 5 February 2021

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133rd SatCen Board Meeting. The first-onsite meeting in over two years at the headquarters in Torrejón de Ardoz, 18 October 2021

To further enhance these operational ties and to better tailor its products to evolving needs, SatCen continues to invest in a thorough understanding of its user needs and requirements through regular exchanges, visits and dedicated expert meetings.

The Centre has continuously engaged with Member States and other stakeholders, up to the level of the PSC, through regular briefings, Board meetings, Technical Working Groups / Expert User Forums, as well as various bilateral meetings and other events. Many of these meetings and discussions have, similarly to the previous year, again taken place in a virtual format, due to ongoing restrictions from the pandemic.

The Centre has developed into a valued user-oriented organisation, recognised as a dual-use, civil-military reference provider of state-of-the-art services. SatCen operates along the vision set out by its Board:

To be the comprehensive provider of state-of-the-art services based on space assets, in support of CFSP/CSDP and relevant EU space and security policies and activities, maximising synergies with relevant EU and Member State bodies, while staying at the cutting edge of technological development.

In line with the EU's increased level of ambition in security and defence, SatCen has continued to exploit the rapidly evolving technological progress of Earth Observation (EO) services and the associated data processing technology.

Visit of Ms Anca Dana Dragu, President of the Romanian Senate, 14 May 2021

Data is rapidly becoming more and easily available in large amounts, with new services and applications facilitating the exploitation of this supply. This in turn is boosted by technological progress in the field of software tools based on AI and Big Data techniques.

These developments help SatCen provide tailor-made services to its users, and respond to the increasing demand for rapid and accurate analysis in support of comprehensive situational awareness.

SatCen Director Sorin Ducaru interviewed for prestigious Spanish TV Channel TVE on SatCen activities and innovations, 5 July 2021

Visit of Lieutenant General Fernando López del Pozo, General Director of Defence Policy (DIGENPOL), Spain, 21 October 2021

1.3 Implementing the Development Strategy

SatCen is following a clear set of three strategic goals in its evolution strategy. These have been identified as key areas that encompass the strands of work that encompass SatCen's mission:

I. Strengthening and optimising SatCen's mission to maximise user value;

II. Enhancing the Centre's synergies and complementarities with other EU activities and exploring new application fields; and,

III. Continuously upgrading SatCen capabilities in line with cutting edge technology and innovation, as well as consolidating EU and Member State autonomy via access to the Centre's IT services.

In 2021, SatCen was fully engaged in the Ad Hoc Working Group established within its Board to define a plan to implement the recommendations included in the 2019 HR report on the functioning of SatCen. The outcomes of this activity, together with the Implementation Plan with Options produced by SatCen, were made available to support decision making at the subsequent Ministerial Level Board.

At the Ministerial Level SatCen Board, Member States agreed on a development scenario enabling SatCen to keep up with the EU level of ambition in the area of security and defence, growing CFSP user demand and fast-paced developments in space and information technologies. The Board tasked SatCen with further detailing the Baseline Augmented option presented to the Member States.

THE BASELINE AUGMENTED DEVELOPMENT PLAN

A first version of the masterplan reflecting the implementation of the Baseline Augmented development option was presented for discussion to the SatCen Board on 16 July 2021. Based on the guidance from Member States, a new version, called Baseline Augmented Development Plan, was developed in tandem with the Draft 2022 Work Programme and the Draft 2022 Budget.

The new version of this development plan was presented to the Board during the meeting of October 2021, and the relevant actions were then included in the Work Programme for 2022.

In its last meeting in November 2021, the Board approved the Baseline Augmented Development Plan, paving the way for the evolution of SatCen's capabilities, to match future requirements set by the ambitious goal for EU security and defence, as set out in the Strategic Compass. This decision and the following implementation will be reviewed annually and adjusted to the evolving needs of the Centre's users and partners.

LESSONS LEARNED IN 2021

Following guidance from the PSC and the Board, SatCen's contribution to missions and operations increased to 16% of total production in 2021 thanks to the anticipation of intelligence and imagery needs during the planning process of Operation EUNAVFOR MED IRINI. Funding of imagery for missions and operations is paramount to enabling strong support from SatCen and to meeting PSC political guidance.

Cooperation with Member States and complementarity between intelligence services' activities achieved important levels in 2021 on planned activities.

It helped share the workload considering the growing demand and can be reinforced in 2022 through the User Forum. With the support of the PSC, SatCen will continue this collaboration, in close cooperation with SIAC. Seconded National Experts (SNE), as well as training activities and the sharing of IT tools, were and will continue to be key enablers. Expertise in imagery and geospatial analysis is also enforced through delegated operations and the cooperation framework with the Commission, thus developing complementarities.

The full year of 2021 was clearly marked by the ongoing pandemic. SatCen continued its efforts to increase the efficiency of teleworking, notably by digitising its processes in operations (for unclassified products), administration and finance. This helped SatCen return to pre-COVID-19 activity levels and to keep increasing its production in 2021, thanks to the strong commitment of staff and management.

The digitalisation of processes was accompanied by significant attention to security and cyber issues; however, it also increased SatCen's dependency on IT and servers with only one centralised platform on SatCen premises.

The development of the new classified IT platform will provide opportunities to deal with resilience and business continuity issues. Recent events support the case for these investments in 2022.

Regarding SatCen's future evolution, the Centre was fully engaged in the Ad Hoc Working Group following the 2019 HR report[2].

Cooperation with Union agencies and bodies, especially through the Copernicus Service in Support to EU External Action (SEA) and support to Frontex, provided complementary resources for SatCen. Through this cooperation, SatCen continued developing synergies and complementarities within the EU and between the Commission and CFSP/CSDP. In the future, the Centre intends to implement new operational protocols, with SatCen looking for harmonisation between different operational activities.

SatCen continued its contribution to the EU's security in space, as the EU SST Front Desk and being the main interface for the SST services provision (collision avoidance, re-entry and fragmentation analysis), with a consistent team of 11 experts.

With the EU Space Regulation (2021), the EU SST Front Desk role will fall under the Commission umbrella and be moved to the new agency for the Space Programme (EUSPA). The Centre will collaborate closely with EUSPA to ensure a smooth transfer of responsibilities.

SatCen Director Amb. Sorin Ducaru participates in the annual Euroconsult World Satellite Business Week, 15 December 2021

2. Outcome of the Council Meeting 13 July 2020, SatCen endorsements 9459/20 https://www.consilium.europa.eu/media/45005/st09459-en20.pdf

Colonel David Secher, Military Intelligence Service, MoD, France, 9 June 2021 30 September 2021

Rear Admiral Vincenzo Montanaro, Head of Planning & Policy Department, MoD Italy, 22 March 2021

H.E. Amb. Gregor Koessler, Director Political Affairs Federal Ministry for European and International Affairs of Austria, 15 February, 2021

Mr Marko Mihkelson, Chairman of the F.A. Committee, Estonian Parliament, 22 November 2021

Mr Vlad Gheorghe, Member of the European Parliament, 29 October 2021

Brigadier General Adrian Brînză, Commander of Communications and IT, Command Defence Agency, MoD, Romania, 16 November 2021

General de Brigada Javier López de Turiso, Deputy Director CIFAS, MoD Spain, 11 March 2021

H.E. Ambassador Riccardo Guariglia, Italy, 10 February 2021

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Général Jean-Philippe Reiland, OCLCH, France, 9 December 2021

French Senators from the Committee on Foreign Affairs, Defence and Armed Forces, 19 November 2021

NATO Alliance Ground Surveillance (AGS) Representatives, 4 November 2021

Almirante Santiago Ramón González, Director General Armamento y Material, MoD Spain, 19 April 2021

133rd SatCen Board Meeting, 18 October 2021

Centre des Hautes Etudes Militaires, MoD France, 14 June 2021

Escuela de Técnicas Aeronáuticas, ESTAER, MoD Spain, 26 November 2021

CSDP High Level Course 20 January 2021

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2 CONTINUING HIGH OPERATIONAL INTENSITY

2.1 Mastering the Ongoing Pandemic Challenge

The ongoing pandemic afflicted all operational activities in 2021. However, following the 2020 lessons learned, the Centre was able to sustain a high level of geospatial and imagery intelligence production, and to even increase total output numbers beyond pre-crisis levels.

Especially noteworthy was the significant increase in support to missions and operations, mainly due to services provided to EUNAVFOR MED IRINI. SatCen was able to generate this new level of operational support while increasing services to SIAC and EEAS users.

As a result, the share of SatCen output dedicated to supporting missions and operations jumped from 3% to more than 16% in 2021.

This represents a level of service support the Centre aims to maintain into the future, as long as the planning of future missions and operations anticipate the need for imagery analysis in their budget. Along the same line, support to SIAC has remained a key focus of daily operations.

Without prejudice to these core tasks, SatCen supports the Member States, EEAS, the Commission and international organisations such as the OSCE, OPCW and United Nations. The increase in products downloaded by Member States and SatCen's contribution to international organisations (30% of total production) contribute to the development of a common European awareness, as well as the EU's international visibility and its commitment to effective multilateral solutions.

EU Missions and Operations and Cooperation with International Organisations

Responsible Institution: **European Union**
Operation EUNAVFOR MED SOPHIA (Mediterranean)
Operation EUNAVFOR MED IRINI (Mediterranean)
EUNAVFOR ATALANTA (Horn of Africa)
EUMM Georgia (Georgia)

Responsible Institution: **OSCE**
SMM Ukraine (Ukraine)

Responsible Institution: **UN/OPCW**
OPCW (Syria)

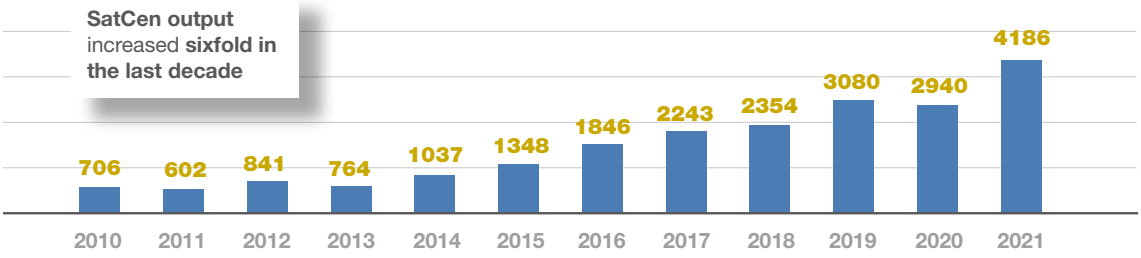
Responsible Institution: **UN**
UNSMIL (Libya)
MINURSO (Western Sahara)

2.2 Production Highlights in 2021

During 2021, SatCen delivered a total of 4,186 products, thus maintaining a similar level of output to the previous year, despite severe constraints stemming from the ongoing COVID-19 pandemic.

The EEAS/SIAC, EU missions and operations (in particular Operation EUNAVFOR MED IRINI), Frontex, the OSCE, and the EU Member States were the main users.

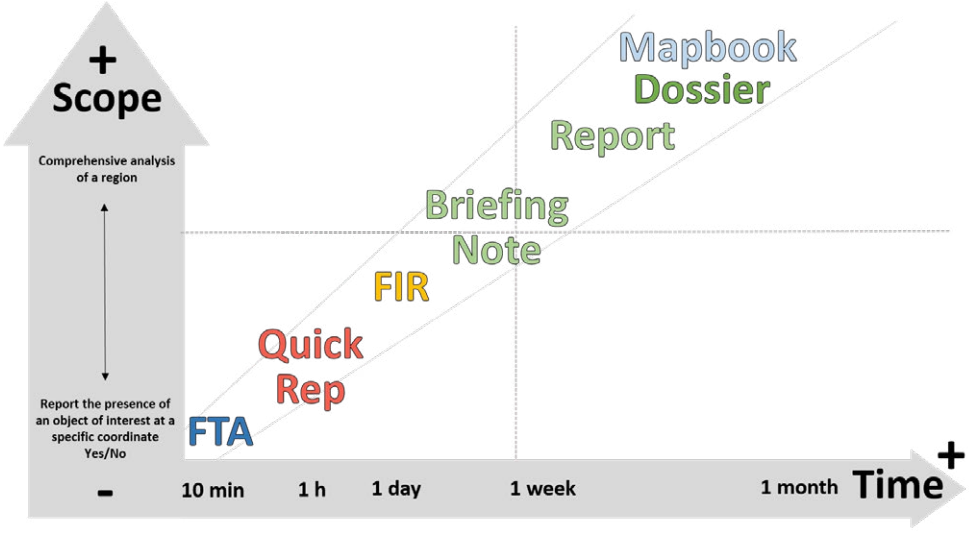
Annual Nominal Output of Geospatial Intelligence Products 2010-2021



One of SatCen's main operational challenges is to meet the requirements of a very wide variety of users, from high level political users to personnel deployed on the ground in missions and operations.

SatCen offers a set of products and services that are designed to find the right balance between the complexity of the question being asked and the speed of response, resulting in an extensive portfolio that covers all possible crisis management scenarios.

Consolidated SatCen Portfolio



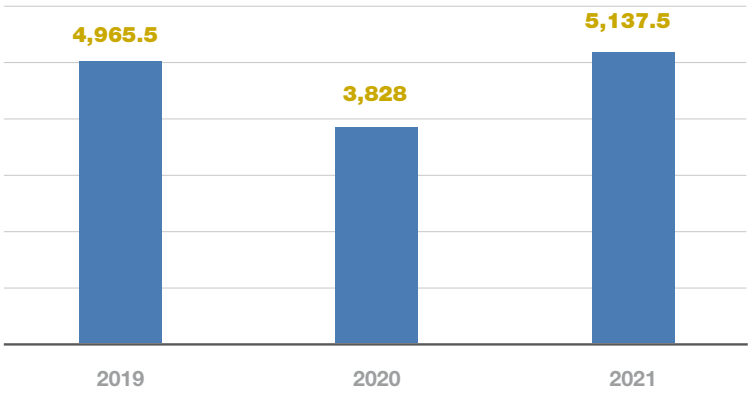
Within this portfolio, users can choose which type of report best fits their information needs. One page Quick Reports that can be issued in less than one hour after reception of the imagery are designed to address very specific questions; whereas, multiple page Dossiers that take several weeks to produce are suited to answering more complex issues of a strategic nature.

The different type of products has also posed a challenge in terms of production management and reporting, since they require completely different amounts of resources to produce. For this reason, in 2021 SatCen introduced a normalisation procedure to adjust this heterogeneity of products and thereby enable the provision of seamless and coherent statistics.

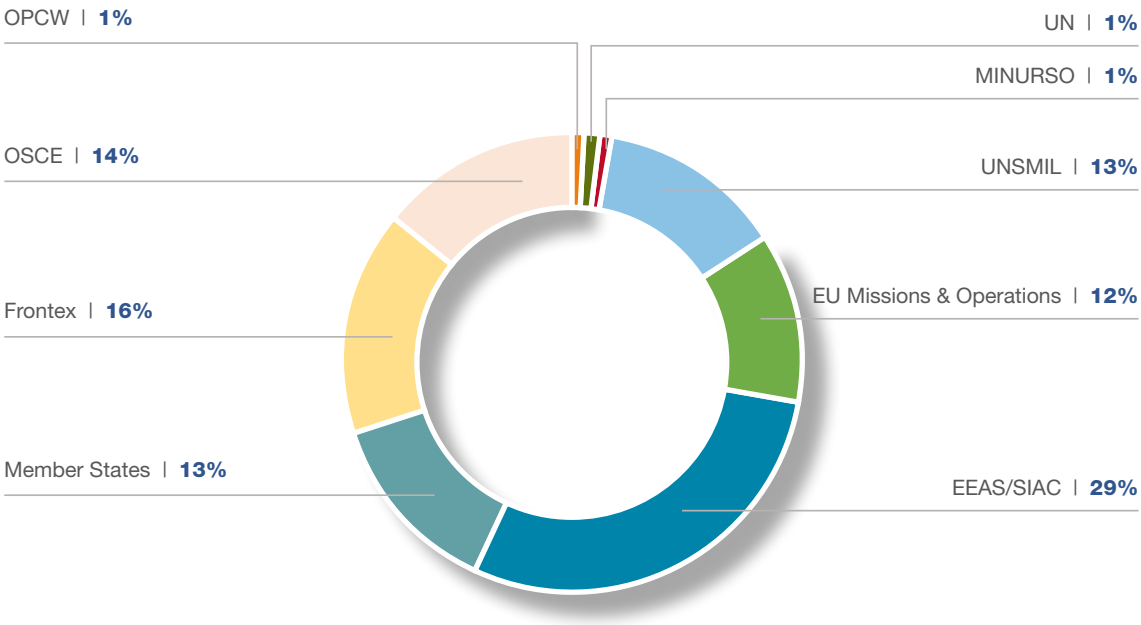
The normalisation coefficient intends to calibrate the amount of effort invested in the creation of each type of product by using the First Impression Report (FIR) as a unit of reference. Consequently, the Quick Report, which on average requires half the effort to produce as a FIR, counts as 0.5 rather than as 1 in our statistics. Comparatively, a Dossier, which can require as much as 10 or 20 times the effort needed to produce a FIR, counts as 15 in our statistics. Experience has shown that these coefficients fit on average throughout the year.

SatCen Annual Normalised Production

PRODUCT	APPLIED COEF.
Flash TA	0.25
QuickRep	0.5
FIR	1
Briefing Note	2
DGI	5
Report	8
Dossier	15
Mapbook	15
GeoPortal	15



2021 Normalised Production Share



Given the significant increase in the nominal production share for EU missions and operations (from 3% in 2019 to 16 % in 2021) within the context of ongoing human resource constraints, the share of SatCen output to direct requests from Member States decreased from 24% in 2019 to 9% in 2021. However, the decrease is not so significant considering that some of these requests were absorbed by EEAS/SIAC and were therefore met in the corresponding products.

Visit of H.E. Amb. Charles Fries, Deputy Secretary-General in charge of the Common Security and Defence Policy and Crisis Response (CSDP-CR), 23 September 2021

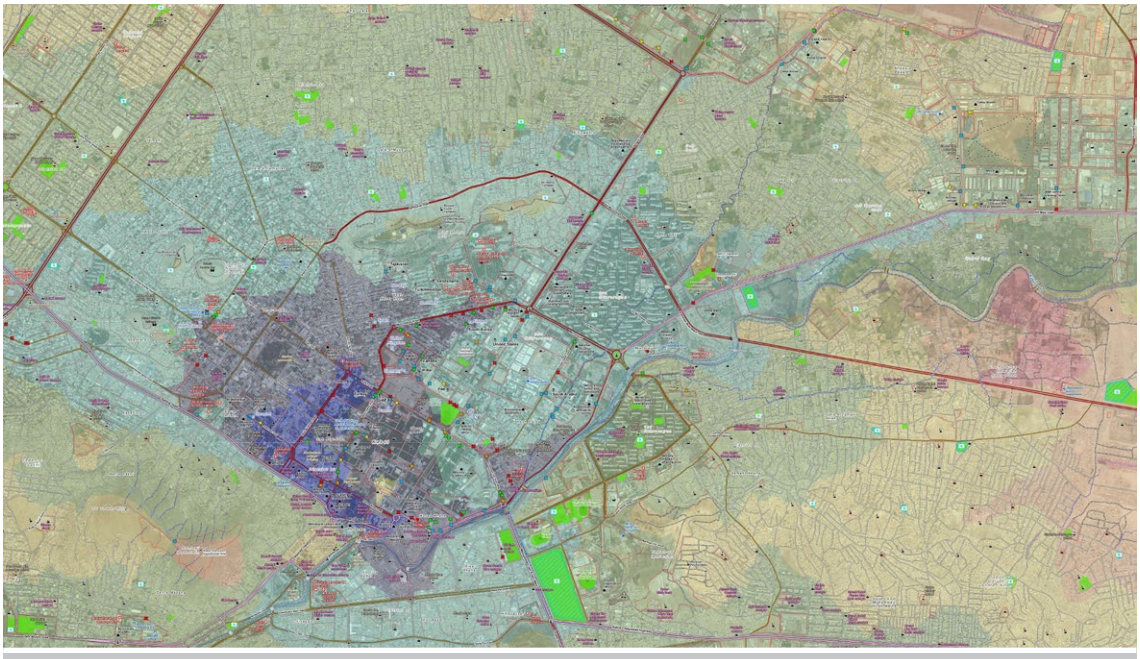
2.2.1 Service Provision to EEAS/SIAC

SatCen provided the EEAS with continuous situational awareness services throughout the year, analysing events across the world and delivering autonomous assessments of situations unfolding around the globe.

In 2021, the Centre continued to provide its full range of geospatial intelligence support to its core user, SIAC (the EU's intelligence analysis entity consisting of INTCEN & EUMS INT). A selection of sanitised examples depicting analysis services are presented on the following page.

Monitoring of irregular migration activities, Worldview-3 ©DigitalGlobe (2016) supplied by European Space Imaging

Reference Map, Support to Evacuation Plan on Kabul (Afghanistan) © European Union 2021



Time Response Map, Support to Evacuation Plan on Kabul (Afghanistan) © European Union 2021

ITS San Giorgio © EUNVFOR MED Operation IRINI

2.2.2 Support to Operation EUNAVFOR MED IRINI

SatCen has been monitoring the activity at Libyan ports and airports for an extensive period, and is familiar with the patterns of cargo handling activity, including delivery of weapons and other military-related equipment. Based on this essential experience, the Centre has been able to provide support to the EU naval operation IRINI, right from the beginning of the mission.

SatCen is able to combine information from multiple sources, such as automatic identification system (AIS) data and open sources imagery, with satellite imagery confirmation of activity in violation of the UN arms embargo. SatCen delivered 678 reports over the course of 2021.

"IRINI monitors violations of the UN arms embargo on Libya occurring at sea but also on land and by air. During the past year alone, it tracked 16 Libyan ports and oil facilities, 25 airports and landing strips and close to 200 flights suspected of carrying military related cargos to and from Libya. For that purpose, IRINI can also rely on the information provided by the European Union Satellite Centre, thus demonstrating the importance of this capability to European security."

HR/VP Josep Borrell Blog Post regarding recent visit to IRINI HQ, 21 March 2021

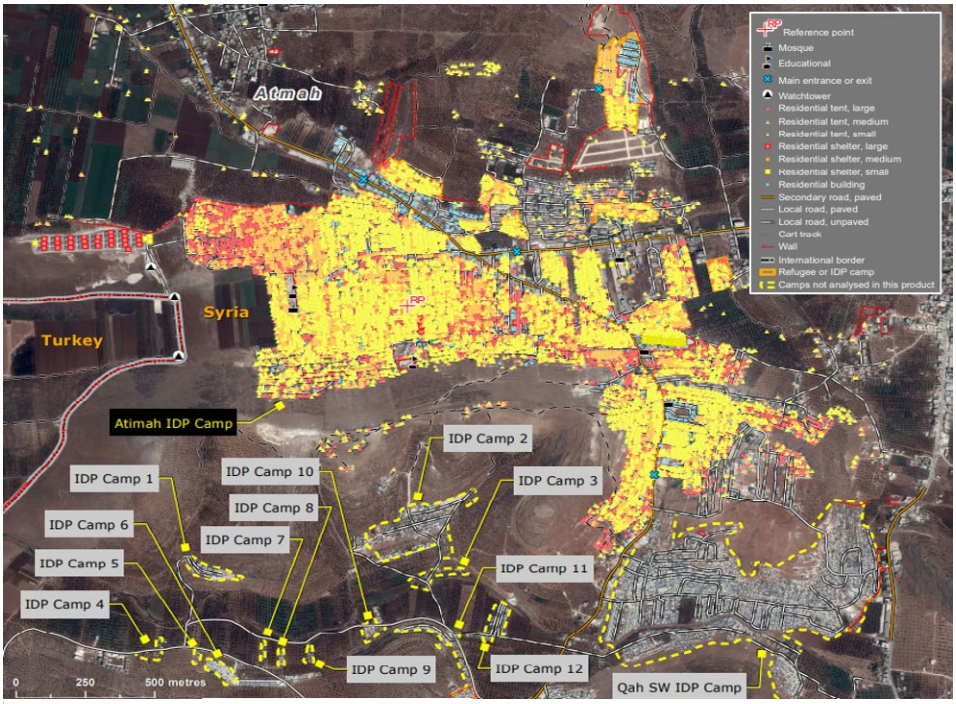
2.2.3 Support to UNSMIL

In addition to the work being carried out for the EEAS (SIAC) and Operation IRINI, the Council also requested SatCen to support the mandate of the UN Support Mission in Libya (UNSMIL) with geospatial information. Geospatial analysis is key when there is a lack of other reliable sources of information.

The experience accumulated during 2020 enabled procedures to be streamlined and an optimisation of the data collection plan, in coordination with the UN personnel deployed in the area, thus improving the cost effectiveness of SatCen support. This also allowed for the creation of synergies with other operations that work in the same area and maximised the return on effort invested.

2.2.4 Copernicus SEA

In 2021, Copernicus SEA reached its fifth year of service implementation. The service demonstrated flexibility and the ability to evolve its output to continuously meet emerging user needs. Among other uses, the Copernicus SEA products supported the security of EU citizens abroad and improved situational awareness during crises and conflicts. For example, the service contributed to internally displaced persons camp monitoring by analysing a combination of new and archive satellite imagery, making it possible to measure and monitor the changes in size and distribution of camps.

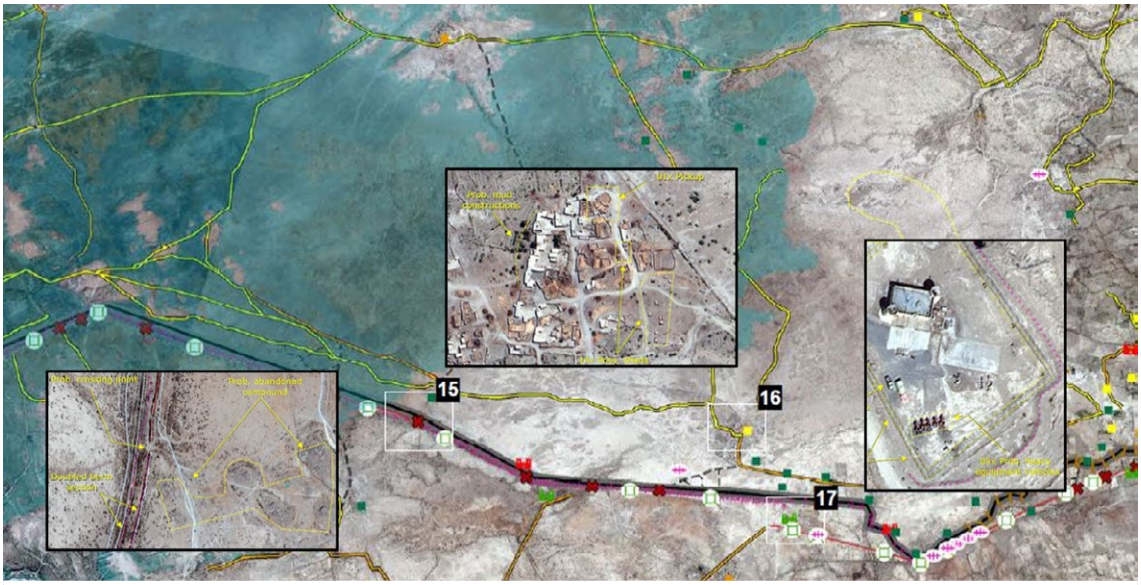


Camp Analysis on Atimah, Syria © European Union 2021

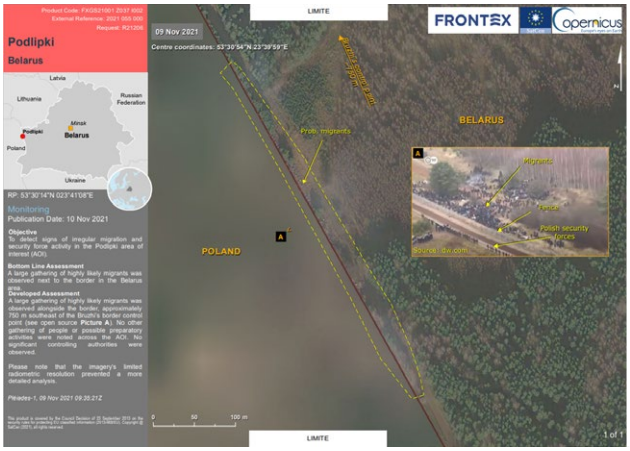
2.2.5 Support to Frontex

2021 also marked the sixth anniversary of SatCen's operational support to the European Border and Coast Guard Agency (Frontex).

It was in March 2015, as the migration crisis in the Mediterranean Sea reached an unprecedented peak, that SatCen and Frontex signed a service level agreement (SLA), initiating a period of intense cooperation under the umbrella of the European Border Surveillance System (EUROSUR) and the Copernicus surveillance service. Since then, more than 3,000 geospatial analysis products have been downloaded by the Member States, supporting them with their decision-making process.



Pre-frontier imagery analysis to provide Frontex (Copernicus Security – Border Surveillance Service) awareness in terms of activities related to migrant smuggling and cross-border crime, Afghanistan © SatCen 2021



Support to Frontex and Member States during a migrant crisis at the Kúznica Border Crossing Point (Poland/Belarus) © SatCen 2021

Supporting Frontex and the EU during migrant crisis events, Morocco © SatCen 2021

SMM on patrol in Verkhnotoretske, Donetsk region © OSCE SMM

2.2.6 Support to OSCE

2021 turned out to be a particularly unrestful year in Eastern Ukraine, with a significant growth in military activity in the region, as well as increased denial of access to Non-Government Controlled Areas (NGCA) for the OSCE SMM monitors.

In such cases, SatCen once again proved to be a valuable asset and a reliable source of information to assess the violation of ceasefire agreements and the disengagement of forces.

OPCW in the field © OPCW

2.2.7 Support to OPCW

In line with the SLA signed by SatCen and the OPCW in March 2018, implementing Council Decision (CFSP) 2017/2303 supporting the OPCW Fact Finding Mission in Syria, the Centre continued its analysis support to OPCW.

Analysis produced by SatCen is meant to provide OPCW inspectors with a geospatial and temporal context in which they can frame their investigations. SatCen reports draw evidence from satellite imagery which can be fused with other sources of information to ascertain the use of forbidden chemical weapons in areas of conflict.

2.3 Data Provision Services

The primary source of data for SatCen analysis services are commercial satellite operators, complemented with governmental providers used on a case-by-case basis. Under normal circumstances and intending to improve the use of European governmental imagery for EU decision-making, SatCen organises an annual Governmental Imagery Forum with the participation of those EU Member States that provide the Centre with national classified data (DE, FR, IT, ES, BE, EL). In 2021, due to the limitations on physical meetings caused by the pandemic, the Governmental Imagery Forum could not take place.

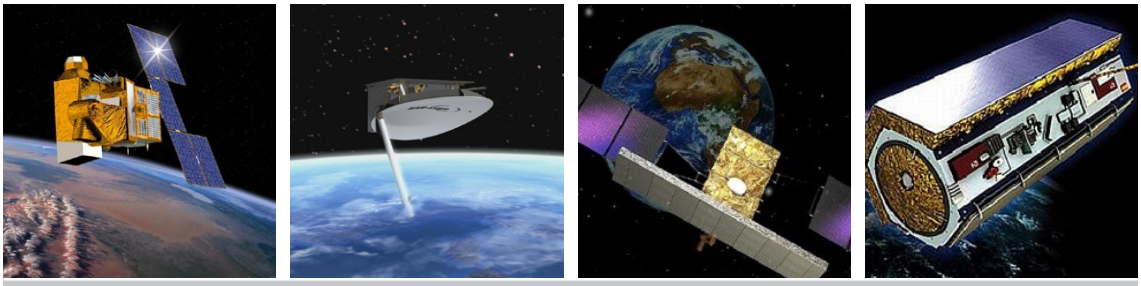
The SAR-Lupe classified link between SatCen and the German ground segment, operational since 2013, is used to place requests and to download SAR-Lupe classified imagery. Several improvements have been made since then, broadening the use of SAR imagery.

Space sensors accessible by SatCen - in red: governmental, blue: commercial, black: European © SatCen

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

SatCen can also access governmental imagery from the HELIOS system through the HELIOS consortium, which provides this high-quality imagery on the basis of a specific agreement.

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 imagery.



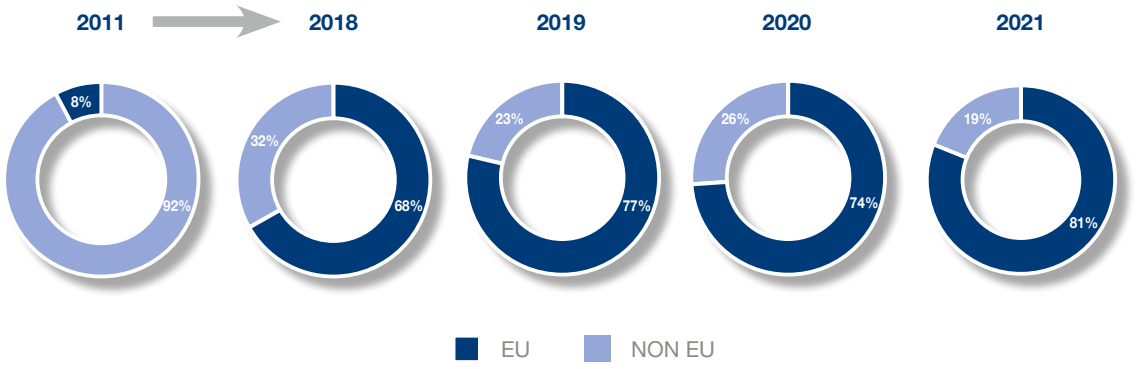
Governmental space sensors accessible to SatCen, from left to right: HELIOS, SAR-Lupe, COSMO-SkyMed and PAZ © ESA

The ability to react in a timely and flexible manner is one of SatCen's core strengths. In this context, tailored commercial solutions like framework contracts with data providers support a very high level of responsiveness. To complement and enrich the analysis, collateral data (i.e. essential additional information supporting and complementing the imagery analysis) is acquired from open sources and users of the Centre's services.

In 2021, the EO data quota granted by the Commission to SatCen through the Copernicus Data Warehouse again constituted an important contribution to the Centre's analytical capability. In return, SatCen provided the European Space Agency (ESA) and the Commission with requirements for security applications for the Warehouse, in order to further optimise the data acquisition process.

One important aspect to be highlighted is the fact that the share of the Centre's direct expenditure for data acquired from European commercial satellite imagery providers has increased significantly in recent years, representing around 80% of the total data expenditure in the last two years, compared to about 8% a decade ago. This became possible through the increased service quality of European satellite data providers and the development of a close and efficient working partnership between SatCen and these providers.

Satellite Data Acquisition Expenses 2018-2021 Split by Provider Based on Sensor (EU/Non-EU)



NOTE

In 2011, European satellite data providers' share of SatCen data expenditure was just 8%. In the last years this share increased to around 80%.

The Centre liaised with commercial providers to further improve 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 provision.

As far as European providers are concerned, the Centre worked closely with Airbus (Pléiades, Pléiades Neo, Spot 6/7, TerraSAR-X, TanDEM-X), E-Geos (COSMO-SkyMed), ICEYE and HISDESAT Servicios Estrategicos S.A. (PAZ), adapting their tasking procedures to the Centre's evolving data needs.

In particular, the Centre participated in the Airbus Pléiades Neo Early Adopter programme, gradually moved to the use of the OneAtlas platform and initiated Pleiades Neo usage as of its official commercialisation on 1 November 2021. 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 the enhancement of the Centre's analytical capability by allowing the generation of digital elevation model products that are ideal for 3D modelling and 3D analysis. The incorporation of the 30cm Pléiades neo is expected to further contribute to SatCen's analytical capabilit

SatCen also made use of annual subscription services from MAXAR (SecureWatch service) and investigated the potential operational use of the growing supply from new satellite constellations that promise better revisiting times with eventual multiple acquisitions per day. To that end, the Centre formalised the existing working relationship with Planet Labs (US) and at the beginning of 2021 signed a framework contract with this data provider, which supports up to four revisits per day at certain latitudes.

SatCen also initiated framework contracts with radar satellite imagery providers ICEYE (FI) and Capella (US).

3 IMPROVING CAPABILITIES AND COOPERATION

3.1 Capability Development and Cooperation in Space, Security and Defence

In 2021 SatCen maintained its strong dedication to capability development and cooperation activities. Through the participation in relevant EU programmes and initiatives, the Centre continued identifying and developing appropriate tools and services to support SatCen's mission, thereby contributing to supporting EU external action, border and maritime surveillance activities and the protection of space assets, as well as developing innovative EO solutions. In order to maximise synergies and complementarities, SatCen strives to cooperate with the Commission, the Member States and organisations and institutions operating in space, security and defence.

3.1.1 Cooperation with the European Commission

SatCen's cooperation with the Commission spans over a wide range of activities, from the involvement in several R&I initiatives, cooperation with other EU agencies and Directorate Generals of the Commission, up to the participation in the operational implementation of the Copernicus programme and Space Surveillance and Tracking (SST) Support Framework of the Union, with all its components.

The Centre continued its collaboration with the Directorate-General for Defence Industry and Space (DG DEFIS), mainly within the framework of Copernicus.

As Entrusted Entity for the implementation of Copernicus Service in Support to EU External Action (SEA), SatCen participated in the Copernicus governance bodies (i.e. Copernicus configuration of the EU Space Committee, Security Board, and User Forum). SatCen also started to work on establishing the basis for future cooperation with the Commission within the framework of Copernicus 2.0 and the new EU Space Programme, in view of ensuring full SEA service continuity from 2022 onwards.

Under the framework of interagency cooperation and Copernicus border surveillance, SatCen continued its support to Frontex through service provision and started the preparation of the next SLA for 2022 onwards. In parallel, a working arrangement (WA) between both agencies is also foreseen. The WA will not replace or repeal the SLA but will be an overarching cooperation instrument aimed at enhancing the cooperation between SatCen and Frontex and exploring new areas of common interest.

SatCen and the European Fisheries Control Agency (EFCA) are progressing towards reaching interagency cooperation, in particular in the area of actionable geospatial intelligence to support fisheries control, within the framework of Copernicus.

The Centre's involvement in DG MARE's Common Information Sharing Environment (CISE) initiative continued through its participation in the CISE Stakeholders Group, in close coordination with Member States and EU agencies, accompanying CISE's network evolution in achieving an operational framework.

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

Cooperation with DGs RTD, CNECT and HOME continued in 2021 as part of the SatCen Research, Technology Development, and Innovation (RTDI) activities. In 2021, RTDI intensified cooperation with DG RTD in particular, including its active involvement in SatCen organised sessions at key events of the Group on Earth Observations (GEO).

The work on H2020 projects continued in 2021, namely CivilNext, MEDEA, Marine-EO, BETTER and E-SHAPE, while three new projects, ARCOS, ENTRUSTED and GEM, were started during the year. In addition, the new projects AI4Copernicus, PROMENADE and CALLISTO, AI-ARC, SPACEWAYS and EUSTM also started in 2021. Thanks to these projects, SatCen contributes to user engagement and uptake activities and works on the gathering of user requirements for relevant services, technical developments and in the evolution of operational services, including Copernicus and SST.

R&I initiatives under the H2020 programme strongly contributed to cooperation with the Commission and they remain essential to support the continuous enhancement of SatCen core capabilities. Initiatives that once started as R&I projects have evolved into significant operational activities that are strategic for the Centre and its users, such as Copernicus SEA, support to Frontex for Copernicus border surveillance and the Centre's role in SST.

It is also important to highlight that through the ENTRUSTED project, led by EUSPA, SatCen is contributing to the shaping of the future GOVSATCOM component of the EU Space Programme, coordinating the gathering of user requirements and use cases for future secure satellite communications services for governmental users in the EU.

In summary, 2021 has seen an intense cooperation with the Commission for both operational (Copernicus and SST) and research and development activities, to the benefit of SatCen and its users. The outcomes of the various collaboration activities provide direct support and an additional operational capacity to SatCen services, contributing to an increase in the value-added by SatCen products and services to its users.

3.1.2 Copernicus

In 2021, SatCen continued to contribute to Copernicus, the Earth observation (EO) component of the EU Space Programme. As Entrusted Entity for the Copernicus SEA service and in the framework of cooperation with Frontex for the Copernicus border surveillance service, the Centre maintained its efforts to satisfy user needs for integrated border management, EU external action and emerging scenarios in the framework of other relevant EU security policies.

Copernicus

The implementation of the Delegation Agreement for Copernicus SEA and the SLA with Frontex represents nearly 30% of SatCen total production. Copernicus activities:

- enable the establishment and reinforcement of inter-agency cooperation that strengthens synergies and complementarities among existing EU capabilities, as well as with Member States and international organisations, in particular in the area of space and security.
- include medium-term R&I (e.g. H2020 projects), short-term service evolution (e.g. pilot projects and specific developments) and user engagement.

The end of the year represented a significant milestone for the SEA service with the achievement of 1,000 products delivered. This result depended on several factors, such as SatCen's expertise and solid commitment to its mission, in conjunction with the remarkable contribution of European industry, as well as continuous cooperation with the Commission to maximise synergies and complementarities between EU capabilities. Copernicus SEA capabilities and expertise enabled the delivery of a European geospatial intelligence service that supports the EU and its Member States in their operations and interests, improving situational awareness for informed decision-making. In 2021, Copernicus SEA provided assistance to tens of users, receiving more than 100 activations and delivering more than 300 products. Among others, the Copernicus SEA service supported its users in the framework of stability and resilience for development domains with on-demand, mission-ready and rapidly-delivered geospatial information. The EU, together with its Member States, is the world's leading actor in the area of development and cooperation, providing more than half of the world's aid delivery.

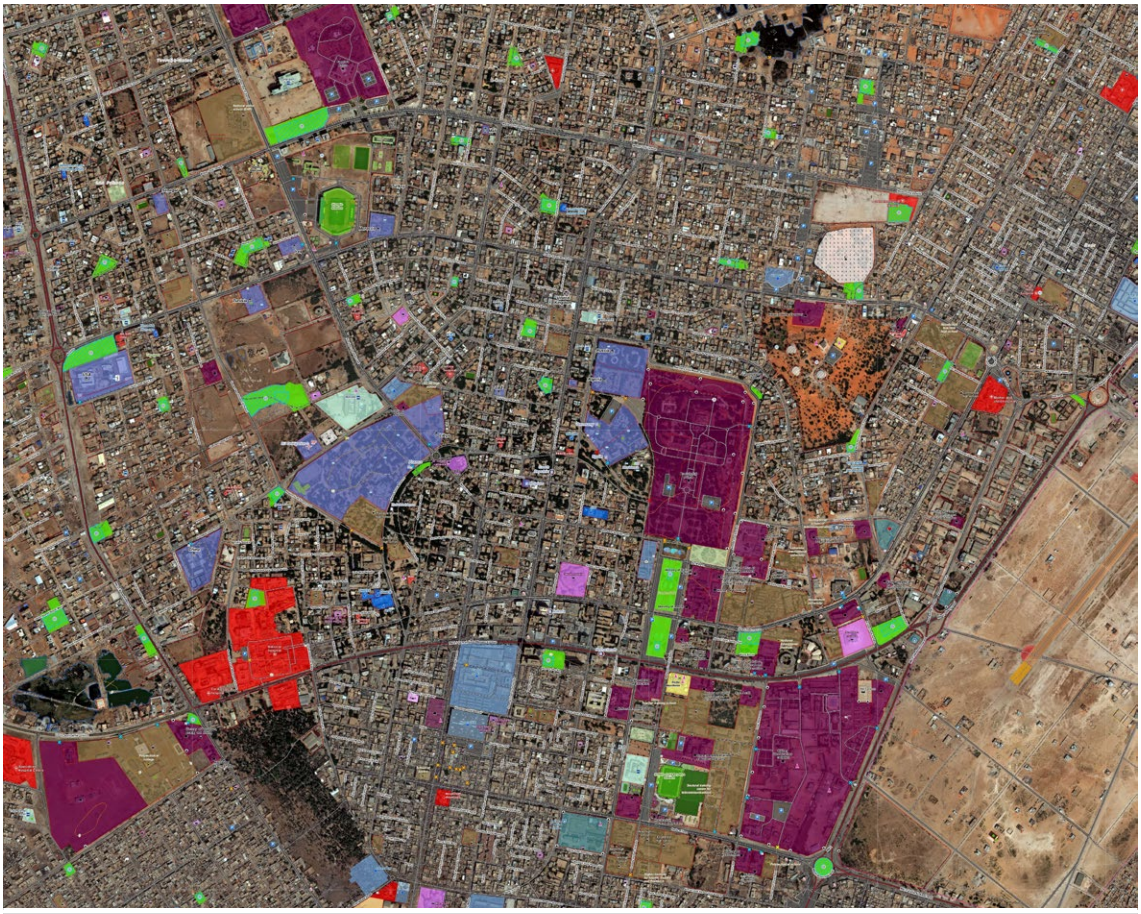
Copernicus SEA 1,000 products delivered publication in the Copernicus Observer Newsletter [3]

3. https://www.copernicus.eu/en/news/news/observer-copernicus-sea-service-marks-milestone-achievement-delivery-1000-products

In this context, Copernicus SEA delivered products to monitor the status of development projects based on detectable indicators and 'footprints' using satellite imagery, making it possible for donors to reduce the need for potentially dangerous site visits and enable more efficient onsite progress evaluation.

EU countries have been cooperating to protect citizens abroad for decades with the establishment of European citizenship, this cooperation gave rise to the status of EU citizen. Due to its commitment and efforts to preserve and maintain peace and collaboration, the EU has seen its role as a protagonist in the world scenario increase, and as such the exposure of its delegations and missions, and consequently all EU citizens, to ever-increasing risks of reprisals by criminal and terrorist organisations.

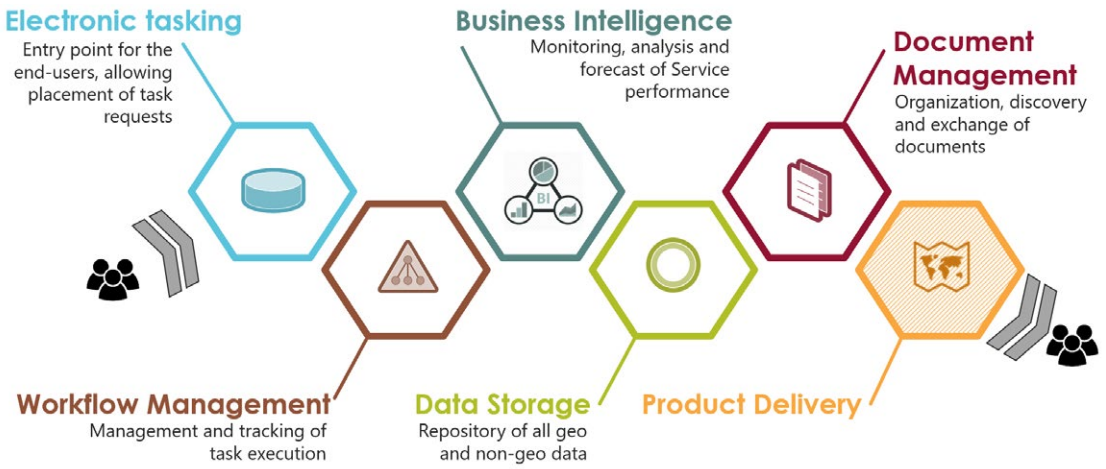
Copernicus SEA contributed to the identification and analysis of main elements that can be affected during a crisis, such as key facilities and installations, calculating evacuation routes and distances from key locations, detecting main transportation hubs and networks to set up evacuation plans and identify open areas potentially used as locations for temporary settlements in the aftermath of a crisis.



Support to Evacuation Plan on Nouakchott (Mauritania) © European Union 2021

In addition, SatCen has been working on the development of a Service Management Infrastructure (SMI) in order to further support the implementation of the SEA service. The SMI consists of a platform providing a broad set of functionalities and integrated tools allowing for the digitalisation and optimisation of all tasking and operational workflows at SatCen.

It will support the daily implementation of service production and management, and provide real-time insights on tasking, production status and workload capacity.



Copernicus SEA Service Management Infrastructure

Its main objectives are:

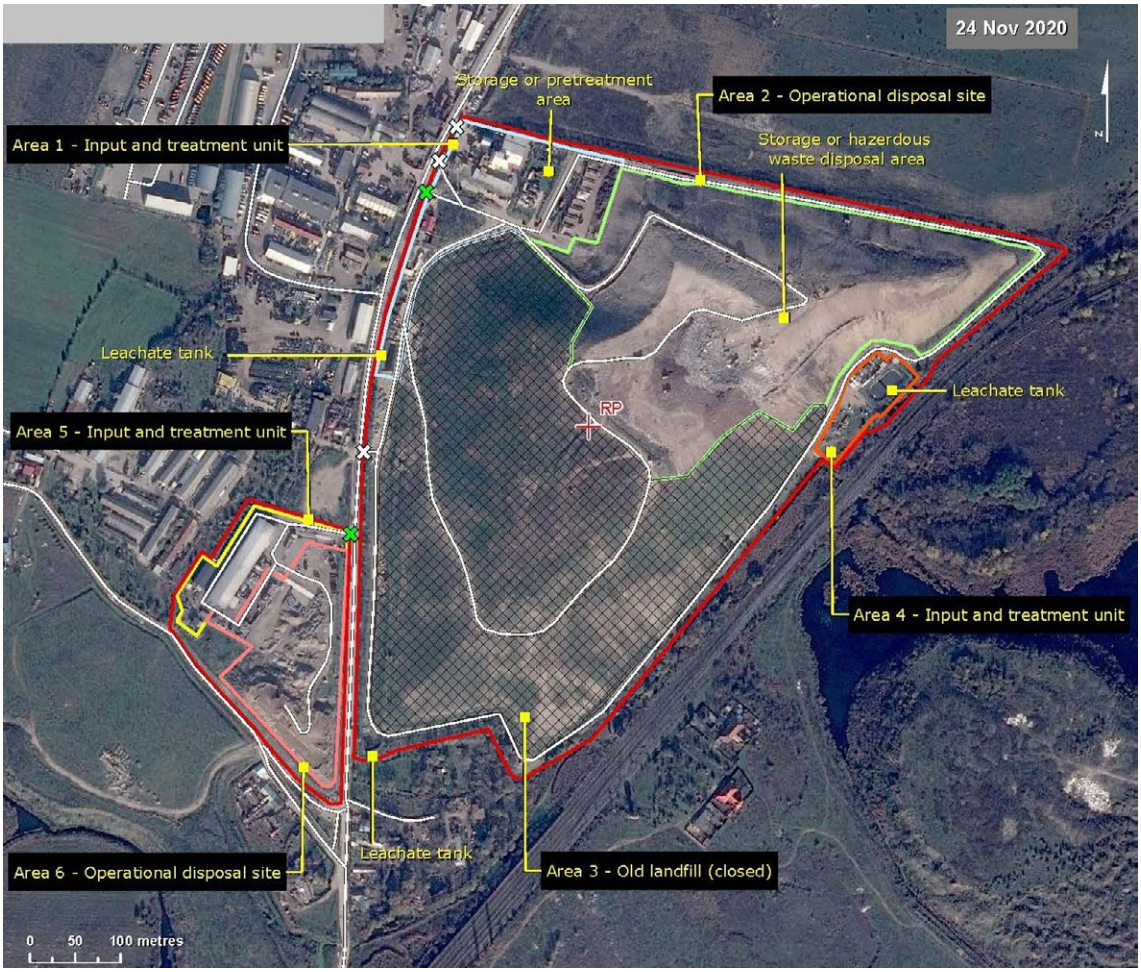
- To guarantee a single service access point for end-users;
- To manage, plan and monitor tasks at both operational (geospatial production) and coordination levels;
- To optimise processes through the automatisation of routine activities.

Software development and component integration activities continued during 2021 and multiple legacy scripts and tools used in the past to support service operation tasks were integrated within the SMI.
The deployment of the first version of the SMI is planned for the first semester of 2022. It will be one of the central services of the classified IT platform.

In the framework of R&I and service evolution initiatives, the SEA service conducted several pilot projects in cooperation with users to develop comprehensive solutions for new application areas and products to be transferred into the SEA portfolio. Successful pilots were co-designed and undertaken to monitor illegal activities, such as environmental crime (illegal waste) and cultural heritage (looting activities), together with the Member States.

Moreover, SEA continued identifying and implementing solutions to optimise, improve and adapt the service. In 2021, initiatives were conducted to explore new sensor capabilities for security purposes (e.g. PRISMA hyperspectral data), to evaluate innovative systems for data collection (e.g. crowdsourcing) and to enhance the geospatial production chain (e.g. workflow optimisation, product visualisation).

For example, the pilot project was born from the active cooperation between SatCen, Romania's Ministry of the Environment and the Romanian Space Agency. The pilot project objectives were focused on the design of methodology and techniques for monitoring environmental compliance with satellite images, making it possible to detect and classify waste deposits, as well as to estimate the risks to the local population.



Environmental compliance monitoring – landfill waste analysis, Bucharest, Romania © European Union 2021

The European Green Deal and the EU Circular Economy Action Plan both aim to accelerate our transition towards a circular economy based on a high resource-efficiency, the reduction of waste and high recycling rates in all sectors.

Copernicus SEA supports the EU in its intention to reduce the negative impact caused by the generation and management of waste.

Regarding SatCen collaboration in specific Horizon 2020 EU-funded R&I projects for Copernicus SEA Evolution, the Centre continued its engagement in the ARCOS project. Its main objective is to enlarge the Copernicus SEA Service portfolio by designing and implementing an early-warning system that continuously monitors the Arctic to detect and identify criticalities through near real-time innovative AI analysis techniques.

ARCOS H2020 project, 2020
© European Commission 2021

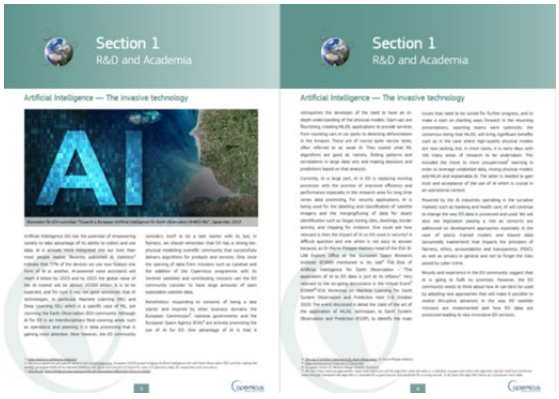
In 2021, the project finalised the high-level design of the system, the AI processing chains and the services to be offered. SatCen made advances in the analysis of the Arctic from a regulatory and strategic point of view and completed the collection of detailed user requirements. Moreover, the Centre worked on the set-up of the User Advisory Board, analysing the priorities, interests and roadmap of European key actors and the relevant strategy and policy landscape in the Arctic region.

Finally, the Hovering Horizon bi-monthly magazine reached more than 200 subscribers. In 2021, the publication covered relevant topics such as health security, the geopolitics of climate security, raw materials and the latest technologies to provide insights for decision-makers in the field of EO.

SatCen also coordinated closely with Frontex, the EEAS, DG DEFIS, DG HOME and the Board to ensure the continuity and evolution of Copernicus SEA and Frontex SLA cooperation activities beyond 2021. This included the preparation and consolidation of future operational protocols, agreements and arrangements for their approval.

SatCen activities in Copernicus enabled the exploration and establishment of inter-agency cooperation (with Frontex, EMSA, EFCA, EDA) of the utmost importance to strengthen synergies and complementarities among existing EU capabilities, but also to consolidate cooperation with international organisations such as ESA and the UN, as well as EU relevant initiatives, such as the European Artificial Intelligence Alliance and the European GNSS Interference Task Force.

SatCen also regularly interacts with ESA for the Copernicus Space Component Data Access (CS-CDA) and participates in working groups such as Sentinel Next Generation Ad Hoc Expert Group and Sentinel Yearly Mission Review and Copernicus Calibration Validation Solution.



Hovering Horizon,
the Copernicus SEA bi-monthly magazine

Support to Frontex continued in 2021, by providing monitoring and analysing irregular migrant flows and cross-border activity, including cross-border crime, with 219 accepted tasks and a 21% increase in delivered products compared to 2020.

Concerning the implementation of the Frontex SLA as part of the evolution of the Copernicus border surveillance service in support to Frontex, SatCen worked on new developments and new technologies such as the electronic tasking tool, the evaluation of high definition (HD) (processed) 15 cm satellite imagery and Cappella Space imagery for Frontex tasks. This task aimed to assess the basic imagery specifications of Capella Space imagery, such as image footprint, quality and acquisition time in the context of SatCen's commitment to diversifying its access to data to respond to the emerging needs of Frontex. Therefore, SAR data from various sources is of use in an ad hoc manner and depending on the tasks that need to be fulfilled. As a first step towards operationalisation of this asset, SatCen tested two SAR images where the SpotLight mode was clearly of better quality and its specifications were closer to SatCen´s needs.

SatCen and Frontex continue developing the electronic tasking tool, with the goal of improving the interagency tasking interface and workflow. The electronic tasking will allow the service managers, through a step-by-step interface, to complete and submit a new task request using an online application. Electronic tasking will allow for a faster tasking process cycle.

15 cm HD imagery: With this task, the aim was to assess the 15 cm HD imagery relevance for Frontex tasks. This 15 cm imagery was compared with the commonly used 30 cm vis-à-vis several objects of interest, such as the detection of wooden skiffs (approx. 6 m), light utility vehicles, compounds, human activity, buildings, trucks, homogenous areas, objects concealed by vegetation, vegetated terrain and tree cover. It was demonstrated that the 15 cm HD processing significantly improves the image quality by preserving the image details, enhancing the edges and smoothing the homogenous areas by removing the noise. The result is an image with better comfort for visualisation and interpretation.

AI-ARC H2020 project flyer, 2020
© European Union 2021

In the framework of H2020 activities, SatCen participates in a new project financed by Commission, AI-ARC. The project applies AI, machine-learning and virtual reality (VR) technologies to filter numerous validated and statistical maritime data streams and databases to develop a Virtual Control Room (VCR) that can provide a situational picture in the Arctic Ocean region, as well satellite-supported maritime tools for services in the Arctic and the Baltic Sea.

SatCen will participate in the AI-ARC pre-operational validation of the information exchange framework and the derived maritime information services. It will also advise on the fusion of satellite imagery data with other data sources and will contribute to the assessment of the future deployment roadmap.

Presentation of SatCen involvement in Copernicus activities, briefing to Mr Vlad Gheorghe MEP, 29 October 2021

Through participation in events and open discussions, the Centre continued to highlight the opportunities that EO can provide. It promoted how evidence-based situational awareness and early warning capabilities support informed decision-making at the EEAS, the relevant services of the European Commission, the Member States and international organisations, and how they support the planning of actions to effectively mitigate possible threats that potentially pose a risk to the security of the Union.

SatCen participation in 'The Impact of Climate Change on Defence and Security from the National and European Standpoint' round table, Turin (Italy) October 2021 ©Italian Air Force

Presentation of SSA capabilities during the visit of the Spanish Ministry of Defence to SatCen facilities, 21 October 2021
© European Union 2021

3.1.3 Space Situational Awareness (SSA)

SatCen has been working for more than 10 years on SSA/SST, based on its unique setting as a service provider in the field of space and security, and its strong institutional links with EU Member States.

SatCen is cooperating closely with the members of the SST Consortium (currently composed of seven Member States: DE, ES, FR, IT, PO, PT, RO) in the EU Space Surveillance and Tracking (SST) Support Framework, managed by the European Commission.

Since 2016, the SST Consortium and SatCen have worked together to develop a European SST capability with the support of the European Union under different funding lines (H2020, Galileo and Copernicus programmes), and formed the SST Cooperation.

As the EU SST Front Desk, SatCen operates and consolidates the dedicated service provision interface for delivering SST services to SST users (the EU SST Portal, available at https://portal.eusst.eu) and operates the EU SST Helpdesk to support SST users. The EU SST Front Desk leads the definition, monitoring and reporting of key performance indicators (KPIs), together with communication and user interaction activities.

Space Situational Awareness (SSA)

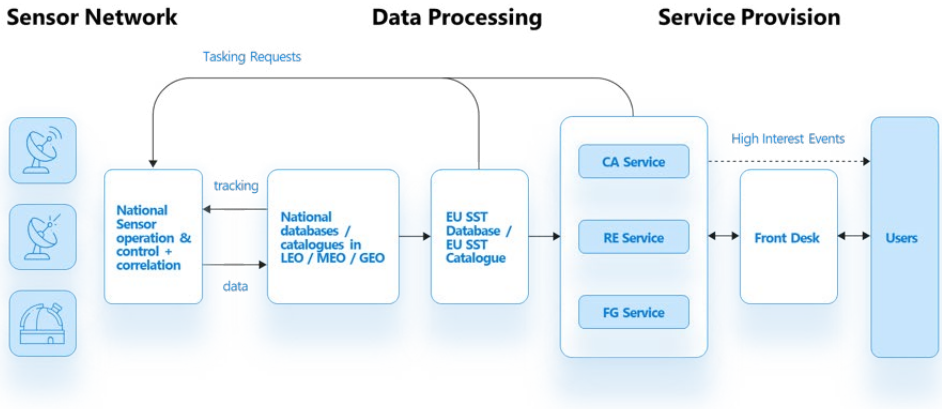
SSA and SST activities aim at protecting the safety and security of European economies, societies and citizens, which rely on space-based applications such as communication, navigation and Earth observation.

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

Read more

The Centre is the main interface for the provision of three SST services: Collision Avoidance; Re-entry Analysis; and, Fragmentation Analysis.

Feedback from users is very good, with very positive comments on the support provided by the Front Desk.



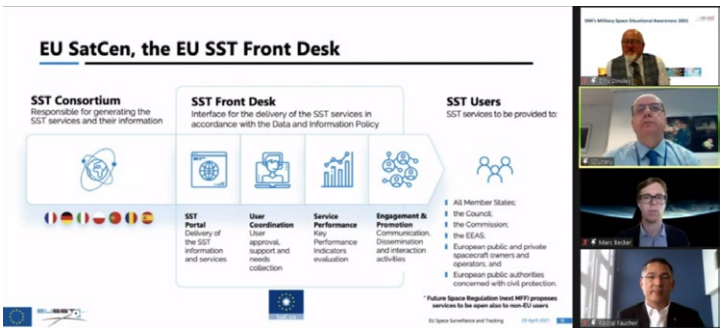
Currently, approximately 135 organisations receive the SST services, including: satellite operators, civil protection entities, EU institutions and bodies, and EU Member States. More than 238 European satellites are safeguarded from the risk of collision against space debris and other satellites.

In 2021, SatCen launched the new EU SST Portal (https://portal.eusst.eu) with a new Service Provision for SST users, featuring a brand-new visual interface and an enhanced user experience, taking into consideration user feedback and needs. The portal now also includes features to support the risk assessment of potential collision events, 2D/3D visualisation capabilities, and improved email notifications.

The Centre also developed the first version of the communications and coordination platform prototype for satellite operators.

The EU SST website was also updated with the inclusion of a procurement opportunities section and the publication of the EU SST R&D plan towards 2028.

Regarding user uptake, on 5 October 2021 SatCen organised the 3rd EU SST Webinar, a flagship EU SST event that focused on how EU SST is building the future of SST in the EU through architecture studies, capability development and R&D activities. Speakers included representatives from the European Commission (DG DEFIS), the SST Consortium and space industry partners. The webinar attracted more than 500 participants. SatCen also launched the 4th EU SST User Feedback Campaign and refined the EU SST user uptake strategy and targets.



EU SatCen presenting the EU SST Front Desk during SMI's Military Space Situational Awareness virtual conference. 29 April 2021
© SMI / EU SST 2021

The Centre also made an EU SST KPIs reporting platform available to the SST Consortium. This tool reports on various KPIs that monitor the different SST functions, i.e. sensor, processing and services. The online platform allows an in-depth statistical analysis of the performance of the different system components and the resulting SST services provided.

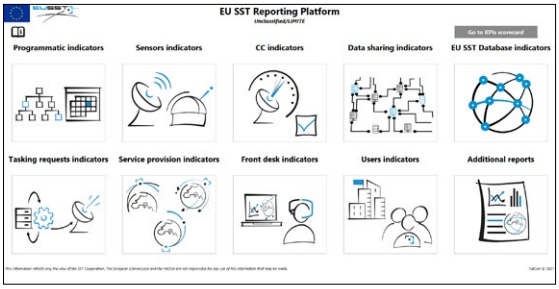
Furthermore, within the SST Consortium, SatCen coordinates the EU SST Taskforce to deal with scenarios associated with critical operations and high media interest events. During this period, six activations of the EU SST Taskforce took place, ranging from support to the first Galileo collision avoidance manoeuvre by mitigating a risky conjunction with a piece of space debris, to three activations on close approaches between large pieces of debris.

Another very particular activation in 2021 was the monitoring of the re-entry of the large space object CZ-5B R/B (2021-035B), the core stage of the rocket that launched Tianhe, the first module of the Chinese large modular space station, or the characterisation of the fragmentation caused by the anti-satellite (ASAT) test against Cosmos 1048 on 15 November 2021. The EU SST network of sensors observed the events closely, providing relevant information to different users and authorities. The EU SST network of sensors observed the events closely. EU SST analysed the data and communicated the events to relevant stakeholders, such as the Commission or the EEAS, and to the public, when appropriate.

Other activities included participation in the SMI Military Space Situational Awareness virtual conference on 29 April 2021, at which SatCen's Director presented the role of the Centre as the EU SST Front Desk and its part of the SST Cooperation, and the coordination of the first EU SST promotional video, aimed at raising awareness on EU SST and explaining its nature, structure and goals.

In the context of Space Traffic Management and in the scope of the H2020 Spaceways project, two virtual workshops were organised by SatCen as part of the Stakeholders Engagement Programme, to gather views and needs on STM from institutional, operator and R&D actors. And in the EUSTM H2020 project, SatCen leads the data governance and security related activities.

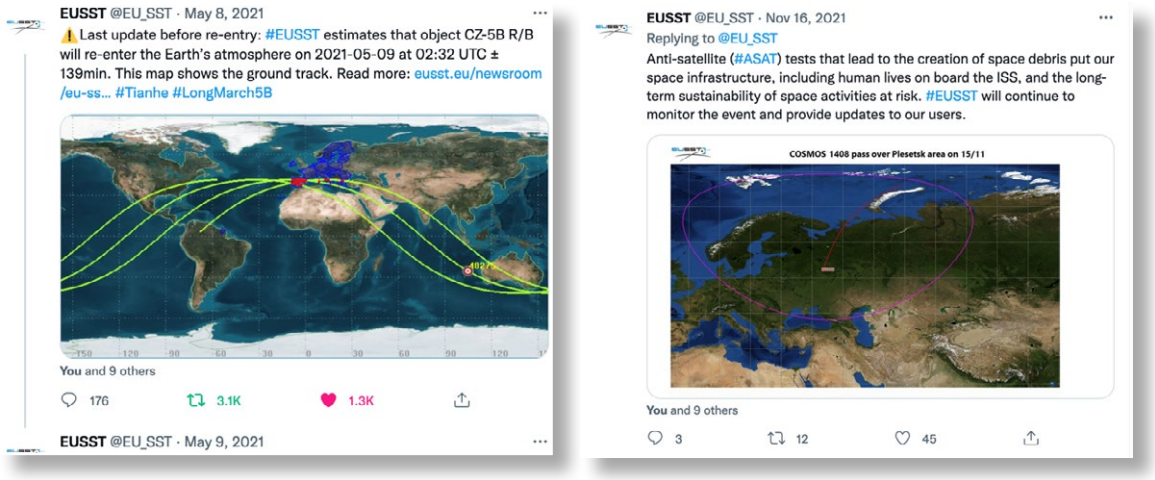
Finally, in 2021 SatCen started a dialogue with EUSPA, DG DEFIS and the SST Consortium on the transfer of the SST Front Desk function to EUSPA in the context of the EU Space Programme.



New EU SST Portal and EU SST Reporting Platform © SatCen 2021

Services	Products	Portal & Helpdesk	Users	Additional
Collision Avoidance Events **435** risky[1] conjunctions	**Collision Avoidance Products** **179,217** CDMs/Reports	**SST Portal Availability** **99.95%**	**Users** **134** Organisations **279** Users	**Reporting Platform** **+50** KPI's and metrics reported
Re-entry Events **69**	**Re-entry Products** **410** Reports	**Helpdesk** **398** Requests registrations and support	**Satellites** **238** European Satellites	**EU SST Social Media** **6.690** followers
Fragmentation Events **4**	**Fragmentation Products** **14** Reports	**Taskforce** [2] **6** Activations for critical events	**3st EU SST Webinar** **500** Live attendees	**+ Activities on** • SW development • Communication • Dissemination • STM

1 Risky conjunction stands for close approach with a high level of risk, also known as high interest event, potentially requiring collision avoidance maneuvers to be performed by the satellite operators. 2 Responsible for ensuring effective communication with key stakeholders when facing crisis management and mediatic events.



EU SST social media accounts reporting on the re-entry event of object CZ-5B R/B in May 2021 and the anti-satellite test performed in November 2021

"The European Union Satellite Centre is an important part of the EU's operational readiness and effectiveness, but it also is a key asset in the space diplomacy conducted by the EEAS Space Task Force. SatCen plays an important role within the EU Space Surveillance and Tracking (SST) consortium, which contributes to the EU's security from and in space."

European Union Institute for Security Studies (EUISS) Brief 9: Securing the Heavens, April 2021

3.1.4 Research, Technology Development and Innovation (RTDI)

Research, Technology Development and Innovation

RTDI initiatives are part of SatCen R&I activities with a focus on the implementation of innovative solutions to enhance SatCen core capabilities. The main RTDI workstreams are related to:

- The development of advanced EO applications by exploiting a wide variety of data sources and state-of-the-art technologies (e.g. Big Data, AI, cloud computing, interoperable platforms) to generate innovative products and results;
- Collaboration with key entities (e.g. ESA, GEO) to ensure SatCen contributes to and gets involved in the main EU and global initiatives (e.g. GOVSATCOM, support to UN SDGs), and benefits from the latest developments in the space and security domains.

Security and its various dimensions have become a cornerstone of EU strategic autonomy. SatCen provides operational support to strengthening this critical pillar of EU stability. To make sure that this support includes leading edge technology, RTDI undertakes R&I projects, in some cases in cooperation with other entities, in which the latest EO and space relevant technologies are addressed.

In the space and security domain, being SatCen's operational environment, technologies have been evolving at an unprecedented pace during the last decade. To make sure the different technologies are tracked and the most promising ones are identified and evaluated, RTDI follows various lines of activities that enable the continuous upgrade of SatCen technological capability to a cutting-edge level.

Engagement in projects and cooperation initiatives are essential in order to have a complete vision of market trends and their evolution. Key projects usually provide the perfect framework to identify, understand, develop and validate new solutions that could be transferred to operations along the whole data lifecycle.

Regarding collaboration within Commission research and innovation framework programmes (i.e. Horizon 2020 and Horizon Europe), several projects continued during 2021.

In April 2021, ENTRUSTED launched a survey coordinated by SatCen to gather user needs for future secure satellite communication services to support the shaping of the future GOVSATCOM Space Programme component. More than 150 answers were received and processed to derive user requirements and to define the suitable use cases.

SatCen coordinated a survey within ENTRUSTED to gather user requirements for GOVSATCOM users, 2021
© ENTRUSTED Project

With respect to E-SHAPE, SatCen increased its role in the project (and its contribution to the EuroGEO initiative) by shaping and participating in a new pilot project related to climate security, in which the impact of flooding in vulnerable regions is addressed.

This activity in support of the understanding of climate security complements the work of the GEM project (Global Earth Monitor). Within GEM, SatCen has a prominent role in developing a pilot application to better understand the climate change and security nexus by combining EO and collateral data sources. SatCen also coordinates the communication and dissemination activities.

In addition to the projects above, two new projects started in 2021.

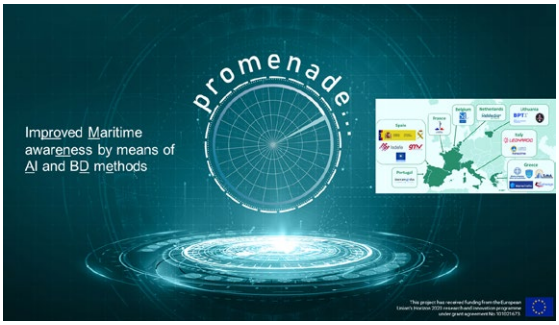
AI4Copernicus' main objective is to provide a digital environment to rapidly prototype new artificial intelligence for Earth observation (AI4EO) applications with a particular focus on domains such as security, energy, agriculture and health.

The project launches open calls to fund innovative developments using EO data and AI techniques. SatCen manages the open calls related to security (e.g. definition of tender specifications, evaluation of tenders and support to 3rd parties in the technical implementation).

In the first open call, three proposals related to the security domain (on maritime awareness, climate security, and infrastructure monitoring) were awarded, starting in Q1 2022. SatCen will follow these projects providing guidance and requirements to make sure that services are developed in line with real needs.

PROMENADE started in Q4 2021. It aims to improve solutions for vessel tracking, behaviour analysis and automatic anomaly detection by means of the application of AI and Big Data technologies. SatCen is in charge of providing advice on the use of EO data for maritime surveillance and of the engagement of external stakeholders. The first online workshop with users was held on 15 December 2021 and was open to the public.

AI4Copernicus under the H2020 ICT call to foster the use of AI powered applications for EO was successfully kicked-off in January 2021. © AI4Copernicus project 2021 (image composition made by SatCen)



PROMENADE under the H2020 Secure Societies call to enhance Maritime Surveillance capabilities was successfully kicked off in October 2021. © PROMENADE Project 2021 (image composition made by SatCen)

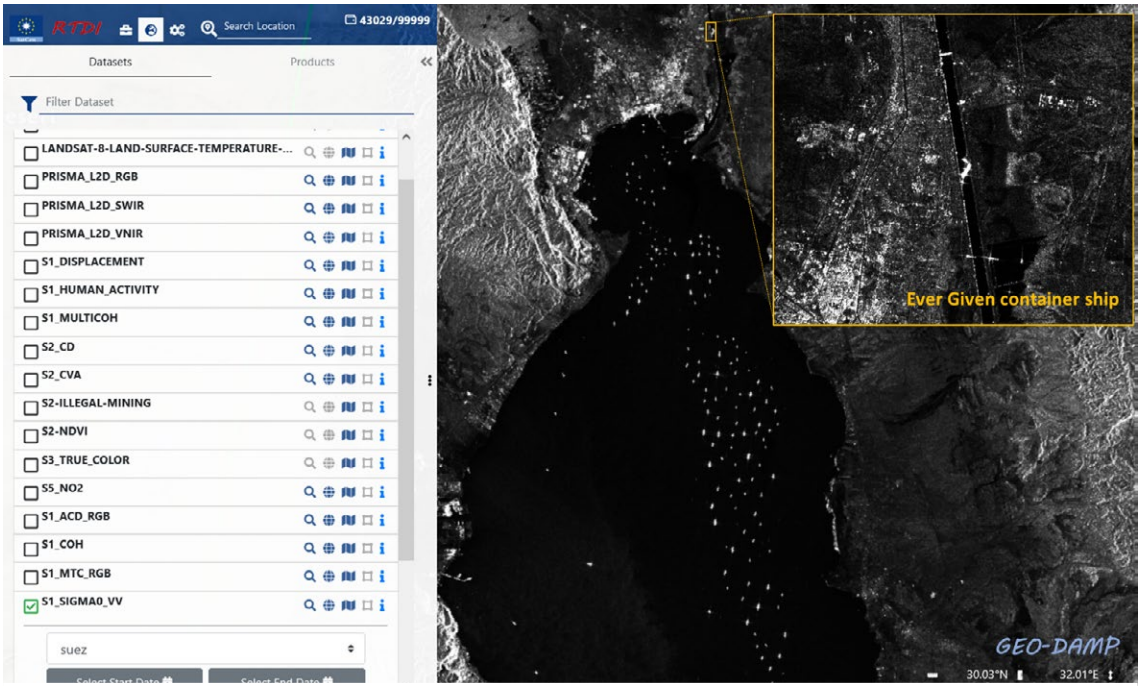
An improved version of the Geospatial Data Management Platform (GEO-DAMP), which already demonstrated the vast potential of working in a platform-based approach, was released in April. By making use of innovative conceptual, architectural and technical solutions, it provides new services to exploit Sentinel data and applications. The current activities led to an updated version in the first half of 2022, integrating new capabilities for the discovery, access and processing of very high resolution imagery.

GEO-DAMP is currently considered a key building block of the future classified IT platform as well as a proof-of-concept for a Digital Twin Earth for Security, a digital replica of the Earth to understand and monitor events impacting the safety and security of citizens and societies.

Through the GEO-DAMP dashboard, users can also access other internal applications responding to specific operational needs.

One of them is MITO, resulting from the internal Maritime Pilot Project, which facilitates the integration of AIS and EO data and is expected to evolve by integrating project results (e.g. PROMENADE) and SatCen user needs. Other applications include the SWIPE tool, which enables easy and fast exploration of Sentinel data at native resolution, and specific tools designed to explore collateral data like event databases, geolocation data and open-source datasets.

In summary, RTDI activities ensure SatCen involvement in relevant initiatives to keep its knowledge base up-to-date regarding technologies and trends by cooperating with key entities. As well as EDA, ESA and GEO, described in the next sections, RTDI participates in relevant initiatives within the Open Geospatial Consortium (OGC), the Community of European R&I in Security (CERIS) and the Data, AI and Robotics (DAIRO) association.



Monitoring of blocked maritime traffic during the obstruction of the Suez Canal (Egypt) using the GEO-DAMP Platform and Sentinel-1 images, 27 March 2021 © European Union 2021 (contains modified Copernicus Sentinel data [2021], processed by ESA)

3.1.5 Cooperation with the European Defence Agency

Since 2016, the EDA and SatCen have been officially cooperating to harmonise and synchronise their respective annual work programmes through a jointly agreed cooperation roadmap.

As space-based capabilities have become a critical part of all MS and EU defence strategies, being an indispensable tool for any civil/military mission and operation, EDA and SatCen have teamed up to help Member States improve their capabilities in this domain.

The cooperation with EDA provides a major pillar of SatCen's close and trustful collaboration with key partners in space and defence, focusing on common interests in further developing EU capability in this field.

During 2021, cooperation with EDA continued, namely through SatCen's participation in activities such as MARSUR III, working on the global enhancement of the network with new technical requirements (security, maintenance, new contractor), as well as new principles of work with regards to other initiatives and participations in the maritime domain such as CISE.

SatCen participates in Project Team (PT) Satellite Based Earth Observation (SBEO) as well. The Common Staff Requirements draft document (CSR) and the Business Cases were finalized and endorsed by EDA Steering Board in spring 2021.

Furthermore, the EU SSI study (Shared Satellite Imagery) was launched with a strategic consultation among the contributors (Member States, EU entities, SatCen), to which the Centre provides an important contribution.

The REACT3 project concerning the enhanced use of SAR radar images with a full operational capacity was launched at the beginning of March. The user community includes Member States, Frontex and the SatCen itself.

The GISMO GeohuB was deployed and is now operational at Operation Atalanta, EUMM Georgia and the German MNGSG and is regularly used for the support of the EU exercises. GeohuB operational use is supported by training provided to different user groups. Deployment to EEAS and OHQ in Larissa is planned for 2022, as well as a service restore at Operation IRINI.

Meeting of SatCen Director Amb. Sorin Ducaru with EDA Chief Executive Amb. Jiri Sedevy, 17 October 2021

The GeonaW project was finalised in February. It produced a reference study of the application of position, navigation and timing, which will be used to develop geospatial solutions to support OPS planning in the framework of navigation warfare (NAVWAR), and PNT denied environments. Building on this success, the GeonaW-II project started in May with the aim of defining and implementing a first prototype able to provide solutions to support mission NAVWAR planning and operations.

In these margins, SatCen and EDA CapTech teams started a dialogue to identify new synergetic activities for cooperation.

Finally, the MATRIX project started in March for a duration of 18 months. It is a landscape study on AI solutions for supporting complex imagery intelligence (IMINT) processes.

In the framework of this initiative, an expert working group (MEWG) was established enabling the building of a Member States AI community of experts that steer the study.

Participants from 10 different Member States agreed on the relevance of the working group as a shared environment to foster AI knowledge within the IMINT community, paving the way for future developments while establishing possible synergies with relevant national and international AI initiatives.

3.1.6 Cooperation with the European Space Agency

Cooperation with the European Space Agency (ESA) is crucial for SatCen due to the prominent role of the ESA in developing space technologies and applications. The Administrative Arrangement between ESA and SatCen provides, from January 2018, a formal and structured framework for cooperation on activities of common interest, as well as for identification and exploration of opportunities for future collaboration.

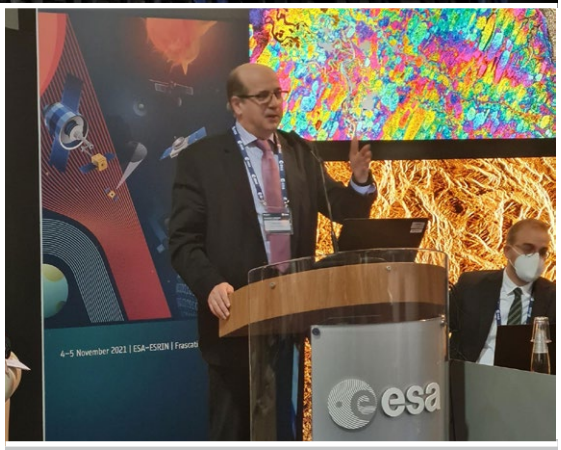
Relevant activities in 2021 included the organisation of the 5th edition of the Big Data from Space Conference (BiDS), jointly organized by ESA, SatCen and JRC, held online from 18 to 20 May 2021. This edition, supported by the Romanian Space Agency and the Politehnica University of Bucharest, featured more than 800 registered participants and represented a key milestone in the move from insights to foresight in the space and security domain.

Also worth mentioning is the work on the ESA-SatCen Large Scale Pilot (LSP) and the associated organisation of a workshop on Climate Security on 14 June 2021, moderated by the EUISS, in which key international institutional stakeholders participated online. The workshop addressed three climate security scenarios related to the impact of climate change on the Arctic, on human/environmental security and on sustainable energy development, laying the foundations for ESA-SatCen collaboration on this topic.

ESA Intermediate Ministerial Meeting 2021 and the intervention of SatCen Director in Matosinhos (Portugal), 19 November 2021 © ESA 2021 (image composition made by SatCen)

SatCen Director Amb. Sorin Ducaru participates as an observer at the ESA Intermediate Ministerial Meeting held in Matosinhos, Portugal, 18-19 November 2021

By the end of 2021, SatCen had participated in the ESA Intermediate Ministerial Meeting held in Matosinhos, aiming at generating a new vision for space activity and preparing the ground for the Ministerial Conference planned for 2022.



SatCen Director Amb. Sorin Ducaru participates in the ESA Security Conference in Italy, 5 November 2021

3.1.7 Cooperation with the Group on Earth Observations

SatCen continued its participation in the Group on Earth Observations (GEO), being part of the European GEO High-Level Working Group and the EuroGEO Coordination Group, thus maintaining a regular dialogue with Commission DGs RTD and DEFIS as well as with other relevant EU entities and Member States participating in GEO. Within the GEO Space and Security Community Activity, led by SatCen, a pilot project was launched to exploit SAR interferometry products to support sustainability and civil security in vulnerable regions.

In addition, SatCen participated in the two main GEO events in 2021, organising and moderating the session 'Enhancing security on Earth from space' within the GEO Symposium in May and the session 'EO as a key tool to ensure civil security for society' within the GEO Week in November. The sessions, with participants from the Commission, NASA, ESA and WFP, were the first GEO events ever with security as a main topic. The activities within the GEO framework provide SatCen with a global vision of the EO domain and enhance its visibility in international environments.

3.2 Innovation in Information and Communication Technology

Meeting the specific conditions and heavily increased teleworking requirements during the pandemic was again an important trend in 2021. SatCen thus continued to invest in the relevant IT infrastructure and related services, in order to support the maximum operational productivity possible under such conditions.

All servers from the classified network have been migrated from Windows 2016 to Windows 2019 in preparation for the next inspection of SatCen's operational network according to security regulations.

Network storage capacity has been substantially increased in both classified and unclassified networks to cope with the increased activity and the cloud-native infrastructure.

The main area of work in 2021 was the automation of operational tasks, for production and dissemination through different projects.

An automatic image co-registration system has been implemented and is currently being tested by the Data Preparation team to verify that its level of accuracy matches SatCen's requirements. The main goal is to automatise part of the processing workflow to adapt to the ever-increasing flow of data.

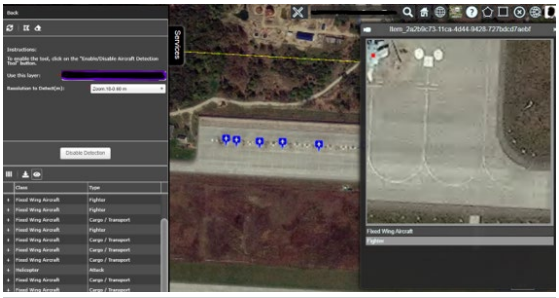
All SatCen products are being packaged in a way that will ease their access through EOW, taking into account the current limitation of the bandwidth.

A geospatial vector quality control gateway has been deployed, allowing external geospatial providers to check their production match SatCen's requirements before final delivery.

An additional function to the 3D Catalog has been developed, allowing instant production of reports and sharing within a team, and is currently being tested by the Operations Division. An AI aircraft detection tool has been integrated into the 3D Catalog using a model developed by the training unit.

Providing SatCen classified interactive services through EU OPS WAN has been successfully tested with suitable Member States, as well as an EU OHQ, following prior tests with the EEAS.

A task scheduler taking advantage of SatCen's private cloud infrastructure has been implemented allowing hundreds of tasks to be run automatically in parallel, such as image processing or AI detections.

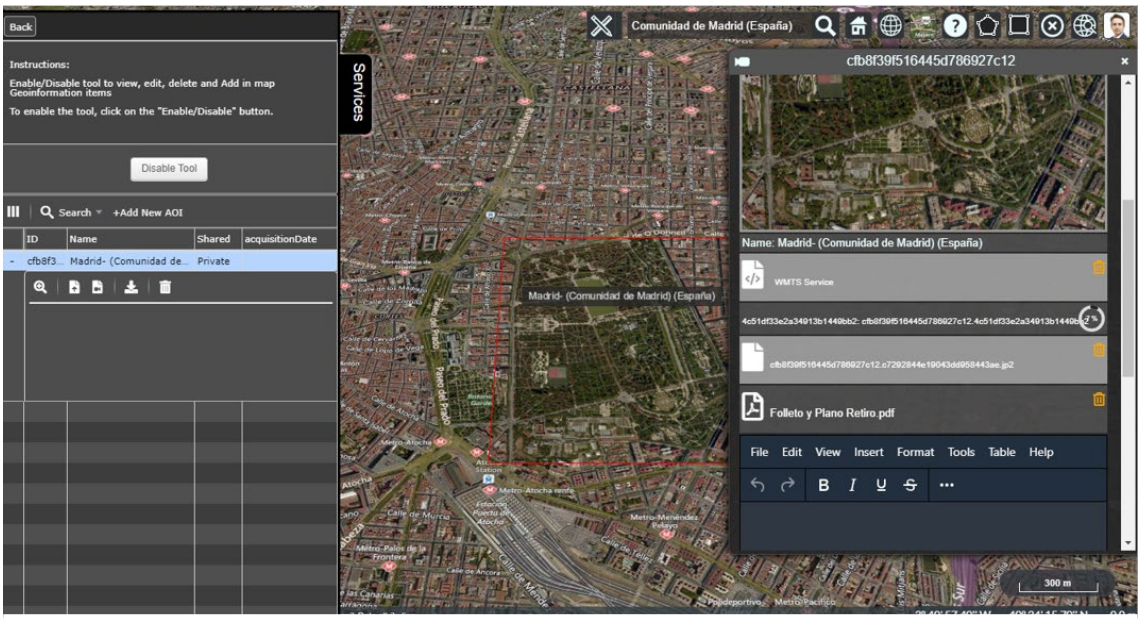


The use of operational AI helps SatCen analysts quickly identify different types of military objects

Business intelligence tools have been deployed on the classified network to allow analysts to generate advanced reporting from heterogeneous data sources.

The Task Management Tool has been upgraded in order to serve immediately finished operational products through EU OPS WAN.

A laboratory to work on the future prototype of the classified IT platform has been provisioned from SatCen virtual server infrastructure. It will allow quick and easy testing of hardening parameters that will be required. In 2022, the first prototype of the platform implementing basic services and user management will be implemented.



Productivity tools help analysts gather heterogenous data in compact packages and generate fast products

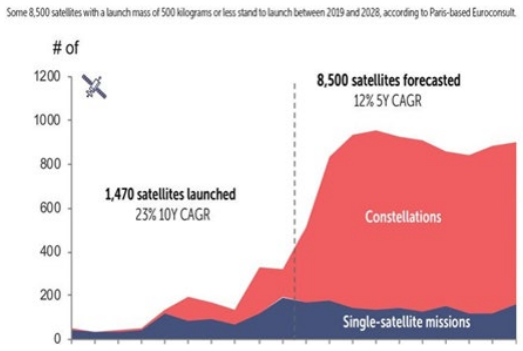
3.2.1 A Classified IT Platform for Classified EU Intelligence Services

The development and deployment of a classified IT platform is a key part of SatCen's strategic evolution. The drastic increase in the amount and speed of demand, the explosion of EO data available for analysis, as well as the general move from 'paper products' to interactive always-on services online, are the key drivers for this tool to become mission critical in delivering the Centre's tailored operational support to its users in the future. Based on the Board's 2021 approval of the Baseline Augmented plan, SatCen has started to implement its platform concept.

ADVANTAGES OF THE CLASSIFIED IT PLATFORM

A. Rapid growth of data to process and new technologies

The number of EO satellites and the range of their capabilities has grown constantly over the last few years. The commercial market has moved from a small list of large providers operating a few satellites (e.g. Airbus, Maxar) to an ever-growing number of 'new space' companies, launching complex constellations of satellites (e.g. Planet, Satellogic, Capella, IceEye, etc.). Such a large quantity of data can only be exploited through new technologies based on Big Data techniques and AI.



Source: Euroconsult's Prospects for the Small Satellite Market, 5th Edition

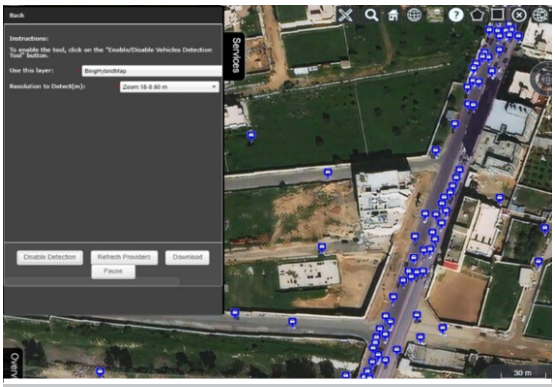
B. Future governmental imagery platform

The EU Member States are currently collaborating within EDA on the PESCO project, approved in November 2021, to provide a common platform for governmental imagery. This platform will require a classified infrastructure with cloud-native technologies that will offer direct classified links to Member States networks and centralised authentication mechanisms.

SATCEN'S OPERATIONAL ASSETS

A. Cloud technology, Big Data, and AI operational experience

Based on its operational, research and innovation activities, SatCen has developed broad expertise in the domain of platforms and cloud technologies. It has already developed a large portfolio of applications, all running on the same technologies that will now be implemented in the classified IT platform.



The use of operational AI applications at SatCen

B. Portfolio of geospatial services and applications developed and owned by SatCen

Over the years, SatCen has developed and integrated an impressive portfolio of geospatial intelligence applications (GeoHub, 3D catalogue, reconnaissance applications, AI detections, GeoDamp, Task Management Tool, etc.). These services will also become directly available to Member States and other users via the platform, providing immediate access to a trove of databases and processes.

PLATFORM FUNCTIONALITIES

SatCen's classified IT platform will:

- be directly accessible to analysts and end-users for geospatial intelligence services, interconnecting SatCen, EEAS, OHQs and MS;
- enable processing at scale in the classified domain, running algorithms on large areas and wide databases;
- support a new business model, moving from PDF format / paper products to always-on interactive products and services;
- offer a hosting platform for new solutions requiring classified capacities (for example for EU SSI, MARSUR, GeoDamp, GeoNaw, React, etc.); and,
- enable an end-to-end tasking process including real-time monitoring of activities and new generation performance indicators and reports.

3.3 Training

The Centre's training activities in 2021 were still severely constrained by the pandemic situation. However, training activities continued with a mix of online training for SatCen staff via the SatCen Training Campus, and on-site training (4). The classes covered essential topics like IMINT foundations, GEOINT, SAR, and included the four-week imagery intelligence course. The nuclear fuel cycle and the two-week industrial installations courses also took place, as well as two editions of the IMINT webinar course to Frontex.

In-situ and tailor made courses were also offered throughout the year and upon request by various Member States.

Training with a transversal approach was also offered to SatCen staff members. It included the third edition of a project management course (PRINCE2) and the first KPI course.

The main objective of SatCen's training programme remained unchanged, which is to empower its analysts with all the relevant skills and knowledge their professional duties demand and to provide spare capacity to analysts of Member States and institutions. This integration of external participants provides a solid foundation of peer-to-peer contact and knowledge exchange, aimed at establishing trustful relations between different stakeholders, fostering a common culture and common methods.

In total, 19 weeks/modules of courses were delivered at SatCen's premises and in-situ, featuring a total of 152 attendees from SatCen and from Member States, together with 130 participants in the four webinars and online seminars organised for Frontex.

4. Students and instructors had to follow strict COVID-19 protection measures at all times

4 RESOURCE MANAGEMENT

4.1 Administration

4.1.1 Personnel

Fulfilling SatCen's mission depends heavily on the professional expertise of its specialised staff and their continued high level of motivated engagement.

Given the specificity of the Centre's activity, with a 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 consistent and updated training are key to maintaining the essential added-value of SatCen's human resources.

At the end of 2021, SatCen was composed of 151 members of staff: 90 of them occupied permanent positions, 56 of them occupied temporary positions, furthermore, two seconded national experts (SNE) complemented the pool of imagery analysts. We also had one local staff member and two trainees collaborating on various tasks. The breakdown by type is illustrated below.

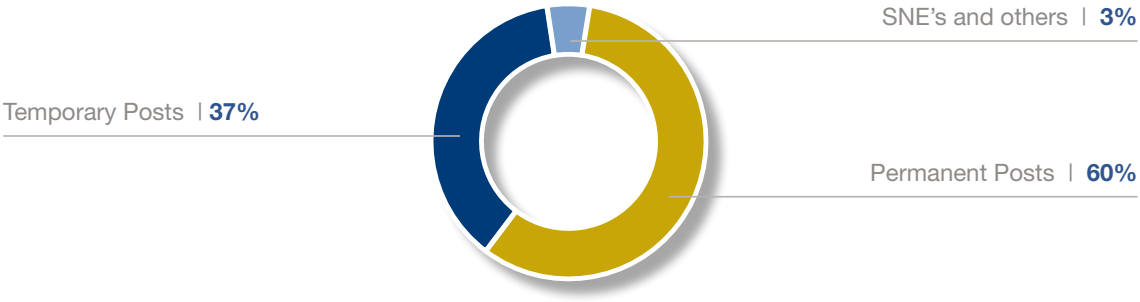
Due to the COVID-19 restrictions in force, SatCen had to continue conducting its selection procedures online, consisting of both interviews and written tests.

In 2021, SatCen launched 24 recruitment processes of which 21 were finalised, including the selection of the Centre's new Deputy Director, new Head of Administration Division and a new Operations Manager. The new Head of Operations Division, who was selected the year before, also took up his duties.

In addition, throughout the year, the Centre welcomed the arrival of three new SNEs, three trainees and one intern; the latter being the result of a new internship policy that has been introduced to offer undergraduate students the opportunity to gain valuable work experience.

With the assistance of the Madrid Health Service, all staff who wished to be vaccinated against the Covid-19 virus successfully received their vaccines, representing 98% of all staff.

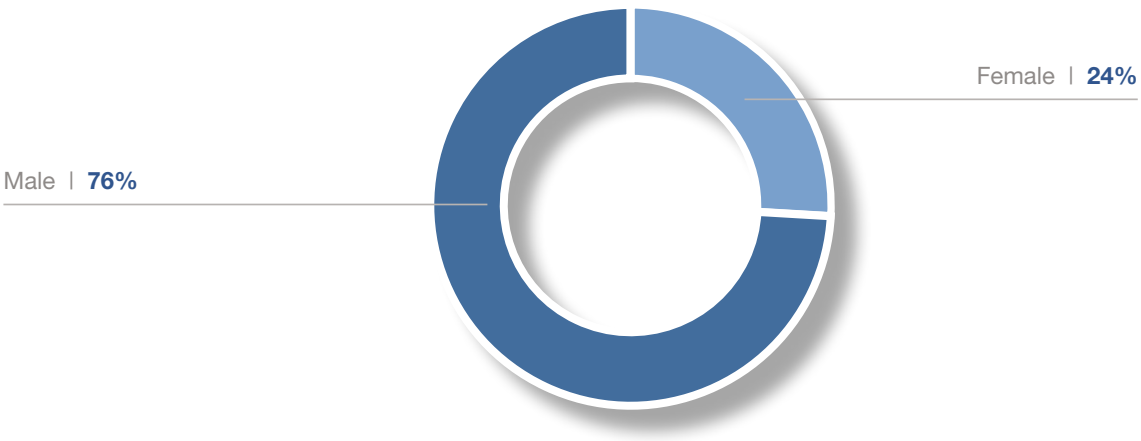
Composition of SatCen Staff



On 31 December 2021, SatCen staff represented 17 nationalities, across five different age groups, reflecting the high level of diversity among both permanent and temporary staff. As for gender, the breakdown remained roughly the same: 115 men and 36 women.

There is a strong commitment to continuously make progress regarding gender balance and the national representation of SatCen staff. In fact, a new Diversity and Inclusion Strategy and Action Plan have been prepared for adoption in 2022 [5].

SatCen Gender Representation



As in previous years, SNEs were a channel for the mutual exchange of expertise between SatCen and Member States. In 2021, the Centre hosted SNEs from Hungary, Poland and Romania.

SNEs serve a special function, by not only reinforcing the Centre's operational capacity and widening the spectrum of services, as recommended by the HR/VP, but also by helping to foster transparency and a fruitful exchange of knowledge. The hosting of SNEs is also an effective way of spreading awareness of SatCen capabilities and helps achieve the important goal of strengthening operational ties with Member States.

5. Diversity and inclusion strategy and 2022 Action Plan:
https://www.satcen.europa.eu/keydocuments/Diversity%20and%20Inclusion%20Strategy%202022-2023620ce64c3172450001c26508.pdf

4.1.2 Data Protection Policy

Data protection (DP) is an integrated requirement for SatCen's handling of personal data. In this context, the SatCen DP team prepared an awareness video on the occasion of the DP Day (28 January 2021) and a related questionnaire for all staff, focusing on the main topics of Regulation 2018/1725.

SatCen has published the Central Register of Processing Activities on its website, where the public records of the Centre's processing activities are accessible for public consultation.

Furthermore, a procedure in case of a personal data breach has been implemented, as well as the improvement of the procedure for the data subjects to exercise their rights.

In addition, the DP team provided three awareness sessions on the processing of personal data for staff in November 2021.

4.1.3 Procurement and Legal

SatCen concluded and published the procurement plan in January for the whole of 2021, merging all the needs of the different SatCen divisions.

The public procurement manual and the procurement practical guidelines have been updated in order to indicate the roles in the TED e-Tendering electronic platform used by SatCen and to establish the obligation to review contract award notices before publication on the OJEU.

Following a negotiated procedure with the consultation of 49 economic operators, SatCen has awarded to the Italian company e-Geos S.p.A. a contract for the performance of a landscape study on AI solutions for imagery intelligence processes and a common framework for AI knowledge sharing within the user community.

The landscape study is part of a joint project between the Centre and the EDA, called MATRIX (Machine-based Algorithms and Tools for enRiched IMINT eXploitation).

Based on an open procedure, SatCen awarded the Spanish bank Banco Santander, S.A. with a contract for the provision of banking services, which will allow major cost savings during the multi-annual term of the contract.

4.2 General Budget

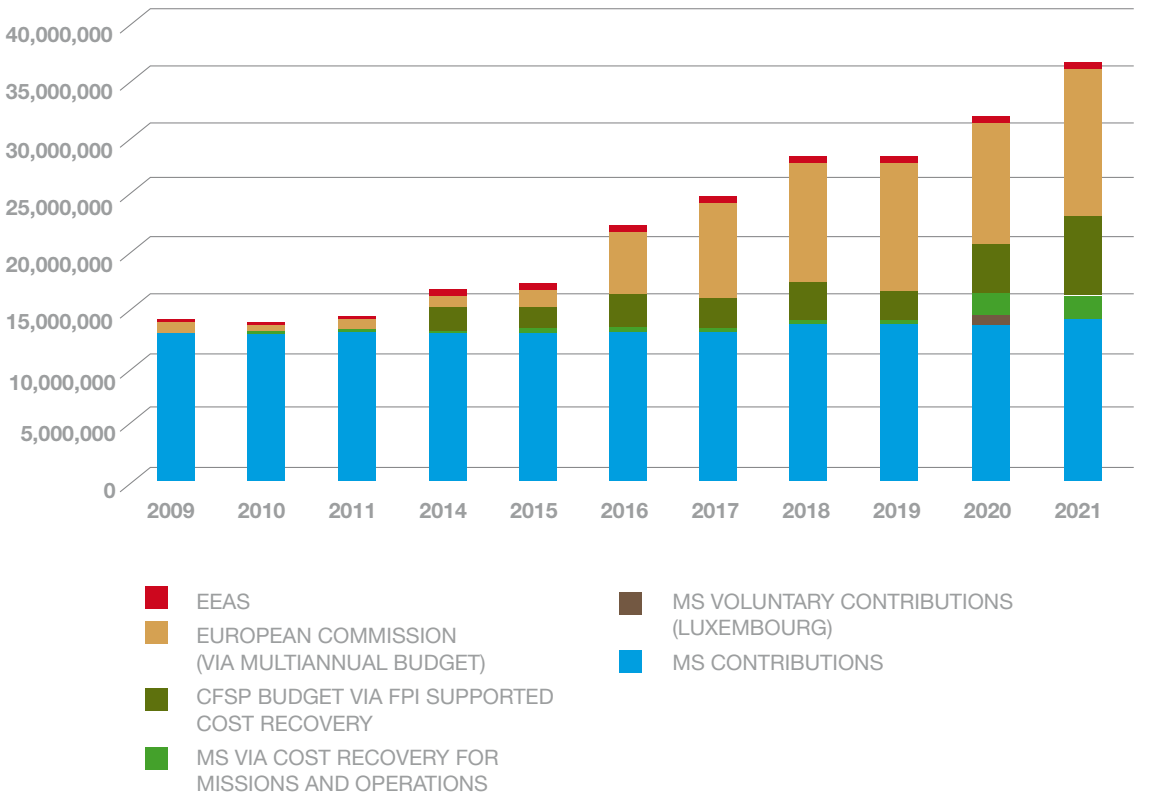
SatCen continued its strive to secure adequate funding for the continuously increasing level of support requested by its clients. The national contributions to the Centre's budget increased in 2021 by 1.48% (from EUR 12,830,887 to EUR 13,020,451).

In view of the eroding purchasing power of the Member States' annual contributions (a real-term loss of around EUR 861,000, or 6,2% in funding since 2010 relative to a four-fold increase in output over the last decade), the further growth in Cost Recovery provided existential resources.

On the one hand, Cost Recovery provides an effective complementary contribution to the direct funding from Member States; however, it also introduces an element of funding uncertainty and associated operational risks thus affecting budgetary sustainability and predictability. At the same time, these funds allow the exploitation of critical synergies between the various SatCen activities, from analysis services to collaboration activities.

The following chart illustrates SatCen's general budget for 2021 along with the relevant Cost Recovery.

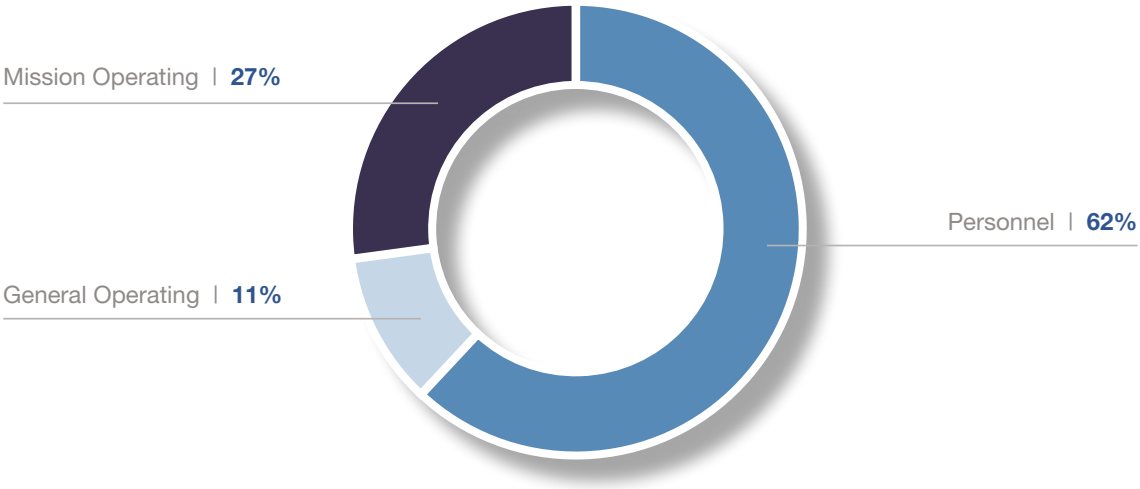
SatCen Budget



The following charts illustrate SatCen's general budget for 2021 by expenditure chapters.

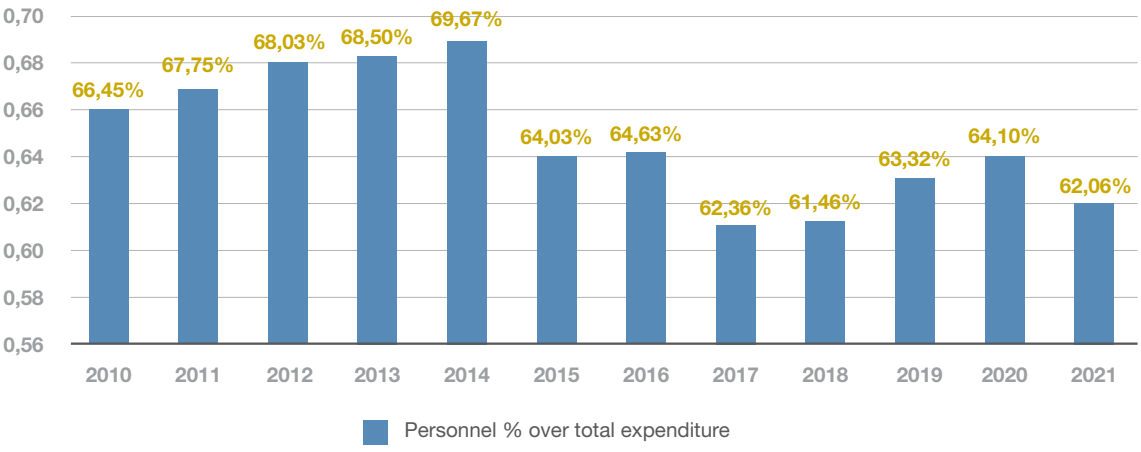
The graph demonstrates the high relevance of its expert human capital as a major part of the Centre´s budget.

Expenditure Distribution 2021



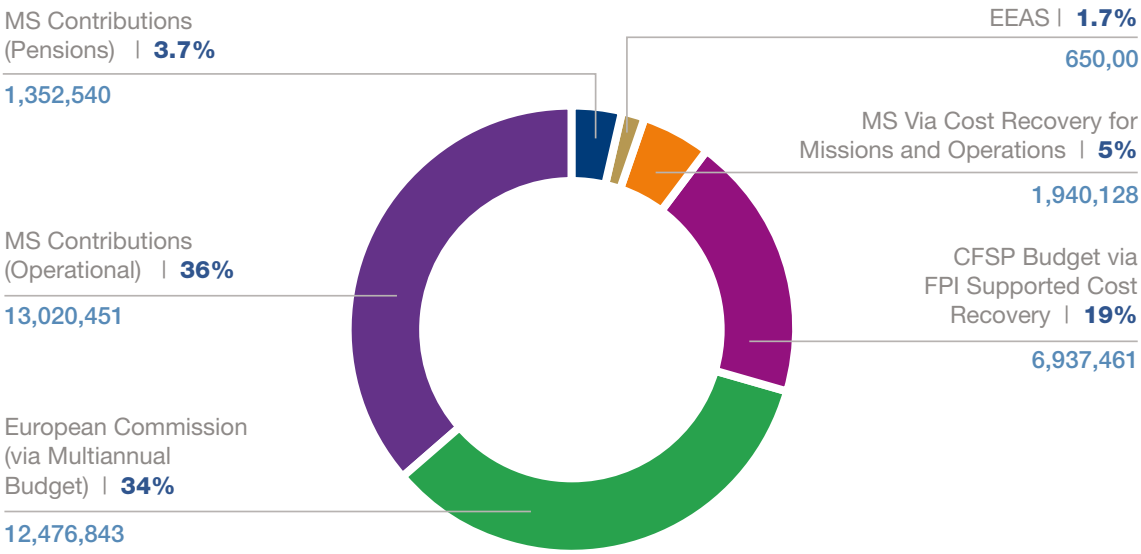
The following chart displays the cost of personnel over total expenditure:

Evolution of the Share of Personnel Expenditure: 2010 - 2020



The income sources of the SatCen Budget 2021 are depicted below:

SatCen's 2021 budget by funding source, including the pensions budget and multi-annual budget



After its approval in December 2020, the Implementation Manual of SatCen Financial Rules was fully implemented in 2021. Also in 2021, the 2020 Closing Accounts review of the College of Auditors (CoA) ended with a very positive auditor's report, recognising both the significant effort of SatCen, and the success in adjusting the scope of the 2020 financial statements in such a way that international standards are broadly met. The financial activity in 2020 was complied in a successful manner with IPSAS requirements under the judicious validation of the CoA.

The automated A/X system migration is currently an important challenge, towards a final and hopefully positive result during 2022.

SatCen Finance Unit conducted a aforementioned tendering procedure for the selection of new banking services, which was concluded in 2021.

4.2.1 Financial Management and Auditing

SATCEN MULTI-ANNUAL PROJECTS AUDIT

The CoA performed several audits with SatCen, including in the area of multi-annual projects. The procedures were carried out to assist the Commission's evaluation of whether the costs of the Centre's Financial Statements were declared in accordance with the Agreement. The Commission draws its own conclusions from the report and any additional information it may require. Among these projects were the grant agreement on NextGEOSS, the Delegation Agreement on the implementation of Copernicus support to the Union's External Action (SEA) Services and the SST activities.

BREXIT UK PENSIONS' LIABILITIES

The reference for the UK Pensions' Liabilities after Brexit is the Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community (19/10/2019) - hereafter 'the Withdrawal Agreement', CHAPTER 7 Agencies of the Council and Common Security and Defence Policy operations, where Articles 156 and 157 are applied.

In line with Art. 157 of the Withdrawal Agreement, the UK liabilities needed to be computed on the basis of SatCen's 2020 financial accounts. The actuarial study was conducted by the ISRP, based on the preliminary closing accounts of 2020, resulting in the figure for the total liabilities, which were paid by the UK in 2021.

THE PILLAR ASSESSMENT REVIEW

The Pillar Assessment review was conducted by the firm Ernst & Young Reviseurs d'Entreprises (EY) as mandated by the Commission in 2020.

Since January 2021, the Centre has been involved in the exchange of information for the final endorsement of the conclusions of the Commission.

The Pillar Assessment is a requisite for the Commission to entrust the implementation of EU funds or budgetary guarantees to the countries, organisations and bodies. It thus provides a review of SatCen practices.

The positive feedback of the Commission, including during the Board debate which led to the authorisation by the SatCen Board to start negotiations for a new Copernicus Contribution Agreement, reflects the level of trust and confidence in the handling of the programme by the Centre, both from operational and financial points of view. At the same time, SatCen is committed to continuously take on board advice and recommendations aimed at improving transparency and reporting

5 BUILDING EXTENSION

Overview of progress on the SatCen building extension, 4 May 2021

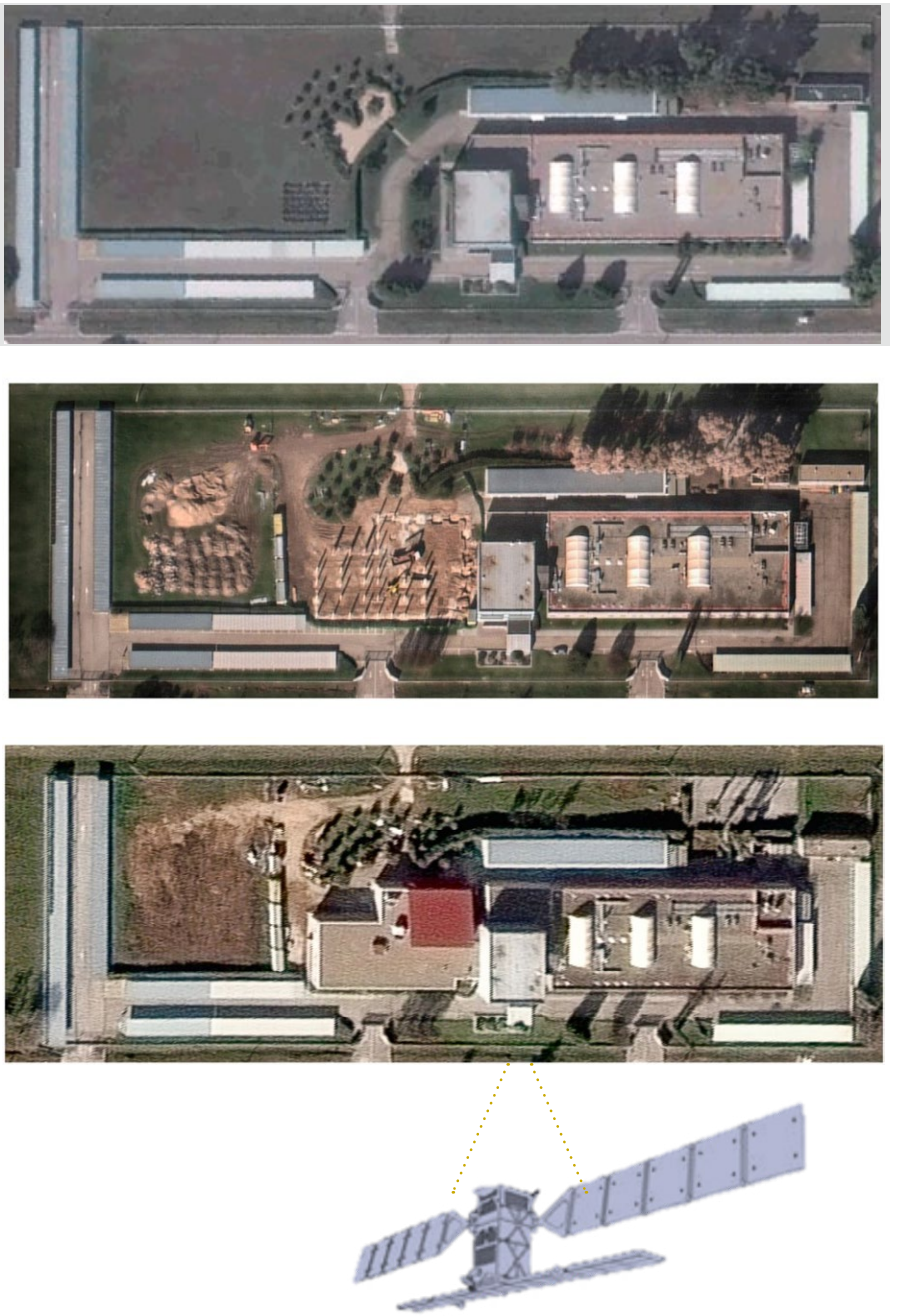
Based on the approval of the SatCen Board for the extension of the Centre's facilities and the associated budget (EUR 1.6 million), the building extension works, which had started in December 2020, continued over the course 2021 at a good pace, with the completion of building works expected in Q1 2022, as planned, in time for SatCen's 30th anniversary.

The extension consist of a new wing for the SatCen building of 1,273 m² (representing a 30% increase in working space), which will include a modern conference hall, with the possibility of being configured for board meetings, external visits on SatCen's site or for training purposes, as well as dedicated operational working areas, a server room, a technical facilities area and sanitary facilities. The extended building will be equipped in 2022-23, with part of it becoming operational in the second half of 2022.

The use of the extended space will allow for the optimisation of the very dense operational and IT activity in a secure environment on-site and will take into consideration SatCen Tomorrow development options, in line with the Member States' decision on the level of ambition for the future of SatCen. The construction allows further extensions in case of future needs.

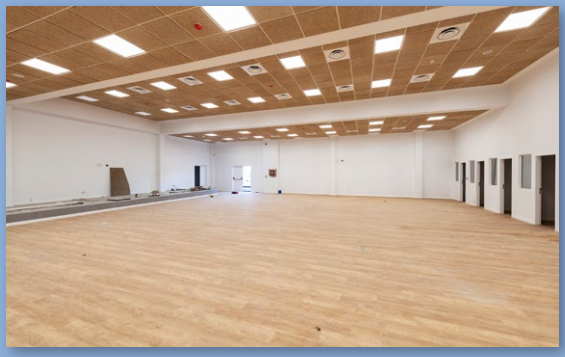
Early in the year, Storm Filomena had caused infrastructural damage to the main building. SatCen's insurance company covered a substantial part of subsequent repair costs, so that all relevant parts could be repaired throughout the year.

Furthermore, SatCen also stood out for its exceptional environmental performance in 2021, documented by the environmental audit carried out by air force auditors, who determined the degree of implementation of the environmental management system and the management and improvement of its energy performance.



The SatCen building construction evolution 2020-2022 seen from above. WorldView-3 © 2021 DigitalGlobe, Inc. When photographed from above, the SatCen building resembles a satellite; the main three-leveled building, in the center, representing the core body, while the one-level building structures on both sides act as the 'solar wings'

Building Extension Works



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6 CONCLUSIONS - FUTURE PERSPECTIVES

SatCen achieved record operational activity in 2021, reflected in its output of geospatial analysis products and services. Nonetheless, 2022 and the years ahead will certainly see a continuation of the upward trend in operational activity. The drivers of this upward trend will be the increasingly complex security environment and fast growing user demand. The unprecedented security concerns brought about by the war in Ukraine have already produced a spike in demand for SatCen products at the beginning of 2022, generating an increase in operational activity to significantly higher levels than in previous years, and to a much higher level than foreseen by SatCen's 2022 Work Programme. The context of this war has highlighted more than ever, also in the public domain, the increasing relevance of geospatial intelligence analysis for security and defence purposes.

SatCen will start the implementation of the development masterplan, approved at the end of 2021, based on the level of ambition set by the Member Sates at the Ministerial Level Board. It provides the basis to start implementing the core element of the classified IT platform. The upcoming prototype phase is scheduled for 2022 and entails significant focus on the key functional and security accreditation aspects of the platform. The implementation of the extended storage and processing capacity, as well as of the new applications aimed at increasing the efficiency, speed and pro-activity of SatCen's operational activity, will take place over the 2023 to 2027 period. It will significantly support the increasing intensity of SatCen's operational output and adaptation to growing user demand.

In this context, SatCen will continue the development of dedicated artificial intelligence tools and other innovative capabilities to support SatCen's core geospatial analysis mission.

SatCen will extend its support to EU missions and operations as well as to the UN, OSCE, OPCW, as mandated by Member States. The Centre will also continuously engage in maximising synergies and complementarities with other EU activities in the field of security, defence and space, in particular with the Member States, the EEAS, the Commission and the EDA. Through its activities, SatCen will continue to contribute to the four pillars of the EU Strategic Compass.

The extension of SatCen's premises will be finalised in 2022. Their inauguration in the second half of 2022 will be concomitant with the celebration of the Centre's 30th anniversary. The extended premises will offer the possibility to accommodate the increasing operational activity and the new multi-purpose conference centre will be equipped to host institutional events with SatCen stakeholders. It will also support the engagement of SatCen staff, as well as relevant interactions with industry and academia, in line with the aim to maintain SatCen at the cutting edge of technological developments.

SatCen's 30th anniversary in 2022 will not only increase awareness of its three decades of contributions and its unique role as an autonomous EU asset supporting security, defence and space related objectives, but it will also foster the debate on the further adaptation of SatCen, in line with the ambitious objectives of the Strategic Compass and the future European Space Strategy announced during the French presidency of the Council of the EU.

The next Ministerial Level Board to be held on SatCen premises, according to the Ministers' decision in May 2021, will be a great opportunity to take stock of SatCen's achievements and further project its development and adaptation in line with the security context and the relevant objectives of the Union and its Member States.

30 years supporting a European security endeavour - SatCen milestones

1992 An agreement is signed to transfer the building on Torrejón Airbase to the Western European Union to house the Centre

1996 The WEU Satellite Centre assists inspectors on site in Kosovo in verifying the dismantlement of armament and equipment. This is the first important event supported by the Centre

2002 The WEU Satellite Centre is transferred to the European Union and becomes the European Union Satellite Centre

2003 The European Security Strategy is released, and the EU starts launching military operations and civilian missions. The first EU operation supported by SatCen is EUFOR Althea in Bosnia and Herzegovina

2011 The European External Action Service is formally launched. It is currently the main user of SatCen products and services

2014 SatCen's mission is broadened to support the decision making and actions of the EU by providing products and services resulting from the exploitation of relevant space assets and collateral data

2016 The Global Strategy for the EU's Foreign and Security Policy is released. SatCen is a key instrument for the implementation of this Strategy

2020 Visit of HR/VP Josep Borrell to SatCen and recognition of the Centre as a "key asset for a Europe that protects its interests, security and citizens".

COVID-19 Pandemic: Due to limitations of mobility/activity on the ground, GEOINT analysis of SatCen increased in relevance

2021 First SatCen Board at Ministerial Level agrees on SatCen development option in line with EU level of ambition in security, defence and space

2022 The Strategic Compass is formally launched, aiming to "strengthen the EU Satellite Centre to boost our autonomous geo-spatial intelligence capacity".

SatCen celebrates its 30th anniversary

SatCen

1992 - 2022

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Annexes

ANNEX 1. ABBREVIATIONS

AI	Artificial intelligence
AI-ARC	Artificial Intelligence based Virtual Control Room for the Arctic
ARCOS	ARCtic Observatory for Copernicus SEA Security Service
ARTES	Advanced Research in Telecommunications Systems
BEARTESTTER	Big-data Earth Observation Technology and Tools Enhancing Research and Development
CALLISTO	Copernicus Artificial Intelligence Services and data fusion with other distributed data sources and processing at the edge to support DIAS and HPC infrastructures
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
EUF	Expert User Forum
EUMM	European Union Monitoring Mission
EUMS	European Union Military Staff
FPI	Foreign Policy Instrument
Frontex	European Border and Coast Guard Agency
FTA	Flash Text Assessment
GEO	Group on Earth Observation
GEO-DAMP	Geospatial data Management Platform
GEOSS	Global Earth Observation System of Systems
GEOINT	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
MEDEA	Mediterranean practicioners' network capacity building for effective response to emerging security challenges
MFF	Multi-annual financial framework
MPCC	Military Planning and Conduct Capability
NAVFOR	Naval force(s)
NAVWAR	Navigation warfare
NextGEOSS	Next Generation GEOSS for Innovation and Business
OHQ	Operational headquarters
OSCE	Organization for Security and Cooperation in Europe
PAB	Project Arrangement Board
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
SMI	Copernicus Service Management Infrastructure
SMM	Special Monitoring Mission
SNE	Seconded national expert
SSA	Space Situational Awareness
SST	Space Surveillance and Tracking
STF	Space Task Force
TAB	Technical Advisory Board
TWG	Technical Working Group

ANNEX 2. ORGANISATIONAL CHART

ANNEX 3. MEETINGS AND EVENTS

The Centre received and organised the following key visits and meetings in 2021, in addition to a high number of online meetings held under pandemic conditions:

20 January	CSDP High Level Course
25 January	Jornadas de Introducción a las Operaciones Espaciales, ESTAER
5 February	Visit of Gen. Claudio Graziano, Chairman of the EU Military Committee
10 February	Visit of H.E. Amb. Riccardo Gurariglia, Italy
15 February	Visit of H.E. Amb. Gregor W. Koessler, Director Political Affairs and H.E. Amb. Christian Ebner, Austria
27 February	48th Expert User Forum
28 February	47th Technical Working Group
8 March	Celebration International Women's Day
10 March	Visit of Mr Maurizio Galata, UNSMIL
11 March	Visit of General de Brigada Javier López de Turiso, Deputy Dir. CIFAS, MoD Spain
19 April	Visit of Almirante Santiago Ramón González Gómez, Director General Armamento y Material, MoD Spain
22 April	Visit of Rear Admiral Vincenzo Montanaro, Head of Plan and Policy Department, MoD Italy
6 May	**SatCen Board at Ministerial Level**
14 May	Visit of Ms Anca Dana Dragu, President of Senate & H.E. Ambassador Gabriela Dancau, Romania
9 June	Visit of Colonel David Secher, Military Intelligence Service, MoD France
11 June	Visit of Mr Gilles de Kerchove, EU Counter-Terrorism Coordinator
14 June	Centre des Hautes Etudes Militaires, MoD France
28 June	Visit of Mr Giorgio Mulè, Undersecretary of State for Defence, MoD Italy
7 July	Visit of H.E. Minister Arancha González Laya, MFA Spain
12 September	Visit of SEDE Committee Delegation, EU Parliament
23 September	Visit of H.E. Ambassador Charles Fries, CSDP-CR, European Union
24 September	Visit of Colegio Oficial de Físicos, Spain

30 September	Visit of H.E. Minister Bogdan Aurescu, MFA Romania
15 October	Visit of MoD & MFA Delegation, France
18 October	133rd SatCen Board Meeting in Torrejón de Ardoz, Madrid
21 October	Visit of Teniente General D. Fernando López del Pozo, DIGENPOL, MOD Spain
29 October	Visit of Mr Vlad Dan Gheorghe, Ms Volha Kozhukh, EU Parliament
4 November	Visit of NATO Alliance Ground Surveillance Representatives
5 November	ESA Security Conference
12 November	Visit of Mr Marko Mihkelson, Chairman of the Foreign Affairs Committee, Riigikogu Parliament, Estonia
16 November	Visit of Brigadier General Adrian Brînză, Commander of Commander of Communications and IT Command, Defence Agency, MoD Romania
18 November	ESA Intermediate Ministerial Meeting
19 November	Visit of Sénateurs de la Commission des Affaires étrangères, de la Défence et des Forces armées, France
26 November	Escuela de Técnicas Aeronáuticas, ESTAER, MoD Spain
9 December	Visit of Général Jean-Philippe Reiland, OCLCH, France
15 December	Euroconsult World Satellite Business Week

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