

SESAR 3 JU CONSOLIDATED ANNUAL ACTIVITY REPORT 2023

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This consolidated annual activity report (CAAR), established in accordance with Article 26 of Council Regulation (EU) 2021/2085 of 19 November 2021 as last amended by Council Regulation 2023/1782 of 25 July 2023 establishing the Joint Undertakings under Horizon Europe and with Article 23 of the Financial Rules of the SESAR 3 JU, provides comprehensive information on the implementation of the Joint Undertaking's work programme, budget, staff policy plan, management and internal control systems in 2023.

The SESAR JU Governing Board approved this consolidated annual activity report on 25 June 2024.

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FACTSHEET

Name	Single European Sky ATM Research 3 Joint Undertaking (SESAR 3 JU)
Objectives	The mission of the SESAR 3 JU is to accelerate, through research and innovation, the delivery of an inclusive, resilient and sustainable Digital European Sky. The general objectives of the SESAR 3 JU are defined in Articles 4, 5 and 142(1) of the single basic act (SBA). The specific objectives of the SESAR 3 JU are defined in Article 142(2) of the SBA. The tasks of the SESAR 3 JU are defined in Article 143 of the SBA.
Legal basis	Article 187 of the Treaty on the Functioning of the European Union and Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the joint undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014
Executive Director	Andreas Boschen
Governing Board	The SESAR 3 JU Governing Board is responsible for the strategic orientation and the operations of the JU, and supervises the implementation of its activities. Chaired by the European Commission (Directorate-General for Mobility and Transport), it is composed of 55 founding members in addition to permanent observers from strategic partners.
Other bodies	Bodies of the SESAR 3 JU: - States' Representatives Group - Scientific Committee Advisory body to the Executive Director: - SESAR 3 JU Programme Committee
Staff numbers	37 temporary agents, 1 contract agent, 2 seconded national experts
Total budget (2023)	Commitment appropriations: EUR 102 969 318 Payment appropriations: EUR 238 120 278
Budget implementation/execution	Commitment appropriations (% of the committed amount/budget) Total consumption: EUR 101 752 460 (92 %) Title 1: EUR 5 877 272 (93 %) Title 2: EUR 4 530 983 (93 %) Title 3: EUR 5 980 859 (93 %) Title 4: EUR 85 363 346 (100 %) Title 5: no consumption Payment appropriations (% of the paid amount/budget) Total consumption: EUR 196 542 929 (81 %) Title 1: EUR 5 871 152 (86 %) Title 2: EUR 3 458 624 (55 %) Title 3: EUR 30 017 593 (70 %) Title 4: EUR 157 195 560 (99 %) Title 5: no consumption

Grants/tenders/prizes	50 Horizon Europe grants signed (ER1 and IR1) for a total value of EUR 203.1 million in EU contribution and a total cost of EUR 399.1 million 8 Digital Sky Demonstrators grants co-funded under the Connecting Europe Facility for a total value of EUR 116.3 million in EU contribution and a total cost of EUR 238.2 million 60 contracts signed for a total maximum value of EUR 4 112 542 2 prizes awarded for a total value of EUR 6 500 Total value: EUR 207.2 million (excluding DSD grants)
Strategic research and innovation agenda	Strategic research and innovation agenda for the Digital European Sky
Call implementation	Number of calls for proposals launched in 2023: 2 Number of proposals submitted: 100 Number of eligible proposals: 93 Number of proposals granted: 0 (evaluations ongoing in 2024) Number of global projects in portfolio as of the end of 2023: 50 Horizon Europe projects and 8 Connecting Europe Facility projects
Participation, including small and medium-sized enterprises (SMEs)	Total number of beneficiaries of Horizon Europe funded projects: 683 (258 unique participants) of which: ▪ 14.8 % were SMEs, which received 12.1 % of the EU funding; ▪ 59.9 % were private for-profit/large companies, which received 71.9 % of the EU funding; ▪ 4.1 % were non-associated, non-EU members' entities; ▪ 40.7 % were newcomer entities Total number of beneficiaries of Connecting Europe Facility funded projects: 148 (119 unique participants)

FOREWORD



As we reflect on the achievements of the SESAR 3 JU throughout 2023, it is with great pride and enthusiasm that I present this annual report.

This pivotal year marked the conclusion of the SESAR 2020 research and innovation programme, with the closure of the remaining Horizon 2020 projects. The SESAR projects have now delivered 136 solutions ready for deployment, which are testimony to the success of the SESAR innovation pipeline in bringing technological innovations to maturity. Once implemented on a large scale, these solutions will bring about tangible benefits in terms of performance, notably on safety, capacity, efficiency and the environment.

At the same time, we intensified and accelerated the implementation of the Digital European Sky programme, evidenced by the launch of 50 new research projects complemented by three new Digital Sky Demonstrators. These initiatives, backed by substantial public and private investments and the involvement of over 300 players from across the aviation sector, are instrumental in pioneering the technological solutions that are the digital backbone of the Single European Sky. They will be complemented in 2024 by 18 projects awarded through the second call for exploratory research, which was launched in 2023 and resulted in 100 submitted proposals, demonstrating the appetite of the sector to advance research and innovation.

Collaboration remains at the heart of our partnership. This is exemplified by our transition to the new premises at EUROCONTROL Headquarters, poised to enhance collaboration and increase synergies. The updating of the European ATM Master Plan, which we began in 2023 reflects our commitment to steer the collective efforts towards the delivery of the Digital European Sky. Moreover, through our partnerships with institutional and industry stakeholders at the EU level and our active engagement with the international aviation community, we are accelerating the development and market uptake of solutions that make the European aviation sector more competitive, resilient and sustainable, while contributing to a harmonised global ATM framework.

However, while we have made substantial progress towards our goals, significant challenges remain on our path. Despite the enthusiasm accompanying the elaboration of our updated Master Plan, the actual deployment and operational integration of SESAR Solutions across Europe continues to face substantial challenges. As we look ahead, engagement in the update of the Master Plan and in the upcoming calls for proposals is crucial. It is essential that all our members and partners align their efforts with the strategic objectives of the SESAR project, through sustained investment and active participation. A full commitment from all our stakeholders is crucial for the successful mobilization of the entire ATM sector towards our common goal. By harnessing our collective strengths and commitments, we can effectively address these challenges and drive forward our vision of a Digital European Sky.

I extend my sincere gratitude to all our members, partners, stakeholders and staff members for their unwavering support and dedication. Together, we will continue to shape the future of ATM, making Europe the most efficient and environmentally friendly sky to fly in the world.

Andreas Boschen
Executive Director of the SESAR 3 JU



Arrivals

13:30	Algiers	AH2054	Bags delivered
15:20	Rome	AZ204	Bags delivered
15:20	Bahrain	GF003	Bags arriving
15:25	Guangzhou	CZ303	Bags delivered
16:05	Sofia	FB851	Expected 16:18
16:10	Amsterdam	KL1021	Expected 16:31
16:15	Amsterdam	KL1025	Expected 16:27
16:20	Kuala Lumpur	MH004	Expected 16:06
16:20	Paris CdG	AF1280	Expected 16:04
16:50	Casablanca	AT800	Expected 16:40
16:55	Tunis	TU790	Expected 18:02
17:00	Kuwait	KU103	Expected 17:05
17:10	Amsterdam	KL1029	Expected 17:05
17:25	Seoul	KE907	Expected 17:05
17:35	Amsterdam	KL1023	Expected 17:05
17:50	Amsterdam	KL1031	Expected 17:05
17:55	Mumbai	9W118	Expected 17:05
17:55	Doha	QR001	Expected 17:05
18:00	Milan-Linate	AZ238	Expected 17:05
18:10	Malta	KM106	Expected 17:05
18:15	Abu Dhabi	KM2136	Expected 17:05
		CZ7015	Expected 17:05
		9W122	Expected 17:05

EXECUTIVE SUMMARY

In 2023, the SESAR 3 JU delivered on its strategic objectives and implemented the activities planned for the second year of its 2022–2023 biannual work programme. The activities outlined in this report demonstrate the progress of the JU in positioning itself as the global leader in the digital transformation of the air traffic management (ATM) sector, its contribution to the European Union's strategic priorities, and its commitment to make Europe the most efficient and environmentally friendly sky to fly in the world.

Accelerating the Digital European Sky programme

In 2023, the exploratory and industrial research calls (ER1/IR1) resulted in 50 projects that were selected and put into execution, covering exploratory research and industrial research and validation under the nine SESAR flagship areas. In addition, three new Digital Sky Demonstrator projects funded under the Connecting Europe Facility joined the five already managed by the SESAR 3 JU. These 58 DES projects currently in the innovation pipeline represent a total investment of more than EUR 600 million and the involvement of over 300 different beneficiaries. They are vital for pioneering new ATM technologies, enhancing operational efficiency and reducing environmental impact. The exploratory research 2 call, launched in June 2023, which resulted in 100 project proposals, and the synergy call with the Europe's Rail JU, will lead to 19 new projects entering the innovation pipeline in 2024.

Towards an update of the European ATM Master Plan

In 2023, the SESAR 3 JU initiated an update of the European ATM Master Plan, which will set out the vision and prioritise the digital solutions necessary to deliver the DES. The update campaign, set for completion in December 2024, includes extensive consultations with stakeholders to ensure a collaborative and aligned approach towards achieving the strategic objectives leading to ATM modernisation.

Collaborating for success

In 2023, the SESAR 3 JU intensified its engagement with the European and global aviation community through various activities and events.

In March, the JU showcased its results at Airspace World in Geneva, where the winners of the Digital European Sky Awards were announced. In October, it hosted its annual conference in Brussels, centred around the launch of the new European ATM Master Plan, which attracted 400 industry leaders, EU policymakers and technology experts. Finally, the SESAR Innovation Days, which took place in November in Seville, showcased groundbreaking ATM and aviation research, and celebrated emerging talents with the SESAR Young Scientist Awards.

Throughout the year, the SESAR 3 JU strengthened its collaboration with key institutional and industry stakeholders, including EU agencies, air navigation service providers, airports and standardisation bodies, essential for ensuring the rapid uptake of SESAR Solutions. Moreover, the SESAR 3 JU actively participated in international activities, notably in the context of the International Civil Aviation Organization, further extending its visibility and influence, thus paving the way for a more interconnected and harmonised global ATM framework.

Relocation and future partnership expansion

In 2023, the SESAR 3 JU transitioned smoothly to new premises at EUROCONTROL Headquarters, maintaining uninterrupted operations throughout the move. New information and communications technology service agreements with EUROCONTROL and the European Commission enhanced its operational capabilities. The JU also signed back-office arrangements with EUROCONTROL and other JUs, boosting further operational efficiency. At the end of the year, the JU launched a call for new associated members to expand the partnership to deliver the Digital European Sky (DES).

Closure of SESAR 2020 programme

Marking a major milestone, the SESAR 3 JU successfully closed the remaining 24 projects funded under the SESAR 2020 programme, integrating their outcomes into the ongoing DES programme. The SESAR Solutions catalogue now includes 136 delivered solutions, which are ready for deployment, with many already implemented and producing tangible benefits.





1 Implementation of the 2023 annual work programme

1.1 Key objectives for 2023, associated risks and corrective measures

In 2023, the Single European Sky ATM Research (SESAR) 3 Joint Undertaking (JU) implemented the second half of its 2022–2023 biannual work programme (BAWP). By doing so, it continued to progress towards achieving the objectives set out in its single basic act (SBA)⁽¹⁾, and towards the delivery of the Digital European Sky (DES). Details on the achievement of the objectives for each strategic area of operation and for the support provided to operations, governance, financial

management and internal control are provided in each corresponding section of this document.

In addition, measurements of key performance indicators (KPIs) for Horizon Europe and of legacy KPIs for Horizon 2020 are provided in Annexes 3, 4, 5 and 6. Section 1.7 describes the progress against those KPIs.

The SESAR 3 JU ran its annual risk assessment, and the outcome is reported in Section 4.3.2.

1.2 Research and innovation activities/achievements

1.2.1 Strategic area of operation 1: Provision of strategic steering to the SESAR 2020 programme and the Digital European Sky programme

In 2023, the SESAR 3 JU met its objectives related to the provision of strategic steering to the SESAR 2020 programme and the DES programme, as set out in the 2022–2023 BAWP.

This includes the following achievements and results.

Under the SESAR 2020 programme:

- ▶ Supervise and close the transversal activities:
 - ▶ as regards the call H2020-SESAR-2019-1 (industrial research and validation (IR) very large-scale demonstration (VLD) wave 2 call for proposals), the projects PJ19-W2 CI and PJ20-W2 AMPLE were successfully closed.

Under the DES programme:

- ▶ Launch the call HORIZON-SESAR-2022-DES-IR-01 (IR1) and evaluate the transversal project proposals:
 - ▶ proposals were submitted and evaluated;
 - ▶ selected proposals were invited to prepare their grant agreements, which were all signed within the Horizon Europe time-to-grant target;
- ▶ Supervise transversal projects (under call for proposals HORIZON-SESAR-2022-DES-IR-01):
 - ▶ following the ramp-up, all project management plans were approved.

As a result, all four target indicators for measuring progress in this strategic area of operation were fully met.

⁽¹⁾ Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the joint undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014 (OJ L 427, 30.11.2021, p. 17); as amended by Council Regulation (EU) 2023/1782 of 25 July 2023 amending Regulation (EU) 2021/2085 establishing the joint undertakings under Horizon Europe, as regards the Chips Joint Undertaking (OJ L 229, 18.9.2023, p. 55). The SESAR 3 JU's objectives are set out in Articles 4, 5, 142 and 143.

1.2.1.1 Contributions to transversal steering projects

Two SESAR 2020 industrial research projects completed their activities during the first semester of 2023 within the areas of content integration, performance management and business case

development (PJ19-W2 CI); and in supporting SESAR 3 JU in the preparation of the European ATM Master Plan update campaign (PJ20-W2 AMPLE).

Table 1 provides short descriptions of these two projects' results and links to their web pages.

TABLE 1: TRANSVERSAL PROJECTS COMPLETED IN 2023

Project reference	Project title	EU contribution (EUR)
PJ19-W2 CI	Content integration, performance management and business case development	4 473 969
<i>The project provided major inputs for producing the European ATM Master Plan (ATM architecture information (e.g. dataset), performance and cost–benefit analysis consolidation, business case production), which were further consolidated at the time of the campaign to update the Master Plan. It supported the SESAR 3 JU's governance decision-making and programme execution monitoring.</i> Web: www.sesarju.eu/projects/CI2		
PJ20-W2 AMPLE	Master planning	2 011 278
<i>This project ensured the maintenance, updating and alignment of the three levels of the European ATM Master Plan. It facilitated access to ATM data and brought together contributions from SESAR 2020 members, covering air navigation service providers, airports, the airborne and ground industry, and the Network Manager.</i> Web: www.sesarju.eu/projects/AMPLE2		

Within the DES programme, three projects have been launched into execution and support the SESAR 3 JU in its steering of the programme.

Table 2 lists the three DES transversal projects active in 2023, providing short descriptions of the projects and links to the dedicated project web pages.



TABLE 2: TRANSVERSAL PROJECTS ONGOING IN 2023

Project reference	Project title	EU contribution (EUR)
Engage 2	The SESAR 3 knowledge transfer network	3 346 288
<i>The knowledge transfer network aims to share the resources and findings of SESAR research and innovation with a view to informing future fundamental research, and transferring results to application-oriented work. The network will develop a number of instruments to facilitate knowledge transfer, including a knowledge hub, thematic challenges, catalyst funding, workshops and summer schools.</i> Web: www.sesarju.eu/projects/engage2		
AMPLE3	SESAR 3 ATM master planning and monitoring	1 624 640
<i>The project will support the SESAR 3 JU in planning and reporting on deployment activities in both industrialisation and implementation, and to update the European ATM Master Plan. The project will carry out content integration activities to support the SESAR 3 JU's programme management activities and the delivery of a coherent set of SESAR Solutions aligned at the content level with the direction and ambitions set by the strategic research and innovation agenda and the European ATM Master Plan.</i> Web: www.sesarju.eu/projects/ample3		
PEARL	Performance estimation, assessment, reporting and simulation	1 989 359
<i>The project will carry out the SESAR performance management process, under the leadership of the SESAR 3 JU. The project will assess every solution and research outcome and how they contribute to meeting the overall performance ambitions of the European ATM Master Plan. The project will maintain the SESAR performance framework and related material, and provide support to project maturity gates.</i> Web: www.sesarju.eu/projects/pearl		

1.2.1.2 European ATM Master Plan update

In 2023, the SESAR 3 JU started the update of the European ATM Master Plan, last revised in 2020. The new European ATM Master Plan will set the vision and prioritise the digital solutions necessary to deliver the DES. These solutions will enable European airspace to flexibly accommodate new and different types of air vehicle, all flying climate-efficient trajectories that are dynamically adapted in real time using artificial intelligence (AI)-enabled systems.

Preparatory work began in December 2022 with the adoption by the Governing Board (GB) of the action paper proposing a simplified and strengthened master-planning approach⁽²⁾. Moving away from the three-level approach of the previous Master Plan, the simplified new approach is based on a single planning level, steering the execution of both SESAR development and deployment activities. Moreover, it strengthens the alignment between development and deployment activities, includes industrialisation and encourages market uptake by early movers. It also envisages the introduction of strategic development and deployment monitoring reports on the status of SESAR activities.

In March 2023, the GB endorsed the success criteria for the Master Plan update campaign, setting the right ambition level and balancing different expectations of stakeholders, multiple objectives and constraints. The Master Plan is intended to guide future air traffic management (ATM) investments, emphasising priorities and implementation. It seeks to facilitate quicker, deeper changes towards a DES, and it supports strategies for transitioning into execution, focusing on investments, standards and the regulatory framework. The Master Plan will also align efforts with a number of initiatives and frameworks targeting aviation sustainability.

The SESAR 3 JU officially kicked off the campaign to update the European ATM Master Plan at its annual conference on 10 October 2023. The launch was accompanied by the publication of a discussion paper jointly developed by the SESAR 3 JU, EASA and EUROCONTROL. This paper aimed to stimulate discussion among Europe's aviation stakeholders and policymakers about the role ATM should play in achieving the aviation sector's goal of climate neutrality, the importance of SESAR Solutions in this context and the integration of these ambitions in the updated Master Plan. In addition, industry associations issued a joint declaration, committing themselves to rapid and united action

⁽²⁾ Decision GB(D)20-2022 Adoption of the simplified and strengthened Master Planning Process.

to make European airspace the most efficient and environmentally friendly sky to fly in the world.

Following the official launch of the update campaign, a workshop took place in Braunschweig at the end of October to encourage the exchange of ideas and to kick off the activities of the ad hoc working groups. More than 100 experts participated and delivered a substantial number of ideas to help drive the definition of the future vision.

The Master Plan Steering Group, composed of members reflecting the GB's composition, was created as a temporary subgroup of the Programme Committee for October 2023 to June 2024 to monitor and steer the Master Plan campaign. The steering group met twice in Q4 2023.

The updated European ATM Master Plan is expected to be adopted by the GB in December 2024.

1.2.2 Strategic area of operation 2: Delivery of exploratory research

In 2023, the SESAR 3 JU met its objectives related to exploratory research, as set out in the 2022–2023 BAWP. This includes the following achievements and results.

- ▶ Regarding the supervision of the call H2020-SESAR-2019-2 (ER4 call for proposals), the last remaining project was successfully closed. Short descriptions of the final research results of the ER4 projects were already provided in the 2022 consolidated annual activity report (CAAR).
 - ▶ Regarding the supervision of the call HORIZON-SESAR-2022-DES-ER-01 (ER1 call for proposals), proposals were submitted and evaluated. Grant agreements for all selected proposals were signed.
 - ▶ The call HORIZON-SESAR-2023-DES-ER-02 (ER2 call for proposals) was launched in June 2023, with a deadline in November 2023. The
- ▶ Building on the commitment of the scientific community regarding the SESAR topics:
 - ▶ the SESAR Young Scientist Awards event took place in November 2023 as part of the SESAR Innovation Days;
 - ▶ the SESAR 3 JU maintained active cooperation with the Association for the Scientific Development of ATM in Europe and the European Aeronautics Science Network ;
 - ▶ the SESAR 3 JU maintained the SESAR Digital Academy at a slower pace during the transition to the new Engage 2 project, whose scope includes some dedicated development and support.



As a result, the target indicators for measuring progress for this strategic area of operation were met, with the exception of the Digital Academy, for which no event was organised due to the

transfer from Engage to Engage 2 projects for the support to the Digital Academy. Coordination with EUROCONTROL's agency research team did not occur, as the team is currently dormant.



1.2.2.1 Status of Digital European Sky Exploratory Research 1 call (with reference HORIZON-SESAR-2022-DES-ER-01)

The evaluation of the 68 eligible proposals took place between November 2022 and February 2023, leading to the selection of 18 proposals⁽³⁾. The grant preparation phase was launched in February 2023, and all the grant agreements

were signed by June 2023, in accordance with the Horizon Europe target for time-to-grant. During the second half of 2023, the projects ramp up was executed with the aim of confirming the projects schedule and start preparing the research activities.

Table 3 lists the ER1 projects active in 2023, providing short descriptions of the projects and links to the dedicated project web pages⁽⁴⁾.

⁽³⁾ Detailed information on the call ER1, including the number of proposals submitted and breakdowns by country and by participant type, is provided in the 2022 CAAR, Section 1.3.

⁽⁴⁾ Engage 2, also awarded funding under the ER1 call for proposals, is included in the transversal steering projects and presented under strategic area of operation 1 in Section 1.2.1.

TABLE 3: ER1 PROJECTS ACTIVE IN 2023

Project reference	Project title	EU contribution (EUR)
ASTAIR	Auto-steer taxi at airport	986 484
The project is designing a support tool to fully automate the supervision of airport ground operations. The partners will prototype a human-machine interface that will make use of algorithms to autonomously manage vehicle movements on the ground at airports. The project aims to provide the controller with enough flexibility to locally tweak the algorithm rules to cope with operational events. Web: www.sesarju.eu/projects/astair https://research.dblue.it/astair/homepage/		
AEROPLANE	Advancing Measures to Reduce Aviation Impact on climate and enhance resilience to climate-change	659 000
The project aims to develop a toolkit to mitigate the climate impact of aviation and improve the sector's resilience to climate change. Web: www.sesarju.eu/projects/aeroplane		
AI4HyDrop	An AI-based holistic dynamic framework for a safe drone's operations in restricted and urban areas	1 993 113
The project will develop a framework that incorporates various AI-based tools and associated information flows to enable future drone operations at scale. The proposed framework will represent a digital step change in ATM, using AI as a means to move to more automated U-space⁽⁵⁾ services. Web: www.sesarju.eu/projects/AI4HyDrop		
ASTRA	AI-enabled tactical FMP [flow management position] hotspot prediction and resolution	1 139 244
Today, air traffic congestion or hotspots are identified using flight plan data and are managed in the pre-tactical stage of the flight. However, on the day of operation, an aircraft's actual trajectory may differ significantly from its flight plan. As a result, hotspots still occur, and these have to be resolved by the controllers. With today's tools, tactical hotspots are identified only up to around 20 minutes in advance. The aim of ASTRA is to predict and resolve hotspots much earlier than today by using an AI-enabled tool. The overall aim is to optimise capacity while enabling aircraft to adhere to more efficient and green trajectories. Web: www.sesarju.eu/projects/astra		
CODA	Controller adaptive digital assistant	1 929 486
Addressing the mental workload of controllers is an important area of SESAR research and innovation, and one that can be addressed using AI. The project aims to develop a digital assistant capable of predicting future traffic, and of assessing controllers' stress levels and attention span and whether they would be capable of handling the expected workload. The assistant would decide how to act, following an adaptation strategy: it might, for instance, increase the level of automation, enable additional AI-based tools or request changes to the airspace (sector splitting). Web: www.sesarju.eu/projects/coda www.coda-sesar.eu/		
E-CONTRAIL	Artificial neural networks for the prediction of contrails and aviation induced cloudiness	997 500
Contrails and increased cloudiness caused by aviation can trap heat and lead to a net warming effect on our planet. However, their impact on climate can depend on weather, regional and seasonal variations. The project will blend cutting-edge AI techniques and climate science to better predict and understand the non-CO₂ impact of aviation on global warming and reduce uncertainties as an essential step towards greener aviation. Web: www.sesarju.eu/projects/e-contrail www.econtrail.com/		

⁽⁵⁾ U-space, a set of new services relying on a high level of digitalisation and automation of functions, and specific procedures designed to support safe, efficient and secure access to airspace for large numbers of drones, initially looking at very low-level operations.

Project reference	Project title	EU contribution (EUR)
Green-GEAR	Green operations with geometric altitude, advanced separation and route charging solutions	1 245 006
Since the early days of aviation, barometric pressure measurements have been a simple and robust method for altimetry. However, it has some drawbacks, including having no direct reference to terrain and vertical profile variabilities that restrict capacity and flight efficiency. The project will investigate the environmental potential of geometric altimetry enabled by satellite navigation, to increase safety, support greener climb and descent operations, while also optimising capacity. At the same time, the project will investigate the potential of environmentally driven route charging. Web: www.sesarju.eu/projects/GREEN-GEAR		
HUCAN	Holistic unified certification approach for novel systems based on advanced automation	998 900
The adoption in ATM of increasingly automated technologies, enabled by AI, raises new challenges around liability and certification, which must be addressed at the point of design. The project proposes a novel and holistic approach for the certification and approval of AI-enabled ATM airborne and ground systems, targeting EASA, national authorities and air navigation service providers. The project will also develop a set of suitable design guidelines and an associated toolkit for streamlining the development of automation and AI-powered technologies, targeting manufacturers. A parallel analysis of certification approaches, legal and regulatory features, and critical issues concerning such technologies will be carried out. Web: www.sesarju.eu/projects/hucan https://research.dblue.it/hucan/		
HYPER Solver	Artificial intelligence controller able to manage air traffic control (ATC) and air traffic flow management (ATFM) within a single framework	759 200
In ATFM, measures are issued when traffic demand exceeds capacity, usually in advance of take-off. Controllers then give different aircraft instructions to separate them when airborne. The challenges facing ATFM and ATC may differ, and solutions to them are often developed in isolation from one another. The project aims to develop a 'hypersolver' based on an advanced artificial intelligent reinforcement learning method with continuous reassessment and dynamic updates. The tool is a holistic solver from end to end, covering the whole process to manage the density of aircraft, complexity of trajectories, interactions (potential conflicts in the dynamic capacity-balancing timeframe) of trajectories, conflict of trajectories in the medium term and conflict of trajectories in the short term. Web: www.sesarju.eu/projects/hypersolver		
ImAFUSA	Impact and capacity assessment framework for U-space societal acceptance	877 208
Citizens' confidence and acceptance are critical to the further development of the drone services market in Europe, especially urban air mobility (UAM). The project will develop an impact and capacity assessment framework for the societal acceptance of U-space, to assist local authorities, other U-space stakeholders and users with the implementation of socially acceptable and beneficial UAM in cities. The framework and its tools will address matters that influence public opinion, such as the environment (e.g. noise, visual pollution and air quality), safety and socioeconomics (e.g. affordability, accessibility, economic development, public space use and connectivity). Web: www.sesarju.eu/projects/ImAFUSA www.imafusa-sesar.eu/		
MAIA	Multimodal access for intelligent airports	1 000 000
The project will develop a set of data analytics and modelling tools to support the implementation of multimodal airport access solutions based on two passenger mobility innovations: shared autonomous vehicle fleets and unmanned aerial vehicle (UAV) fleets. The tools will monitor and anticipate passenger behaviour changes due to these new options, optimise vehicle dispatching in the event of multimodal disruptions and recommend appropriate locations for vertiports, with the aim of maximising the contribution of these mobility innovations to the competitiveness and sustainability of the European aviation sector. The overall goal is to enable multimodal services for airport access that balance passenger experience with capacity and environmental sustainability. Web: www.sesarju.eu/projects/MAIA https://maiasesarproject.eu/		

Project reference	Project title	EU contribution (EUR)
MultiModX	Integrated passenger-centric planning of multimodal transport networks	1 305 380
<i>Air and rail are natural multimodal partners, and collaboration between them is key to assuring a more efficient, predictable and environmentally sustainable door-to-door passenger journey. The project will develop a set of innovative solutions and decision-making tools to support the coordinated planning and management of multimodal transport networks. Specifically, the project will develop a modelling and evaluation framework, and a solution to enable the coordinated design of air and rail schedules according to expected demand behaviour.</i> Web: www.sesarju.eu/projects/MultiModX https://multimodx.eu/		
MUSE	Measuring U-space social and environmental impact	999 731
<i>The project will develop a set of key performance indicators, methods and tools for the comprehensive and rigorous assessment of the impact of UAM operations on the quality of life in European cities, with particular focus on drone-generated noise and visual pollution. The project will develop a new toolset capable of generating accurate 4D trajectories in urban areas, modelling UAM's noise and visual footprints, high-resolution dynamic population mapping and calculation of population exposure indicators segmented by type of day and time of the day, citizens' sociodemographic profile, type of activity being performed and other relevant variables.</i> Web: www.sesarju.eu/projects/MUSE http://www.sesarju.eu/projects/MUSE		
SEC-Airspace	Cyber security risk assessment in virtualised airspace scenarios and stakeholders' awareness of building resilient ATM	999 764
<i>The project aims to introduce cybersecurity components into the state-of-the-art security risk assessment methodologies currently already in use in ATM. The project will also investigate the potential of applying the concept of people analytics to increase cyber security awareness in ATM organisations. The project results will be validated and demonstrated through two real use cases, involving relevant stakeholders.</i> Web: www.sesarju.eu/projects/sec-airspace		
SMARTS	Smart sectors	1 057 494
<i>Optimising airspace capacity is key to accommodating current and future air traffic while maintaining safety, improving efficiency and reducing aviation's environmental impact. The project will focus on dynamic airspace configuration and the design of 'smart sectors'. This covers the design of basic volumes of airspace with optimal distribution of workload, tailored around specific safety and operational requirements, including complexity. As a by-product, the application of cost-efficient capacity actions allows more accurate demand and capacity balancing planning, thus reducing the number of demand measures required.</i> Web: www.sesarju.eu/projects/SMARTS https://wp.lancs.ac.uk/smarts-sesar/		
SynthAIR	Improved ATM automation and simulation through AI-based universal models for synthetic data generation	993 550
<i>The availability of a wide variety of labelled data (e.g. safety related) is a major bottleneck impeding the accuracy of AI models developed for ATM. One possible solution is to generate synthetic data from original data and by a means of a model that is trained to reproduce the characteristics and structure of the original data. The project will explore and define AI-based methods to generate synthetic data. These methods are attractive, since they require less user knowledge expertise and have better generalisation capabilities. The project will take advantage of advances in computer vision and language technology to develop a universal time series generator. The generator can be trained on a certain set of data obtained from a small number of airports in order to generate synthetic data about a new airport.</i> Web: www.sesarju.eu/projects/SynthAIR		
TRUSTY	Trustworthy intelligent system for remote digital tower	999 968
<i>Remote digital towers are capable of delivering affordable air traffic services safely and efficiently. The project aims to harness the power of AI to enhance the capabilities of digital towers in terms of resilience, capacity and efficiency. The overall goal is to enhance the trustworthiness of AI-powered decisions in the context of remote digital towers on specific tasks, such as runway and taxiway monitoring. The project will apply information visualisation techniques such as visual analytics, data-driven storytelling and immersive analytics in human-machine interactions. In doing so, the project is at the crossroads of trustworthy AI, multi-model machine learning, active learning and user experience of interaction between humans and AI models.</i> Web: www.sesarju.eu/projects/trusty https://research.dblue.it/trusty/homepage/		

1.2.2.2 Status of Digital European Sky Exploratory Research 2 call (with reference HORIZON-SESAR-2023-DES-ER-02)

The call HORIZON-SESAR-2023-DES-ER-02 (ER2 call for proposals) was launched in June 2023, with a deadline in November 2023. A total of 100 proposals were received, with 93 considered eligible. The SESAR 3 JU started the evaluation of the submitted proposals in December 2023 with the aim of completing this phase and initiating the grant preparation phase in March 2024.

1.2.2.3 Other exploratory research activities

1.2.2.3.1 Coordination with the scientific community

During the year, coordination meetings were held with the Association for the Scientific Development of ATM in Europe (ASDA). The SESAR 3 JU presented updates on the programme to the general assemblies of the organisation, thereby securing wide outreach and a cascade of information. In 2024, coordination and engagement

with the European Aeronautics Science Network (EASN) began with the SESAR 3 JU being a speaker at their main conference and there being some side meetings at the executive director level. The network recently decided to extend its previous remit of aeronautics to encompass a wider view of aviation and include ATM.

1.2.2.3.2 SESAR Innovation Days

The 13th edition of the SESAR Innovation Days took place in Seville from 27 to 30 November. Hosted by the University of Seville at its Faculty of Engineering, with support from SESAR 3 JU members, Enaire, Indra, Ryanair and Aena, the conference brought together over 450 of Europe's leading researchers in ATM and aviation. It featured some 66 posters and 42 papers. The conference highlighted the importance of sharing research experiences as well as ensuring the flow of innovative concepts coming into the DES to tackle critical challenges such as airspace capacity, climate impact and integration of new aviation entrants. The plenary sessions addressed higher airspace operations, AI in ATM and the research priorities in the European ATM Master Plan update.



1.2.2.3.3 SESAR Young Scientist Awards

The 2023 SESAR Young Scientist Awards featured two categories: PhD scientists, with a prize of EUR 5 000, and students (undergraduate or master's), with a prize of EUR 1 500. The call resulted in 20 applications across both categories, representing an increase from 2022. For each category, three finalists were invited to the 2023 SESAR Innovation Days. The winners of each category were announced during the closing plenary.

PhD scientist category

The top award in the PhD category went to **Nils Mäurer**, Universität der Bundeswehr München / Airbus, for his research, while working at the German Aerospace Center (DLR), into addressing cybersecure communications in the next generation of aeronautical datalinks. The jury praised him for a very sound and rigorous approach to the research, which included solution design, simulation, a security validation, lab work and flight trials.

Wang Zhengyi, Ecole Nationale de l'Aviation Civile / Nanyang Technological University Singapore, was awarded second place for his thesis on strategic planning for unmanned traffic management. In their evaluation, the jury commented positively on the relevance of the research and the scientific excellence demonstrated in the thesis.

Taking third place in the PhD category was **Marta Ribeiro**, Delft University of Technology, for her thesis investigating whether reinforcement learning can improve self-separation efficacy, with emphasis on future unmanned operations. The jury commented positively on the novelty of the approach and scientific rigour of the work.

Undergraduate or master's student category

The top prize in the student category went to **Christopher Conrad**, Cranfield University, whose thesis targets developing a data model supporting vertiport operations. The jury praised Conrad for going beyond the current state-of-the-art innovations to tackle the question of resource management and schedule optimisation in urban air mobility (UAM).

Taking second prize in the category was **George-Daniel Movilă**, Politehnica University of Bucharest, whose thesis focused on a mechanism to score

the performance of automated air traffic control (ATC) systems. The jury commended the scientific soundness of the approach taken in the research.

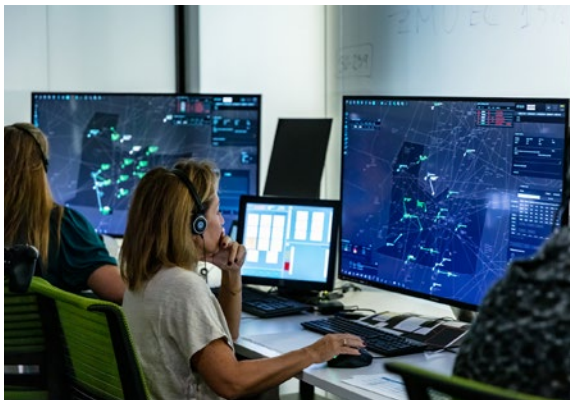
The third prize went to **Olivier Schweiger**, University of Vienna, on an AI-based decision-making tool for ATC. The jury found the thesis to be scientifically sound and the proposed approach to be innovative.



1.2.2.3.4 SESAR Digital Academy

In 2023, the SESAR Digital Academy experienced a slight reduction in its activity levels due to the absence of a dedicated support project to drive its operations, following the closure of the original Engage project in 2022. Despite this, the legacy and positive impacts from previous years remained. The latter half of 2023 saw the initiation of the Engage 2 project, poised to revitalise and further develop the academy's activities. This new project will, among other activities, provide material and support the further development of the digital academy and maintain up to date the education and further development opportunities for researchers (notably with the funding of 10 PhD candidates) and other interested parties. This transition period resulted in a temporary pause in event organisation, setting the stage for a projected increase in activity starting from 2024.

1.2.3 Strategic area of operation 3: Delivery of industrial research and validation



In 2023, the SESAR 3 JU met its objectives related to the delivery of industrial research and validation, as set out in the 2022–2023 BAWP.

This includes the following achievements and results.

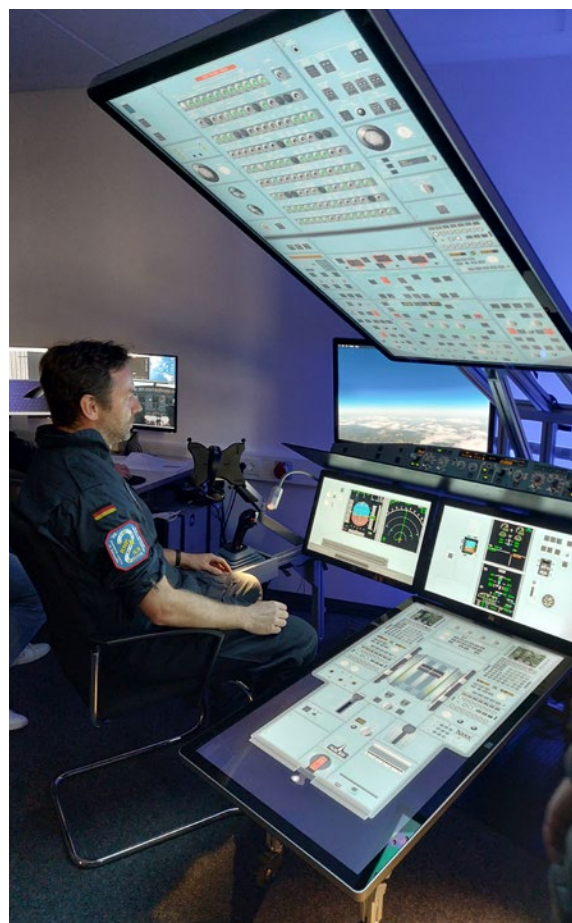
- ▶ As regards the call H2020-SESAR-2019-1 (IR VLD wave 2 call for proposals), the final Horizon 2020 reporting and payments were completed by December 2023, with four exceptions to be paid in January 2024.
- ▶ As regards the call H2020-SESAR-2020-2 (IR VLD wave 3 call for proposals), the final Horizon 2020 reporting and payments were completed by December 2023.
- ▶ Validation exercises for the Release 13 ⁽⁶⁾ plan were carried out and the close-out report was circulated to the SESAR 3 JU Programme Committee in March 2024.
- ▶ Regarding the supervision of the call HORIZON-SESAR-2022-DES-IR-01 (IR1 call for proposals), proposals were submitted and evaluated by February 2023. Selected proposals were invited to prepare their grant agreements, which were all signed by July 2023, in accordance with the Horizon Europe target for time-to-grant. Following the ramp up of the projects, all project management plans were approved.
- ▶ The technical contribution to the definition of the EU-Rail–SESAR Synergy call for proposals (HORIZON-ER-JU-2023-FA1-SESAR) under the Horizon Europe programme with the Europe's Rail (EU-Rail) JU was provided, allowing the publication of the call in October 2023.

As a result, all seven target indicators for measuring progress for this strategic area of operation were fully met.

1.2.3.1 Status of industrial research and validation projects under the wave 2 call (H2020-SESAR-2019-1)

The wave 2 call for proposals resulted in 12 IR grants being awarded and the corresponding projects implemented. Of these 12 projects, two (PJ19-W2 CI and PJ20-W2 AMPLE) addressed transversal activities and are summarised in Table 1 in Section 1.2.1.1.

Table 4 lists the 10 IR wave 2 projects active in 2023, providing short descriptions of the projects' results and links to the dedicated project web pages. These projects delivered their final results by June 2023.



⁽⁶⁾ At the end of 2022, it has been decided to better align the release process with the programme reporting needs. As a result, the release 12 focused on activities executed in 2022, and Release 13 which is reported here on activities executed in 2023; cf. 2022 CAAR, p.24.

TABLE 4: IR WAVE 2 PROJECTS ACTIVE IN 2023

Project reference	Project title	EU contribution (EUR)
PJ01-W2 EAD	Enhanced arrivals and departures	7 806 582
<i>This project developed concepts, tools and procedures to ensure that terminal manoeuvring areas (TMAs) are managed in a more sustainable and fuel-efficient manner while also ensuring the capability to manage a future increase in capacity. This was achieved by taking advantage of the latest technological developments from both an airborne perspective and a ground system perspective and through the secure sharing of data. In particular, the project focused on minimising delays and improving resilience and predictability for capacity-constrained TMAs of high or very high density/complexity. The use of procedures and technologies to improve integration of rotorcraft operations within TMAs, and interoperability with general aviation, drones and remotely piloted aircraft systems (RPASs), was also addressed to increase resilience in poor weather.</i> Web: www.sesarju.eu/projects/EAD2		
PJ02-W2 AART	Airport airside and runway throughput	16 212 101
<i>This project addressed the issue of excessive demand on capacity-constrained airports by delivering solutions such as advanced curved global navigation satellite system based operations in the TMA, the development of separation minima for increased runway throughput, the digital development of integrated surface management and the prevention of runway excursions for tower controllers. These solutions address constraints such as weather, the environment, noise, runway configuration, mixed-mode operations, surveillance and traffic mix, with a view to optimising airport operations with existing infrastructure, and improving safety and the environment.</i> <i>It also addressed improved access to secondary airports, with expected benefits in resilience, cost efficiency and increased flexibility under non-nominal conditions at the airport.</i> Web: www.sesarju.eu/projects/aart		
PJ04-W2 TAM	Total airport management	7 922 171
<i>This project improved airport/network integration for large and medium-sized or regional airports, improved airport airside/landside integration, reduced the impact of meteorological aspects on airport operation, and made further investigations into how environmental aspects could be monitored and managed in day-to-day airport operations. It developed concepts, tools and procedures that increase the predictability and resilience of airport operations, improving the punctuality of flights in a safe and environmentally sustainable manner.</i> Web: www.sesarju.eu/projects/TAM2		
PJ05-W2 DTT	Digital technologies for tower	9 217 244
<i>This project delivered a multiple remote tower and remote tower centre solution that combines air traffic services (ATSS) from various aerodromes in a centralised control room irrespective of airport location. It enables the flexible and dynamic allocation of airports connected to different remote tower modules over time, and therefore allows efficient utilisation of the valuable ATS provider resource while increasing flight safety and controller productivity.</i> <i>The project also delivered innovative human-machine interface modes in tower environments, including virtual and augmented reality applications, and automatic speech recognition supported by AI and machine learning algorithms that improve situational awareness and safety as well as increasing controllers' productivity.</i> Web: www.sesarju.eu/projects/DTT		
PJ07-W2 OAUO	Optimised airspace users operations	4 674 640
<i>This project addressed both civil and military airspace users, further enhancing their interaction with ATM network operations through an improved collaborative decision-making process centred on the evolving business needs of airspace users.</i> <i>The project delivered three solutions ready for deployment. The solutions are an integrated system for declaring critical flight trajectories to avoid delays; a unified framework for flight prioritisation, aiding traffic flow management; and innovative methods for collaborative civil-military mission trajectory planning and dynamic mobile area coordination. The project also initiated the agreed trajectory revisions in execution concept, which will be further developed in SESAR 3.</i> Web: www.sesarju.eu/projects/OAUO2		

Project reference	Project title	EU contribution (EUR)
PJ09-W2 DNMS	Digital network management services	6 735 750
<i>This project improved network traffic predictability and shared complexity representation for all those involved in demand–capacity balancing (DCB), dynamic airspace configuration (DAC), integrated network management, ATC planning and collaborative network performance management.</i> <i>The project delivered a solution ready to be deployed that focused on the user acceptability and operational feasibility of the DAC solutions and addressed DAC's integration with the DCB process into a single and seamless collaborative decision-making process in the pre-tactical and tactical phases of ATC.</i> Web: www.sesarju.eu/projects/DNMS		
PJ10-W2 PROSA	Separation management and controller tools	20 057 736
<i>This project delivered advance automation technology solutions and procedures that ensure resilient and efficient operations and help controllers to handle traffic in a smooth and efficient way.</i> <i>This project included a solution contributing to the defragmentation of European skies, with substantial progress made on the operational procedures for the delegation of ATSS between different ATS units in contingency, night and fixed cases. In addition, the maturity that automatic speech recognition and attention guidance solutions have reached supports ATC for more efficient management of air traffic in various operational environments. The progress made on a solution for increased flexibility of air traffic controller (ATCO) validations has confirmed the need for tools in addition to the operational adaptations. Efforts will continue towards achieving higher levels of maturity with several upcoming projects and Digital Sky Demonstrators.</i> Web: www.sesarju.eu/projects/PROSA2		
PJ13-W2 ERICA	Enable RPAS insertion in controlled airspace	13 150 436
<i>This project defined the operational and technical capabilities that allow RPASs to operate in controlled airspace safely, during nominal and emergency conditions. In particular, it provided the basis for defining, developing and validating the key operational and technological enablers necessary to ensure the proper integration of RPASs into non-segregated airspace. Specifically, the project delivered an RPAS accommodation solution, ready for deployment. The solution makes it possible to accommodate RPAS flight within the general air traffic instrument flight rules flights environment. Further work on this topic will continue under SESAR 3.</i> Web: www.sesarju.eu/projects/ERICA		
PJ14-W2 I-CNSS	Integrated communication, navigation and surveillance system	18 467 876
<i>This project developed an integrated suite of communication, navigation and surveillance solutions to meet the operational requirements of ATM in the short, medium and long terms. It also ensured that these solutions are interoperable globally, as outlined in the International Civil Aviation Organization (ICAO) global air navigation plan (GANP). The implementation of the 19 solutions and one cross-cutting solution developed by the project will provide improvement in secure and safe data communications, and in particular in navigation that enhances environmental sustainability. It will pave the way to European harmonisation, cooperation between air navigation service providers, industry and international organisations, and interoperability between civil and military aviation.</i> Web: www.sesarju.eu/projects/ICNSS		
PJ18-W2 4D Skyways	Improving trajectory management for European air transport	18 336 854
<i>This project delivered trajectory management solutions in support of the roll-out of trajectory based operations (e.g. use of extended trajectory profiles by ground systems and uplink of clearances with ATS B2 controller–pilot datalink communications) for the tactical execution phase for en route and TMA operations. The six solutions developed will improve airspace capacity, flight predictability and efficiency by reducing ATCO workload and separation buffers and facilitating new controller team organisations. It also demonstrated enhanced synchronisation between air and ground trajectories, improving safety and situational awareness. Moreover, the project delivered a trajectory management definition document that can act as a European framework for trajectory management developments, identifying areas for further research and facilitating discussions at the ICAO level.</i> Web: www.sesarju.eu/projects/4DSkyways		

1.2.3.2 Status of industrial research and validation projects under the wave 3 call (H2020-SESAR-2020-2)

The wave 3 call for proposals resulted in three IR grants being awarded and the corresponding projects implemented. These projects delivered their final results by June 2023 (summarised in Table 5).

TABLE 5: IR WAVE 3 PROJECTS ACTIVE IN 2023

Project reference	Project title	EU contribution (EUR)
PJ32-W3 VC	Virtual centre	5 579 565
<i>The project provided an extensive testing of the different architectural options for the implementation of the virtual centre concept (Y, D, U and triangle architectures), mapping their applicability to the different operational cases of the delegation of ATS. In addition to the technical architecture solutions, this project investigated the air traffic flow and capacity management aspects of airspace delegation among air traffic service units, which is particularly important in the case of delegation applied for cross-border and demand–capacity balance reasons.</i> Web: www.sesarju.eu/projects/VC		
PJ33-W3 FALCO	Flexible ATCO endorsement and LDACS complement	5 315 207
<i>This project focused on two solutions. Firstly, it developed methods for making ATM and the deployment of air traffic controllers more flexible, cost-efficient and responsive to changing traffic demands and conditions, thereby improving airspace and human resource efficiency. Secondly, it trialled an L-band digital aeronautical communications system (LDACS), a technology offering spectrum-efficient data link connectivity and digital voice communications between air and ground. Additional work should take place on this topic in Digital European Sky programme.</i> Web: www.sesarju.eu/projects/FALCO		
PJ34-W3 AURA	ATM U-space interface	7 978 320
<i>This project's objective is to lay the foundations for the integration of the new entrants into current and future air traffic environments, developing the required concept of operations and validating U-space service information exchanges with ATM systems. The project identified the requirements for U-space information exchange with ATM through system-wide information management and validated a set of selected U-space services, developing the service definition for the system-wide information management candidate services. Secondly, it defined a novel collaborative ATM-U-space concept of operations for drones in an environment in which they collaborate fully with ATM. The concept goes beyond the existing concepts developed for U-space. The project contributed to enabling the development of very low-level markets, allowing the introduction of new players in a safe, harmonised, sustainable and efficient way that is compatible with the current ATM environment. The project also contributed to avoiding segregation of the airspace and increasing interoperability. The project provided inputs for the current regulatory and standardisation initiatives regarding U-space.</i> Web: www.sesarju.eu/projects/aura		

1.2.3.3 SESAR Solutions delivery: release process in 2023

Release 13 covered the projects and solutions that completed their activities and maturity gates during 2023. As such, it is the last release including SESAR 2020 projects.

The final set of activities as reported in release 13 included:

- ▶ 1 ER project;
- ▶ 44 IR SESAR Solutions expected to complete the following maturity levels:

- ▶ 2 at V1 /TRL2;
- ▶ 23 at V2/TRL4;
- ▶ 19 at V3/TRL6;
- ▶ 8 demonstration projects (both VLD and open-VLD).

Figure 1 shows the distribution of release 13 activities by research and innovation (R & I) pillar: the key focus was the final delivery of SESAR 2020 industrial research activities (in particular the final set of SESAR 2020 V3/TRL6 SESAR Solutions ready to transition towards deployment) and demonstration projects.

FIGURE 1: RELEASE 13 SCOPE BY R & I PILLAR

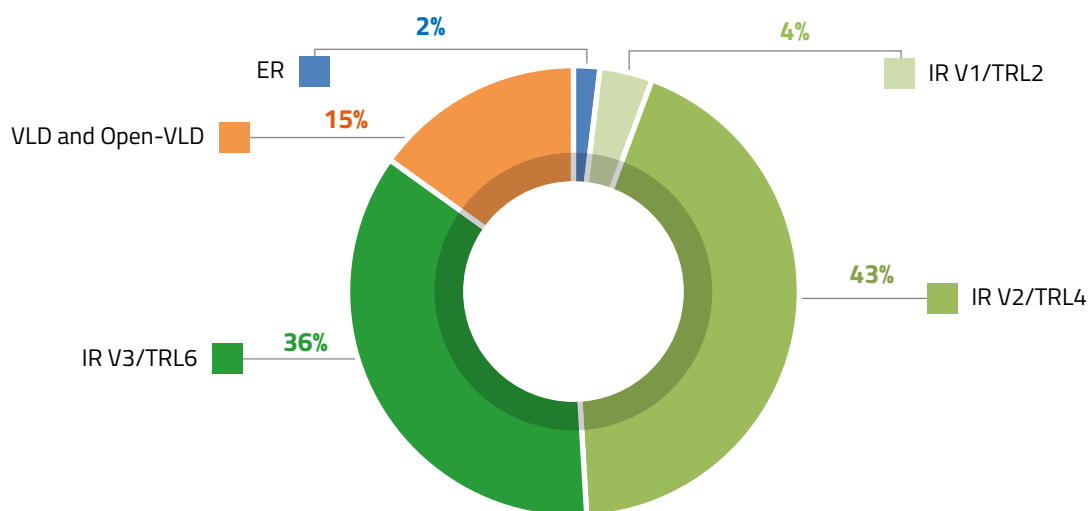
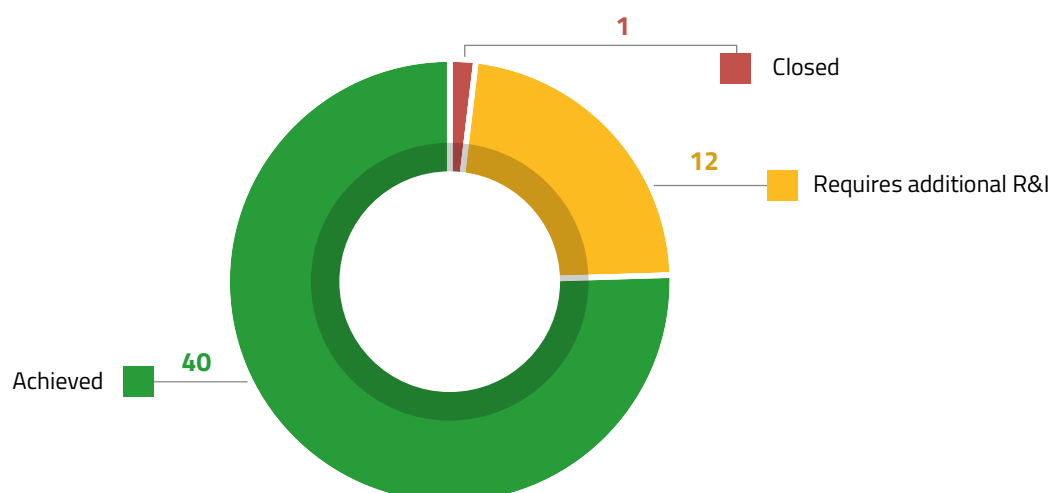


Figure 2 shows the overall results of all maturity gates in release 13 across all the pillars in the innovation pipeline.

FIGURE 2: BREAKDOWN OF RELEASE 13 MATURITY GATE DECISIONS



One activity was in ER.

- ▶ The ER project ECHO successfully completed its target maturity level (TRL2). The results of this project are considered under the project ECHO 2 launched under IR1 (presented in Table 6).

The following V3/TRL6 SESAR Solutions were in industrial research.

- ▶ Thirteen SESAR Solutions successfully completed V3/TRL6 during the final SESAR 2020 activities and are now available for deployment:
 - ▶ **PJ.02-W2-21.1** 'Extended airport safety nets for controllers at A-SMGCS airports';
 - ▶ **PJ.02-W2-25.1** 'Enhanced runway condition awareness for runway excursion prevention';
 - ▶ **PJ.05-W2-35** 'Multiple remote tower and remote tower centre';
 - ▶ **PJ.07-W2-38** 'Enhanced integration of AU trajectory definition and network management processes';
 - ▶ **PJ.07-W2-39** 'Collaborative framework for managing arrival delay within an ATFM [air traffic flow management] regulation';
 - ▶ **PJ.09-W2-44** 'Dynamic airspace configurations (DAC)';
 - ▶ **PJ.10-W2-93** 'Delegation of ATM services provision among ATSUs [air traffic service units]';
 - ▶ **PJ.10-W2-93A** 'Y-architecture supporting delegation of ATM services provision amongst ATSUs';
 - ▶ **PJ.10-W2-96 AG** 'Attention guidance – "fade-out" algorithm';
 - ▶ **PJ.10-W2-96 ASR** 'Automatic speech recognition';
 - ▶ **PJ.18-W2-53B** 'Improved performance of CD/R [conflict detection and resolution] tools enabled by reduced trajectory prediction uncertainty';
 - ▶ **PJ.38-01** 'ADS-C [automatic dependent surveillance contract] common service';
 - ▶ **#201** 'Dynamic route availability document (RAD)';
- ▶ These V3/TRL6 solutions represent a key contribution to the achievement of the SESAR vision (12 out of 13 are categorised as key research and development (R & D) solutions in the European ATM Master Plan 2020) and the Airspace Architecture Study transition plan objectives.
- ▶ Despite the positive work done and the promising results obtained during Release 13, four SESAR Solutions could not complete the expected V3/TRL6 maturity gate and will

require additional R & I activities:

- ▶ **PJ.04-W2-28.3** 'Collaborative airport planning (AOP [airport operational planning]–NOP [network operations portal] integration – event-triggered DPs)';
- ▶ **PJ.04-W2-29.2a** 'Management of airport performance under MET conditions at very-large/large and medium-hub airports';
- ▶ **PJ.13-W2-111** 'Detect and avoid for IFR [instrument flight rules] RPAS [remotely piloted aircraft system]';
- ▶ **PJ.14-W2-60** 'FCI [future communications infrastructure] terrestrial data link (LDACS [L-band digital aeronautical communications system])';
- ▶ Two solutions (**PJ.01-W2-08A1** 'Short-term DCB [demand–capacity balancing] optimisation of TMA [terminal manoeuvring area] and extended TMA airspace with TMA management tools' and **PJ.10-W2-73 FCA** 'Flight centric air traffic control (ATC)') that were not in the scope of the release 13 plan (they were not intended to complete V3/TRL6 in 2023) are finally reported in the release 13 close-out report: the SESAR 3 JU agreed with the solution teams to perform a formal maturity gate to better capture the solutions' maturity status and the remaining gaps. Both solutions did not reach the V3/TRL6 maturity target. Further work is required to ensure full operational acceptability.

The following V1/TRL2 and V2/TRL4 SESAR Solutions were in industrial research.

- ▶ Nineteen industrial research SESAR Solutions have successfully completed V2/TRL4, and two SESAR Solutions have successfully completed V1/TRL2. These results constitute a solid foundation for future R & I activities.
- ▶ Despite the positive work done and the promising results obtained during release 13, two SESAR Solutions could not complete the expected V2/TRL4 maturity gate and will require additional R & I activities:
 - ▶ **PJ.10-W2-73 CC** 'Collaborative control';
 - ▶ **PJ.10-W2-93C** 'U-architecture supporting delegation of ATM services provision amongst ATSUs';
- ▶ The solution **PJ.01-W2-08B1** 'Arrival management streaming for optimised use of systemised airspace', which was never intended to complete V2/TRL4 in 2023, was not included in the release 13 plan endorsed by the Programme Committee. However, the SESAR 3 JU agreed with the solution team to perform a formal maturity gate to better capture its maturity

status. The solution did not reach the V2/TRL4 maturity level mainly because of the need to better quantify costs and benefits and to confirm operational feasibility.

- ▶ The solution **PJ.10-W2-73 IFAV** 'Increased flexibility in ATCO [air traffic controller] validations' was considered not feasible. The European ATM Master Plan (and Airspace Architecture Study transition plan) objectives are fully covered by the alternative solution **PJ.33-W3-01a** 'Increased flexibility in ATCO validation supported by advanced controller assistance systems and procedures', which successfully completed V2/TRL4.

The demonstration activities were as follows.

- ▶ Five demonstration projects (**SORT, ITARO, ALBATROSS, ADSCENSIO** and **VOICE**) have successfully completed TRL7 maturity (at least for some of the SESAR Solutions under their scope).
- ▶ As happened in release 12, the three demonstration projects addressing U-space (**CORUS-XUAM, SAFIR-Med** and **AMU-LED**) could not achieve TRL7 and will require further validation and/or demonstration exercises. These projects provided useful recommendations for the applicable

implementing regulations on U-space (Commission Implementing Regulations (EU) 2021/664 and (EU) 2019/947), and they also proposed new U-space solutions that will require additional R & I activities before achieving TRL7. In the case of U-space, the target TRL7 was too ambitious considering the lack of a formal baseline in the U-space area, such as defined solutions. Moreover, the participants in these projects were not as familiar as those in other areas of the programme with the SESAR methods and processes.

As a result, the final achievements of Release 13 are as follows:

- ▶ one ER project completed TRL2;
- ▶ IR:
 - ▶ two SESAR Solutions completed TRL2;
 - ▶ 19 SESAR Solutions completed TRL4;
 - ▶ 13 SESAR Solutions completed TRL6;
- ▶ five demonstration projects completed TRL7.

More information on the SESAR Solutions is provided in the Digital SESAR Solutions Catalogue ⁽⁷⁾.



⁽⁷⁾ <https://www.sesarju.eu/catalogue>



1.2.3.4 Status of Digital European Sky industrial research 1 (with reference HORIZON-SESAR-2022-DES-IR-01)

The evaluation of the 53 eligible proposals in early 2023 led to the selection of 32 proposals⁽⁹⁾. The grant preparation phase was launched in February 2023, with all the grant agreements signed by July 2023. Out of the 32 proposals, two addressed support to the SESAR 3 JU in the steering of the DES and are covered in Section 1.2.1.1. During the second half of 2023, the projects were ramped up with the aim of confirming their schedules and

starting to prepare the validation activities of the SESAR Solutions.

Projects under the IR1 call are of two types: Industrial research and validation, and Fast-track. Industrial research and validation projects include applied research, pre-industrial development and the necessary validation activities (TRL3 to TRL6). Fast-track projects aim to accelerate the development of high-risk/high-gain projects with a view to shortening the time to market for disruptive and highly innovative solutions (TRL2 to TRL7).

TABLE 6: INDUSTRIAL RESEARCH AND VALIDATION PROJECTS

Project reference	Project title	EU contribution (EUR)
ATC-TBO	Air traffic control trajectory based operations	11 808 173
<i>The project proposes to validate SESAR Solutions for trajectory based operations (TBO) for flights in the tactical execution phase for en route and TMA operations, thus contributing to the finalisation of phase C, started in SESAR 2020, and the realisation of the DES vision in phase D. The results are expected to contribute to capacity, operational efficiency, safety, environment and cost efficiency.</i> Web: www.sesarju.eu/projects/ATC-TBO		
COCONIA	Climate effects reduced by innovative concept of operations – needs and impacts assessment	4 971 224
<i>The project will focus on non-CO₂ effects of aviation, and how they can be measured. The project will work closely with airlines, the network and ATC to ensure these effects can be taken into account in operational planning and design.</i> Web: www.sesarju.eu/projects/CICONIA		

⁽⁹⁾ Detailed information on the call IR1, including the number of proposals submitted and breakdowns by country and by participant type, is provided in the 2022 CAAR, Section 1.3.

Project reference	Project title	EU contribution (EUR)
CONCERTO	Dynamic collaboration to generalize eco-friendly trajectories	5 054 857
The project aims to make eco-friendly trajectories an everyday occurrence in order to reduce the CO₂ and non-CO₂ impacts of aviation. The project aims to integrate green ATC capacity into the system, with the appropriate level of automation, and support stakeholders in balancing regularity and environmental performance at the local and network levels. The project will do so by leveraging state-of-the-art climate science and data to allow ATM stakeholders to take their eco-responsibility to the next level. At the same time, the project aims to demonstrate that mitigation measures can be deployed progressively at the network level, keeping pace with scientific progress. Web: www.sesarju.eu/projects/concerto		
DYN-MARS	Dynamic management of aircraft configuration and route structures	3 770 316
The project aims to minimise the environmental footprint of flights during climb, descent and approach, through novel avionics functions and improved arrival routes and procedures. It provides, for the first time, a holistic solution that combines airborne and ATM improvements enabled by enhanced communication capabilities. Web: www.sesarju.eu/projects/dyn-mars		
ECHO 2	European concept for higher altitude operations phase 2: towards the integration between air traffic management and higher altitude operations	7 030 568
The higher airspace (airspace approximately 60,000 ft) is no longer exclusive to space rockets and military planes, but hosts an expanding range of vehicles, including long-endurance balloons, high altitude platform stations, and supersonic and hypersonic aircraft. With missions varying from connectivity and surveillance to passenger transport and satellite services, these vehicles with vastly different operating characteristics present a new airspace management challenge. The project will build on research from the ECHO project on developing a concept of operations for higher airspace. Specifically, the project will focus on introducing to the concept of operations a module on monitoring space launches in real time, and packages covering ground and air-to-ground operational integration procedures. Web: www.sesarju.eu/projects/ECHO2		
FCA	Flight centric ATC project	2 555 673
European airspace is divided into flight information regions, which are subdivided into sectors to provide safe separation services for aircraft travelling through the airspace. Changing this to a flight-centred structure without reference to geographical sectors opens up the opportunity to distribute the traffic more evenly, and to avoid lost productivity in under-loaded sectors. The project will develop the flight-centric concept for implementation throughout the European Civil Aviation Conference (ECAC) in medium-density traffic areas considering the existing national boundaries. Furthermore, the project includes the development of ECAC-wide deployment scenarios, which are consistent with the limitations of the VHF spectrum for voice communications. Web: https://www.sesarju.eu/projects/FCA		
FCDI	Future connectivity and digital infrastructure	11 292 194
The project aims to specify and develop the future communication, navigation and surveillance (CNS) technologies to support and manage the operational services, such as 4D trajectory management, in the future ATM system. Performance requirements for CNS systems are becoming increasingly complex and demanding, and need to be considered as part of an integrated and holistic system of systems, which includes air and ground CNS solutions considering convergence towards a common infrastructure, and a unified concept of operations, where possible. In parallel, CNS systems and infrastructure for both airborne and ground must take a more business- and performance-oriented approach with efficient use of resources delivering the required capability in a cost-effective and spectrum-efficient manner. Web: www.sesarju.eu/projects/FCDI		
GALAAD	Green aviation – lean arrivals and dynamicity	3 848 817
The project will develop and validate a concept for dynamic required navigation performance route allocation in the terminal area in order to make ATC operations more sustainable, resilient, responsive and adaptive towards changes in operational conditions and variations in traffic demand. The aim is to deliver an end-to-end concept, including the development of relevant decision support tools and taking into account cross-border operations. A move to dynamic routing is expected to result in improved fuel efficiency and environmental sustainability without negatively affecting capacity, while improving safety and cost efficiency. Web: www.sesarju.eu/projects/GALAAD		

Project reference	Project title	EU contribution (EUR)
GEESE	Gain environmental efficiency by saving energy	5 356 612
Migratory birds such as geese often fly in formation to save energy by taking advantage of the changed airflow in each bird's wake. Like a bird, a moving aeroplane leaves a wake of disturbed air, creating an updraft that allows a following aircraft to cut down on engine thrust, fuel use and emissions. The project will seek to introduce this notion of wake energy retrieval (WER) into air traffic operations within Europe. Specifically, the project will draw up an initial concept of operations to enable Europe-to-North-Atlantic WER operations, analysing safety aspects and the impact on legacy systems. The project will also provide operational solutions for the extension of WER operations within European domestic airspace. As an enabler of operations, the project will investigate non-CO₂ potential benefits of formations, in addition to the better-known CO₂ benefits. Web: www.sesarju.eu/projects/GEESE		
HARMONIC	Harmonised network through smart technology and collaboration	4 650 794
The project completes key aspects of the DCB operational concept in those areas where improvements would make the implementation of the operational concept more efficient. Solutions will cover automatic support for spot analysis and resolution, integration of constraints and DAC. The overall aim is to prepare these solutions for early deployment, integrating the new architecture of integrated network management. Web: www.sesarju.eu/projects/HARMONIC		
IFAV3	Increased flexibility of ATCO validations	3 809 500
Deploying controllers more flexibly to specific portions of en route airspace, sectors and working positions, when and where needed, can help ATM become more resilient and responsive to unexpected events, changes in traffic demand or staff shortages. The project aims to advance the concept behind increased flexibility of controller validations based on technical enablers, such as specific controller assistance systems that provide support on sector specific procedures and rules. The project will focus on use in upper area control and in remote tower centres. Web: www.sesarju.eu/projects/IFAV3		
IRINA	IFR RPAS integration into European airspace	4 979 600
An RPAS is a specific set of unmanned aircraft, which is remotely operated by a pilot in a control station. Managing RPAS traffic is challenging for controllers, since RPAS fly significantly slower than conventional jet airliners and experience latency in communicating or loss of communications link with the ground. The project will build on the results of the ERICA project to continue the research work on the integration of IFR RPAS into the airspace, addressing the required infrastructure, services, and detection and avoidance functionalities. Web: www.sesarju.eu/projects/IRINA		
ISLAND	Intelligent suite for local and network demand and capacity balance	7 842 112
Managing demand for access to the airspace and available capacity is a balancing act in ATM. The project will develop dynamic airspace configuration solutions by leveraging AI (including machine learning), various virtualisation models, digital integrated network and ATC planning applications, and network-wide monitoring. The project addresses the need for on-demand air traffic services reflective of traffic demand, and the continuity of ATM services despite disruptions. The solutions are expected to enable increased en route capacity and improved cost-efficiency of air traffic service provision, without compromising the current safety levels. Web: www.sesarju.eu/projects/ISLAND		
iSNAP	iTEC SkyNex ATC platform	11 959 886
This project aims to develop the iTEC platform architecture to support the virtual centre concept, by making use of state-of-the-art digital technologies and underlying architectural principles. Web: www.sesarju.eu/projects/isnap		
JARVIS	Just a rather very intelligent system	10 847 806
By teaming up with their human counterparts (pilots, ATCOs, airport operators), digital assistants can support the execution of tasks to ensure safe and efficient operations in complex scenarios. The project will develop three AI-based solutions: an airborne digital assistant to support crew and single-pilot operations (SPOs); an ATC digital assistant to support more efficient and green tower operations; and an airport digital assistant to increase the level of automation in airports, enhancing safety and security for intrusion detection scenarios. Web: www.sesarju.eu/projects/JARVIS		

Project reference	Project title	EU contribution (EUR)
MIAR	Making I-CNSS [integrated communication, navigation and surveillance systems] a reality	4 623 030
LDACS is a digital broadband radio link that enables a connection between an aircraft and the terrestrial infrastructure, just like in mobile telephony. This secure, scalable and spectrum-efficient data link also boasts navigation and surveillance capabilities, thereby offering an attractive integrated CNS solution for the sector. The project will carry out flight tests to demonstrate how LDACS can enable optimised separation between aircraft in real time and the use of multiple non-global navigation satellite system technologies, to provide an integrated navigation solution. Web: www.sesarju.eu/projects/MIAR		
MITRANO	Mission trajectory in ATC and network management operations	7 286 667
Europe's armed forces operate more than 150 000 flights per year. To accommodate these flights, the airspace is often closed, sometimes at short notice, to civil traffic. Given the growth in demand for and complexity of air traffic, SESAR is developing operational and technical solutions that allow more flexible civil–military cooperation to maximise the use of airspace. Key to this cooperation is the integration of military operations. The project aims to advance solutions to manage mission trajectories and collaborative decision-making at the network level and in ATC operations, including advanced design principles for military access to the airspace. Web: https://www.sesarju.eu/projects/MITRANO		
NETWORK TBO	Network trajectory based operations	5 628 988
Trajectory based operations (TBO) is a cornerstone of the SESAR vision, paving the way for more predictable ATM. TBO is about sharing a common plan for a flight's trajectory, matching that trajectory to the performance needs of the circumstances and delivering the trajectory by means of ATC clearances. The project aims to deliver several solutions to enable TBO during the planning and execution phases, taking a network view. Specifically, solutions will address flight and flow in a collaborative environment, making use of downlinked data from the aircraft (extend projected profile - EPP) and improving both ATC and network processes by synchronising network and local trajectories. Web: www.sesarju.eu/projects/NetworkTBO		
SOLO	Single pilot line operations	4 886 913
Under current EU regulations, at least two pilots must be present within the cockpit of commercial flights. However, new advances in technologies open up the possibility of certifying SPOs, either for certain portions of the journey, such as when cruising, or for the whole flight once the technology is mature. The introduction of greater levels of automation in the cockpit would therefore allow the pilot to focus on more strategic and safety-critical tasks. The project aims to develop a concept for SPOs, ensuring minimal changes to current ATC tools and procedures. The aim is to feed standardisation and regulatory developments on SPOs. Web: www.sesarju.eu/projects/SOLO		

TABLE 7: FAST-TRACK INNOVATION AND UPTAKE PROJECTS

Project reference	Project title	EU contribution (EUR)
CNS DSP	Demonstration of a CNS data service provision	2 845 21
Communication, navigation and surveillance (CNS) infrastructure is the foundation for the provision of air navigation services. To make CNS more resilient and efficient, the DES will see a move away from CNS as physical assets towards a service-based approach. Mindful of this needed change, the project will develop digital platforms and services leveraging state-of-the-art technologies to enable future data-sharing service delivery models. It aims at sharing CNS data between air navigation service providers and other aviation stakeholders (e.g. civil and military airspace users, airports and national authorities). The project will carry out tests using data from several air navigation service providers for use by third-party application/service developers. Web: www.sesarju.eu/projects/CNS-DSP		

Project reference	Project title	EU contribution (EUR)
DARWIN	Digital assistants for reducing workload & increasing collaboration	3 460 077
<i>AI-based automation for cockpit and flight operations is the key enabler for single-pilot operations. The project aims to develop digital assistants to support single-pilot operations, ensuring the same (or a higher) level of safety and the same (or a lower) workload as operations with a full crew today. The project will deliver solutions that enable operational efficiency and route flexibility, taking into account the complexity of the future airspace. The results will support the commercial and operational viability of new airspace users.</i> Web: www.sesarju.eu/projects/DARWIN		
ENSURE	ATM–U-space interface and airspace reconfiguration service	6 353 582
<i>Ensuring an interoperable and effective interface between unmanned and conventional traffic and ATC is critical for the delivery of the future DES. This project aims to refine and complete the definition of a common interface and services for U-space and ATM. The project will develop a standardised data model, architecture and an operational methodology. It will also develop a dynamic airspace configuration service to help ATC actors in charge of airspace reconfigurations to maintain traffic segregation and to avoid proximity between manned and unmanned aircraft within the designated U-space airspace.</i> Web: www.sesarju.eu/projects/ensure		
Eureka	European key solutions for vertiports and UAM	6 924 045
<i>Air taxis are an exciting development in air mobility, but, to get off the ground, these vehicles rely on infrastructure such as vertiports and accompanying ATM procedures. The project outcomes will trigger a major update of the U-space/UAM operational concept with new procedures and tools dedicated to integrating vertiports into the airspace. The project will develop (1) the complete arrival, departure and turnaround process for vertiports, (2) solutions that take collaborative traffic management into account, (3) how to deal with emergencies and disruptions and (4) network flow and capacity management. The project will provide recommendations for regulation/standardisation and any information that will accelerate and harmonise the development of UAM, vertical take-off and landing operations and vertiports across Europe.</i> Web: www.sesarju.eu/projects/EUREKA		
FASTNet	Future data services and applications for airports and network	4 803 147
<i>Every flight begins and ends at an airport, which makes them essential nodes in the aviation network. The project will make use of advances in data technologies to help fully integrate airport operations into the network (AOP–NOP integration). The project will focus on pre-tactical and strategic planning, using AI to enable airport-to-airport collaborative planning within the network operations plan. The project also aims to extend the timeframe of AOP–NOP integration, from months to days in advance of departure. The project will rely on state-of-the-art technologies to integrate new datasets available at the local level, such as local restrictions, pre-tactical flight information and strategic local information, in order to enrich DCB information and ensure efficient planning from the strategic phase.</i> Web: https://www.sesarju.eu/projects/FASTnet		
KAIROS	Unlocking the potential of AI-based weather forecasts for operational benefits	3 787 941
<i>Bad weather can play havoc with the best-laid plans. This is especially true in ATM, where poor meteorological conditions are a primary cause of traffic delays in Europe. Performing better during adverse weather relies on timely and accurate forecasts, which is easier said than done given how quickly conditions can change. The project aims to improve the quality of meteorological information through the use of AI. Specifically, it will integrate live weather information from AI forecasts with existing decision support tools and platforms to assess the operational benefits to several end users. The aim is to improve the management of DCB across the network level, but also for local flow management, and UAM.</i> Web: https://www.sesarju.eu/projects/KAIROS www.kairos-eu.com/		

Project reference	Project title	EU contribution (EUR)
Opera	Operate anywhere	5 974 551
The project will enable safe and efficient operations in all types of airspace (controlled, uncontrolled and U-space) and conditions by validating three different complex innovative air mobility – piloted air taxi and unmanned cargo – operations in real-life ATM conditions including contingency and non-nominal situations. It will stimulate the uptake of new sustainable innovative air mobility services by addressing air-ground integration and the critical transition steps from piloted towards automated flights. In addition, it will ensure environmental sustainability compared with the next best transport alternative, and enhance it, by optimising flight routing for minimum noise footprint and aircraft energy utilisation. Web: www.sesarju.eu/projects/Opera https://project-opera.eu/		
SAFIR-Ready	Obtain flight mission readiness, enabling rapid intervention for healthcare and critical infrastructure, leveraging all value chain actors and U-space services	6 497 546
The project aims to develop new U-space advanced services together with a central command and control centre and automated ground integration (drone cargo port) to facilitate automated time-critical drone-based services for medical and non-medical use cases. Specifically, research will focus on a dynamic capacity management system (U3), detect-and-avoid algorithms (U3) and machine-to-machine communication and decision-making (U4). The project will extend use cases to non-medical critical missions, such as shore to ship for the transport of materials, and the inspection of railway and electric grids in case of unexpected issues with the infrastructure (e.g. tree fallen on high-tension cable). In parallel, research will be done around social acceptance, privacy protection and environmental impact. Web: www.sesarju.eu/projects/SAFIR-ready https://safir-ready.eu/		
SIGN-AIR	Implemented synergies, data sharing contracts and goals between transport modes and air transportation	3 562 808
The project will develop and pilot a new platform for the sharing of data in multimodal travel. The platform will provide the means for transport service providers to register, reach data-sharing agreements with other transport service providers and manage their contractual relationships. The project will address contract templates to simplify the legal and electronic management of each specific contract and information provision about it, routing information for travel companions with enriched information about the specific contracts for their customers. The ultimate aim is to facilitate single ticketing through a comprehensive understanding of the contracts and the data managed, among other information. Web: www.sesarju.eu/projects/sign-air		
SPATIO	U-space separation management	6 996 206
Keeping aircraft safely separated is one of the core functions of ATM today, if not its core function. As larger numbers of unmanned aerial systems take to the skies, separation management becomes more important to avoid mid-air collisions. The project will address separation between unmanned air vehicles, and, in particular, strategic and tactical conflict resolution services and the relationship between separation and capacity in U-space airspace. The tactical resolution service will be based on a ground control station or onboard integrated system. The project will also address the functions of the dynamic capacity management service by detecting hotspots associated with collision risk, and environmental and social impacts. Web: www.sesarju.eu/projects/SPATIO		
VITACY	Virtual centre with triangle architecture and cyber-resilience	3 771 506
Today, ATM in Europe mostly consists of country-based systems and processes, which require customised systems and solutions at each ATM provider. This has led inevitably to a lack of interoperability, higher costs of air navigation services across Europe and inefficient usage of resources. The concept of a virtual centre refers to decoupling ATM data services, such as flight data, radar and weather information, from the physical controller working position. The project will use a triangle architecture, a powerful type of architecture based on disaggregating services currently offered by one main ATM data service provider into new specific functionality-oriented providers for arrival, management, time-based separation, and conflict detection and resolution. The project will also develop cyber-resilience tools focused on monitoring attacks and displaying alerts if any are detected. Web: www.sesarju.eu/projects/VITACY		

1.2.3.5 Status of EU-Rail–SESAR synergy call (HORIZON-ER-JU-2023-FA1-SESAR)

In October, the EU-Rail JU and SESAR 3 JU published a joint call for the development of an 'Integrated air and rail network backbone for a sustainable and energy-efficient multimodal transport system'. The call targets solutions that will improve door to door mobility for Europe's citizens, and is expected to generate synergies between the air and rail innovation communities. With an EU contribution of up to EUR 5 million, the call is being co-funded by the two JUs within

the framework of the Horizon Europe R & I programme. The evaluation phase took place in March 2024 and the results were notified in April. The aim is to address common sectoral issues such as multimodal transport. Aviation and rail are integral parts of the intermodal transport ecosystem expected to optimise door-to-door mobility for travellers. The call will contribute to the optimisation of fuel burn and therefore to reductions in CO₂ emissions per journey. Additional environmental benefits (i.e. emissions, noise and/or local air quality) will come from alleviating congestion at and around airports / railway stations by improving passenger flows.

1.2.4 Strategic area of operation 4: Facilitation of accelerated market uptake of SESAR Solutions

In 2023, the SESAR 3 JU met its objectives related to facilitating accelerated market uptake of SESAR Solutions, as set out in the 2022–2023 BAWP. This includes the following achievements and results.

- ▶ The SESAR 3 JU ensured compliance with the regulatory requirements on facilitating market uptake, and in this regard closely coordinated with EASA and supported the relevant standardisation activities.
- ▶ As regards the calls H2020-SESAR-2019-1 (IR VLD wave 2 call for proposals) and H2020-SESAR-2020-2 (IR VLD wave 3 call for proposals), the final Horizon 2020 reporting and payments were completed by December 2023.
- ▶ As regards the call H2020-SESAR-2020-1 (open VLD2 call for proposals), three projects had been closed by the end of 2022, and five projects completed their demonstration activities by June 2023.
- ▶ As regards the Digital Sky Demonstrator (DSD) call CEF-T-2021-SIMOBGEN, managed by the European Climate, Infrastructure and Environment Executive Agency (CINEA), the five DSD projects initiated their ramp-up in early 2023 and their demonstration activities were mainly planned for the second half of 2023.
- ▶ As regards the DSD call CEF-T-2022-SIMOBGEN, managed by CINEA, the SESAR 3 JU participated in the evaluation in March 2023. Three DSD projects were given awards and had their grant agreements signed, enabling work to start by the end of 2023.

- ▶ As regards the DSD call CEF-T-2023-SIMOBGEN, managed by CINEA, the SESAR 3 JU provided the technical specifications, enabling the call to open in September 2023 with a deadline in January 2024.

As a result, all six target indicators for measuring progress for this strategic area of operation were fully met.

1.2.4.1 Coordination activities to accelerate market uptake of SESAR Solutions

Following the GB decision made in December 2022, the Technical Coordination Group (TCG) was established to boost cooperation with the main entities that contribute at the European level to the SESAR project, including EASA, the European Defence Agency (EDA), the European Organisation for Civil Aviation Equipment (EUROCAE), EUROCONTROL (including Network Manager), the SESAR Deployment Manager (SDM) and the SESAR 3 JU. Specifically, the TCG was tasked to monitor and de-risk the roll-out of the strategic deployment objectives defined in the Master Plan and facilitate the accelerated market uptake of SESAR Solutions.

The TCG was kicked off in April 2023. The group discussed on and agreed its role in the monitoring of the standardisation (and regulatory) activities linked to the needs raised by SESAR Solutions and projects and the relevant standardisation bodies (e.g. the European Air Traffic Management Standards Coordination Group). It also reviewed the SESAR 3 JU strategic deployment monitoring report.

1.2.4.2 Projects carried out under the Horizon 2020 framework

1.2.4.2.1 Status of the very large-scale demonstration projects under the wave 2 call (H2020-SESAR-2019-1)

The wave 2 call for proposals (VLD wave 2) resulted in three grants being awarded for VLD

activities and the corresponding projects being launched. Two of the three projects (VLD1-W2 DREAMS and VLD2-W2 STAIRS) completed their activities in 2022. The other (VLD3-W2 SORT) completed its activities by June 2023.

Table 8 provides a short description of the VLD3-W2 SORT project and a link to its dedicated web page.



TABLE 8: VLD WAVE 2 PROJECT COMPLETED IN 2023

Project reference	Project title	EU contribution (EUR)
VLD3-W2 SORT	Improving runway throughput in one airport	4 500 000

This project demonstrated multiple SESAR Solutions. For arrivals, it tested the use of aircraft-type-specific static pairwise separation with reduced minimum radar separation supported by an optimised runway delivery tool and focusing on the runway occupancy time. It also covered the pre-industrialisation of a wake decay enhancing device, and an integrated runway sequence function combined with the optimisation of the runway configuration at a multiple-runway airport. The project closed the gap between the concept development phase and the deployment (or pre-industrialisation) phase by demonstrating operational and technical readiness, paving the way for the deployment phase of these solutions.

Web: www.sesarju.eu/projects/SORT

1.2.4.2.2 Status of the very large-scale demonstration projects under the open 2 call (H2020-SESAR-2020-1)

The VLD open 2 call for proposals resulted in eight grants being awarded for VLD activities and the corresponding projects being launched. Three

projects had been closed by the end of 2022, and five projects finalised their demonstration activities by June 2023.

Table 9 lists the five VLD open 2 projects active in 2023, providing short descriptions of the projects and links to the dedicated project web pages.



TABLE 9: VLD OPEN 2 PROJECTS ACTIVE IN 2023

Project reference	Project title	EU contribution (EUR)
ALBATROSS	The most energy-efficient flying bird	3 996 331
<i>The project demonstrated how the technical and operational R & D achievements of recent years could further reduce the environmental footprint of aviation to make it a more sustainable mode of transportation. The project followed a holistic approach by covering all flight phases, directly involving all relevant stakeholder groups (e.g. airlines, air navigation service providers, the Network Manager, airports and Industries) and addressing both operational and technological aspects of aviation and ATM. It demonstrated the complementarity of some solutions, from alternative aircraft fuel to enhanced ATM and airspace users' operations on the ground, TMA and en route.</i> <i>The final demonstration led to two new SESAR Solutions, 'Dynamic route availability document (RAD)' and 'Airport-based sustainable taxiing'. Another four have been identified but are not sufficiently mature to call SESAR Solutions at this stage. These have been passed on to the DSD 'HERON'.</i> Web: www.sesarju.eu/projects/ALBATROSS		
AMU-LED	Air mobility urban – large experimental demonstrations	3 997 415
<i>The project delivered a detailed concept of operations and definition of urban air missions followed by simulations and a large real-flight demonstration campaign to verify and validate the concept. The project allowed UAM stakeholders to specify various use cases applicable to logistics and the urban transport of passengers, to design or integrate UAM environment, to test the unmanned aerial system (UAS) ground and airborne platforms and, finally, to assess safety, security, sustainability and public acceptance.</i> Web: www.sesarju.eu/projects/AMU-LED		

Project reference	Project title	EU contribution (EUR)
CORUS-XUAM	Concept of operations for European U-space services – extension for urban air mobility	3 999 389
The project demonstrated how U-space services and solutions could support integrated UAM flight operations, allowing electrical vertical take-off and landing aircraft / UASs and other airspace users (unmanned and manned) to operate safely, securely, sustainably and efficiently in a controlled and fully integrated airspace, without undue impact on operations currently managed by ATM. It also delivered the U-space concept of operations Ed.4.0, which serves as the reference document for the European drone industry. Web: www.sesarju.eu/projects/CORUSXUAM https://corus-xuam.eu/		
SAFIR-Med	Safe and flexible integration of advanced U-space services for medical air mobility	2 038 609
The project demonstrated how U-space operations combining manned and unmanned vehicles can be integrated within an urban environment, in particular for medical air mobility services. The project developed a point-to-point drone flight for medical services in a U-space airspace environment, including urban airspace, making use of digitally integrated U-space services, with digital communication and process automation between operators and U-space stakeholders. Web: www.sesarju.eu/projects/SAFIR-Med https://www.safir-med.eu/		
VLD2 – VOICE	Reduced separations and improved efficiency based on VHF communications over LEO [low Earth orbit] satellites	3 989 808
The project aimed to demonstrate that, with the use of satellite-based VHF systems providing voice and data link, air traffic service in oceanic airspace can be handled in the same way as in continental airspace, and current separation minima can be reduced without compromising safety. In addition, it performed some cross-border operations between adjacent flight information regions belonging to different countries. The project successfully demonstrated the ground segment and its integration with the operational systems (including the ATM Interface Centre and ground stations). Web: https://www.sesarju.eu/projects/voice		

1.2.4.2.3 Status of the very large-scale demonstration projects wave 3 call (H2020-SESAR-2020-2)

The wave 3 call for proposals resulted in the VLD projects PJ37W3 (ITARO) and PJ38-W3 (ADSCENSIO) being awarded funding.

They completed their activities in June 2023 (summarised in Table 10).

TABLE 10: VLD WAVE 3 PROJECTS COMPLETED IN 2023

Project reference	Project title	EU contribution (EUR)
ADSCENSIO	ADS-C enables and supports improved ATM operations	6 759 969
As part of the goal of moving to trajectory based operations (TBO), this project focused on improving various features of ATC in order to better anticipate how flights can behave when using TBO. It developed a SESAR Solution consisting of a common service that distributes the ADS-C / extended projected profile data downlinked from aircraft to the relevant ground users. The project also drew up 14 industrial and deployment recommendations along with two regulation and standardisation recommendations. Web: www.sesarju.eu/projects/ADSCENSIO		
ITARO	Integrated TMA, airport and runway operations	4 292 802
The project delivered a fast track towards deployment to maximise network performance by combining solutions to facilitate greener aviation. It demonstrated on a large scale, in an airport environment, several solutions that research had demonstrated can improve operational and environmental efficiencies. Furthermore, the project conducted several real-time simulations and a live trial of two distinct operational environments. Web: www.sesarju.eu/projects/itaro		

1.2.4.3 Projects carried out under the Connecting Europe Facility framework

1.2.4.3.1 Status of the Connecting Europe Facility call DSD1a (CEF-T-2021-SIMOBGEN)

While CINEA is responsible for the contractual management of the five grants under the DSD1a

call (two addressing the Green Deal and three covering UAM), the SESAR 3 JU steers the awarded projects from a technical perspective to ensure that the demonstration activities and the related outcomes contribute to the DES programme⁽⁹⁾.

Tables 11 and 12 list the five UAM and green aviation DSD projects active in 2023, providing short descriptions of the projects and links to the dedicated project web pages.



TABLE 11: DSDs IN THE AREA OF UAM FOR WHICH THE SESAR 3 JU PROVIDED TECHNICAL EXPERTISE IN 2023

Project reference	Project title	EU contribution (EUR)
BURDI	BeNe [Belgium–Netherlands] U-space reference design implementation	4 744 956
<i>The project aims to demonstrate the feasibility of managing dense and complex unmanned aircraft system operations in controlled, uncontrolled and UAM environments. Multiple domains will be considered, such as the delivery of goods, inspections, and support to medical and security operations, and the project will cover all of the U1 and U2 U-space services. It will establish U-space airspace in the civilian control zones of EBAW (Antwerp), EBBR (Brussels) and EBLG (Liège), and over the port and densely populated city of Antwerp. Ultimately, the project aims to become a reference for best practices, standardisation, harmonisation and/or interoperability, fostering operational deployment of U-space airspace across Europe.</i> Web: www.sesarju.eu/projects/BURDI www.burdi.eu		
EALU-AER	Enhanced automation for U-space/ATM integration	2 776 500
<i>The project aims to demonstrate cutting-edge integrated systems and U1 and U2 services. It will demonstrate a variety of UAM use cases intended to emulate local inspection operations, light-freight operations, long-distance logistics operations, air-taxi operations, etc. In particular, the project will integrate drone and electrical vertical take-off and landing operations over the cities of Limerick, Galway and the Shannon area, in Ireland.</i> Web: www.sesarju.eu/projects/EALU-AER http://ealu-aer.eu/		

⁽⁹⁾ As per the contribution agreement MOVE/E3/CA/SESAR3JU/662-2021/SI2.883337.

U-ELCOME	U-space European COMMon dEployment	6 985 843
The project aims to implement U1 and U2 U-space services through a set of demonstrations in various operational environments and European locations (Spain, France and Italy) in such a way that the project outcomes support the implementation of these services across Europe and contribute to U-space market uptake. The demonstration activities will also address the interface with the ATM system to ensure safe and fair access to airspace for all airspace users. U-ELCOME uses a scalable U-space architecture enabling information exchange and coordination among U-space service providers and the common information service provider, and between those providers and ATM, using interoperable standards. This will allow automated drone traffic management and situational awareness among all U-space stakeholders. The project builds on the outcomes of the previous European projects bridging from research, through industrialisation, to implementation. Web: www.sesarju.eu/projects/U-ELCOME https://u-elcome.eu/		

TABLE 12: DSDs IN THE AREA OF THE GREEN DEAL FOR WHICH THE SESAR 3 JU PROVIDED TECHNICAL EXPERTISE IN 2023

Project reference	Project title	EU contribution (EUR)
ECHOES	Extended communications in VHF over enhanced satellite segment	14 946 142
The project aims to demonstrate the benefits of satellite-based VHF communications (voice and data link) in combination with satellite-based automatic dependent surveillance broadcast technology to improve ATM services and produce positive environmental effects, reducing both CO₂ emissions and non-CO₂ impact derived from persistent contrails. ECHOES will launch two new satellites to provide these new operational services. Web: https://www.sesarju.eu/projects/ECHOES		
HERON	Highly efficient green operations	18 108 094
The project will foster the deployment of a set of ambitious solutions to mitigate CO₂ emissions from air transport and will offer mitigation through the development of meaningful and sustainable activities including more efficient aircraft operations from airport operation (green approaches, green taxiing), traffic management and trajectory optimisation, making use of the general principles of extensive use of automated ground processes, TBO and ADS-C common services. The demonstration will bring together mainline aircraft operators, airports and air navigation service providers, which will carry out some 1 000 flights across Europe. Web: www.sesarju.eu/projects/HERON https://research.dblue.it/heron/		

1.2.4.3.2 Status of the Connecting Europe Facility call DSD1b (CEF-T-2022-SIMOBGEN)

CINEA launched a new call under the CEF framework in September 2022 (DSD1b). It contained provisions for SESAR 3 JU DSDs for the following two flagship areas: connected and automated ATM, and virtualisation and cybersecure data sharing. More specifically, the call specifications focus on the gradual transition

towards higher levels of automation and on the virtual centres and ATM data service providers.

The SESAR 3 JU participated in the evaluation in March 2023. Three DSD projects were awarded grants and had their grant agreements signed, enabling their launch at the end of 2023.

Tables 13 and 14 list the three DSD projects active in 2023, providing short descriptions of the projects and links to the dedicated project web pages.



TABLE 13: DSD IN THE AREA OF CONNECTED AND AUTOMATED ATM FOR WHICH THE SESAR 3 JU PROVIDED TECHNICAL EXPERTISE IN 2023

Project reference	Project title	EU contribution (EUR)
ESMA	European Sky multilink ATN [aeronautical telecommunications network]	11 511 000

ESMA will address the need to increase the level of automation in ATM through the implementation of a multilink communications infrastructure, with a focus on datalink using satellite communication alongside VHF data link mode 2. The demonstration will focus on long-term data collection in an operational multilink environment to demonstrate that technology meets the technological requirements and business needs of air navigation service providers and airspace users.

Web: www.sesarju.eu/projects/ESMA

TABLE 14: DSDs IN THE AREA OF VIRTUALISATION AND CYBERSECURE DATA SHARING FOR WHICH THE SESAR 3 JU PROVIDED TECHNICAL EXPERTISE IN 2023

Project reference	Project title	EU contribution (EUR)
DEVICE	Delegation through virtual centres	22 949 337
<i>The project will showcase the delegation of airspace using a virtual centre setup between ATSUs operating in the same flight information region. It will also demonstrate data exchange and interoperability between vendors. Specifically, the demonstrator will demonstrate several new air traffic service operating models and the feasibility of delivering cross border services even through different platforms (iTEC SkyNex and COOPANS).</i> Web: www.sesarju.eu/projects/DEVICE		
EXODUS	COOPANS EXODUS Project	34 299 380
<i>The project aims to demonstrate the viability of a common system for members of the COOPANS Alliance based on a virtual centre model that geographically separates the ATM data service provider from the location of the ATSU. The goal is to prove the operational and business viability of a future common COOPANS operating model based on two SESAR Solutions on the rationalisation of infrastructure (PJ.16-03) and delegation of ATM services (PJ.10-W2-93A) for tests and training including for supervisory positions.</i> Web: www.sesarju.eu/projects/exodus		

1.2.4.3.3 Status of the Connecting Europe Facility call DSD2 (CEF-T-2023-SIMOBGEN)

In September 2023, CINEA launched a third call (DSD2) under the CEF framework, containing provisions for a series of DES demonstrators for greener, more scalable and resilient ATM. The SESAR-related topics support several of the nine flagship areas outlined in the SESAR 3 JU's multiannual work programme, in particular:

- ▶ ground-based augmentation system demonstrations leading to environmental benefits for airports and TMAs;

- ▶ trajectory based operation (TBO) enabling the European Green Deal;
- ▶ long-haul flight system-wide information-management-enabled in-flight trajectory optimisation;
- ▶ greener ATM operations at European airports;
- ▶ scalable and resilient network management operations.

The deadline for the submission of proposals was 30 January 2024. The evaluation and grant preparation phases of the selected proposals are planned to be completed by summer, with the launch of the projects expected in September 2024.

1.2.5 Strategic area of operation 5: Deliver SESAR outreach

In 2023, the SESAR 3 JU met its objectives related to delivering SESAR outreach, as set out in the 2022–2023 BAWP. This includes the following achievements and results.

- ▶ The SESAR 3 JU further fostered interoperability through the engagement with international partners, notably the International Civil Aviation Organization (ICAO) in view of the revision of the global air navigation plan (GANP), the US Federal Aviation Administration (FAA) and its next generation air transportation system (NextGen) programme, and other international partners through cooperative arrangements.
- ▶ Enhanced synergies with EU programmes materialised in the launch of a joint call with the EU-Rail JU on multimodality.

- ▶ Cooperation with key institutional and stakeholder partners continued, notably including the conclusion of contracts with airspace users and professional staff organisations (PSOs).

As a result, the target indicators for measuring progress for this strategic area of operation were met, with the exception of the cooperative arrangements in place with other European stakeholders. Out of the six planned for 2023, the one with the European Space Agency (ESA) did not materialise due to other priorities and workload issues.



1.2.5.1 Synergies

In 2023, the SESAR 3 JU continued to work closely with CINEA and the EU-Rail JU on creating synergies between their activities. The SESAR 3 JU also carried out an exercise to identify the scope and priorities for future synergies work with other organisations, with a plan to implement a range of further activities over the course of 2024–2025.

1.2.5.1.1 Across Horizon Europe

In October, the EU-Rail JU and the SESAR 3 JU published a joint call for the development of an 'Integrated air and rail network backbone for a sustainable and energy-efficient multimodal transport system', as detailed in Section 1.2.3.5. In addition, the SESAR 3 JU explored potential synergies with the Clean Aviation JU.

Throughout the year, the SESAR 3 JU participated in the meetings of the Clean Planet Inter-Partnerships, an assembly launched in December 2020 by the European Commission, to stay abreast of developments and potential synergy opportunities among Horizon Europe partnerships and initiatives (e.g. topics in the work programmes and relevant project results).

Throughout the year, the SESAR 3 JU coordinated with Greenet, the international network of Horizon Europe national contact points for cluster 5 'Climate, energy and mobility', to promote relevant content about the DES programme and activities on the Greenet communications channels and newsletters.



1.2.5.1.2 With the European Climate, Infrastructure and Environment Executive Agency

The launch and implementation of the DSDs, as part of the DES programme, led to strong cooperation with CINEA, as detailed in Section 1.2.4.3.

1.2.5.1.3 With national (sectoral) policies, programmes and activities

The SESAR 3 JU continued to work with its States' Representatives Group (SRG)⁽¹⁰⁾ to exchange information on the JU's actions and relevant national or regional initiatives and policies. The aim is to identify potential synergies and create greater impact, notably through a dedicated plan that the SRG intends to develop in 2024. Representatives presented national activities such as the Austrian SESAR Networking Initiative, an open platform established to facilitate stronger synergies between European and national programmes addressing ATM modernisation.

1.2.5.2 Stakeholder engagement

1.2.5.2.1 Institutional stakeholders



European Union Aviation Safety Agency

In 2023, the SESAR 3 JU continued to strengthen its partnership with EASA supported by the service-level agreement. The SESAR 3 JU and EASA secured close coordination, aiming to ensure an early exchange of knowledge on new technologies being developed, thereby facilitating the process of certifying and regulating resulting products and services, and ultimately accelerating the market uptake of innovative SESAR Solutions by a critical mass of early movers.

In 2023, the SESAR 3 JU and EASA enhanced their cooperation through participation in decision-making bodies: the SESAR 3 JU GB, the EASA Member States' Advisory Body, the Member States' Advisory Body Research Group and the Air Traffic Management / Air Navigation Service Technical Body. The improved collaboration foresees a more proactive contribution of the SESAR 3 JU in two EASA documents: the European

⁽¹⁰⁾ See Section 3.5 for more details about the SRG.

Plan for Aviation Safety (EPAS) and the European Aviation Environmental Report (EAER) for ATM-related aspects. EASA has also been supporting the European ATM Master Plan campaign, to ensure its alignment with the EPAS and the EAER.

The SESAR 3 JU and EASA have enhanced coordination at the technical level across the nine flagship areas. To this end, a pairing of EASA experts with SESAR 3 JU programme managers has been established to facilitate and strengthen the SESAR 3 JU–EASA collaboration.

In addition, the SESAR 3 JU was an active member of the Common Project 1 (CP1) Industrialisation Forum convened by EASA to assess the readiness for implementation of the CP1 ATM functionality 6 (AF6) at its industrialisation target date (31 December 2023).

Finally, the SESAR 3 JU was also involved in the study 'Impact analysis, prevention and management of air traffic controllers (ATCOs) fatigue in the EU'. This study aimed to better understand the causes of fatigue and to provide recommendations on how to manage, prevent and mitigate these factors.



European Defence Agency

Operational air traffic by the military serves various purposes such as training, homeland security and sovereignty missions, and often requires immediate and unpredictable access to airspace. This unpredictability necessitates flexible ATM to ensure that military operations do not adversely affect the overall flow of air traffic. Therefore, the extensive involvement of the military in SESAR activities is critical.

In close dialogue with the SESAR 3 JU since 2011, the EDA is the main interface between the DES programme, on the one hand, and military aviation and ATM, on the other, and is responsible for coordinating military views with regard to SESAR.

In 2023, under the MOC, the SESAR 3 JU and the EDA agreed to establish a task force designed to enhance coordination during the execution of the DES programme. This task force kicked off in 2023 with a view to establishing a plan to support the EU action plan on synergies between civil, defence and space industries and ensure complementarity between the work programmes of the SESAR 3 JU and the European Defence Fund. In the meantime, building on the results achieved in SESAR 2020, the SESAR 3 JU and the

EDA have continued to harmonise their RPAS research programmes to reduce duplication and to promote dual-use solutions. The SESAR 3 JU participated in reviews, discussions and events relating to the EDA RPAS activities, and the EDA reciprocated in the SESAR ER and IR projects. The EDA continues to contribute output from this harmonised work to European joint civil and military solutions, particularly through support to standardisation. This cooperation supports a harmonised approach to RPAS standardisation and operational integration, and will continue further during SESAR 3.



European Space Agency

The European ATM Master Plan identifies the need for space-based positioning of navigation and communication services in support of TBO, and for improved operations at less well-equipped airports or airports with differently equipped vehicles.

Coordination between ESA and the SESAR 3 JU continued in 2023, particularly in relation to ESA's and Inmarsat's Iris activities on satellite communications, although delays in the Iris programme have limited the opportunities to use aircraft equipped with satellite communications within the SESAR 2020 programme. However, the forthcoming DSD project ESMA, starting in 2024, will allow the ongoing validation of satellite communication linked to the Iris programme. Ultimately, this coordination with ESA and the finalisation of the Iris system are key to enabling 4D operations worldwide.



European Union Agency for the Space Programme

The SESAR 3 JU continued discussions with the European Union Agency for the Space Programme (EUSPA) to explore the potential for closer collaboration with a view to establishing synergies between cluster 4 'Digital, industry and space' initiatives and cluster 5 'Climate, energy and mobility' initiatives under Horizon Europe. It was agreed in principle to establish an MOC between the two organisations, and it had originally been planned to sign it during 2023. However, owing to other priorities, the finalisation of the MOC was delayed and signing is now expected in the first half of 2024.

1.2.5.2.2 Industry stakeholders



SESAR Deployment Manager

Collaboration between the SESAR 3 JU and the SDM continued during 2023. The text of a new memorandum of understanding between the SESAR 3 JU and the SDM was submitted to the European Commission for approval in early 2023. Pending its final approval and signature, a first Steering Committee meeting was held in September 2023 to discuss the operation of the memorandum and common objectives and priorities. These priorities include close cooperation at the working level on future updates of the European ATM Master Plan and the SESAR deployment programme, cooperation on preparation of a potential Common Project 2 (CP2), cooperation in the framework of technical coordination groups and associated activities, activities emerging from the cooperation with the FAA, communications around SESAR success stories, and joint visits by SESAR 3 JU and SDM management.

Advisory Council for Aviation Research and Innovation in Europe

In 2023, the SESAR 3 JU continued to support the activities of the Advisory Council for Aviation Research and Innovation in Europe (ACARE). The SESAR 3 JU was represented at meetings of the council's General Assembly and attended meetings of its Strategy and Integration Board. During the period, ACARE working groups progressed work on a gap analysis for the 'Fly the Green Deal' document across the aviation sector. This and the revised organisation proposals are scheduled to be presented to the General Assembly in early 2024.

Air navigation service providers

The SESAR 3 JU maintained close contact with the Civil Air Navigation Services Organisation (CANSO) during 2023. This included collaboration in showcasing the results of the SESAR 2020 programme during CANSO's Airspace World event in March 2023. The SESAR 3 JU also contributed to CANSO's Complete Air Traffic System initiative, which involves over 60 organisations worldwide. This included participation in two meetings of the CATS Global Council, in March and November, and contributions to the work area on the concept of operations for global airspace management.



Civil and military airspace users and professional staff organisations

Civil airspace users are associated with a wide range of undertakings and carry out a wide spectrum of activities, including scheduled and charter flights, cargo flights, business and general flights, and rotorcraft operations. Civil users of airspace are permanent observers of the GB, with voting rights⁽¹¹⁾.

The SESAR 3 JU has a particular relationship with the PSOs: the International Federation of Air Traffic Controllers' Associations, the European Cockpit Association, the International Federation of Air Traffic Safety Electronics Associations, the European Transport Workers' Federation and the Air Traffic Controllers European Unions Coordination. These organisations represent the overwhelming majority of European aviation workers.

During the period of transition between SESAR 2020 and the DES programme, the SESAR 3 JU maintained effective ad hoc liaison and communication with the airspace users and PSOs. At the end of 2023, the SESAR 3 JU signed specific contracts with PSOs and with the International Air Transport Association, the European Business Aviation Association, the International Council of Aircraft Owner and Pilot Associations and the European Helicopter Association. Work resumed immediately, notably with an emphasis on supporting the European ATM Master Plan update campaign, which will continue into 2024.

European airports

Recognising the need for further airport integration, the SESAR 3 JU works closely with Airports Council International (ACI) Europe to raise awareness of SESAR activities beyond the airports represented in the JU's membership.

In 2023, the close cooperation between ACI Europe and the SESAR 3 JU was further strengthened through a third specific contract implementing the framework contract signed at the end of 2020. Through this specific contract, the following main activities were performed.

- ▶ ACI Europe supported the SESAR 3 JU in a number of communication activities, including in the production of animations, articles and video interviews to promote SESAR R & I activities to decision-makers and the general public.

⁽¹¹⁾ According to Article 150(3) of the SBA, civil users of airspace must have at least 10 % of the total number of votes.

- ▶ The SESAR 3 JU Executive Director participated in a panel at the ACI Europe and ACI World Annual Congress and General Assembly in Barcelona. At the same event, a SESAR 3 JU-sponsored Digital Transformation Award was presented to Prague Airport, a SESAR member, recognising a European airport that has embraced digitalisation and adopted innovative technologies and procedures to improve safety, capacity, efficiency and sustainability.
- ▶ The SESAR 3 JU airport programme managers also participated in both ACI Europe's Technical, Operations & Safety Committee meetings and the ACI Europe Regional Airports Conference and Exhibition to promote SESAR R & I work.
- ▶ On behalf of the SESAR 3 JU, ACI Europe experts attended the SESAR 2020 PJ.04-W2 closing event and the SESAR 3 SIGN-AIR workshop on multimodality.

New entrants

The SESAR 3 JU's membership includes a number of organisations in the field of new entrants, which encompasses unmanned traffic management / U-space, unmanned aerial systems (UASs) and high-altitude operations. The SESAR 3 JU is also actively involved in the Network of U-space Stakeholders, which it co-chairs together with the European Commission, EASA, EUROCONTROL and now the EDA. The SESAR 3 JU also contributes in this field through participation in the European ICAO ATM Coordination Group together with the European Commission and other European institutions.

The SESAR 3 JU actively participated in international activities related to new entrants, in particular through the IR project ECHO 2, looking at high-altitude operation, multiple U-space and advanced air mobility (AAM) projects. It also supported ICAO, providing a co-rapporteur to ICAO's guidance development working group within the new AAM Study Group.

Small and medium-sized enterprises and start-ups

The SESAR 3 JU explored the possibility of establishing a cooperative arrangement with the European Aerospace Cluster Partnership with a view to providing a platform to promote the involvement of small and medium-sized enterprises (SMEs) and start-ups in the SESAR 3 JU's activities. The cooperative arrangement, which also focuses on ensuring the provision of timely information to SMEs, particularly in relation to funding opportunities, is expected to be progressed in 2024.

Alliance for Zero-Emission Aviation

In 2023, the SESAR 3 JU actively participated in the meetings and the work of the Alliance for Zero-Emission Aviation (AZE). Launched at the end of 2022 by the European Commission, AZEA is a collaborative effort involving public and private stakeholders to prepare for the introduction of hydrogen-powered and electric aircraft, aiming to achieve zero-emission flight. The participation of the SESAR 3 JU is in working group 5, which focuses on preparing for the integration of zero-emission aircraft into the European network. The participation of the SESAR 3 JU to this initiative is crucial, as these new types of aircraft will require an adaptation of the ATM systems to accommodate new flight characteristics and operational needs. In 2023, the working group's focus was the development of the first version of the AZEA concept of operations, which was published in January 2024. In 2024, the focus will be on modelling activities to produce a network performance and maturity assessment and later to derive an action plan and roadmap.

1.2.5.2.3 Standardisation bodies

In 2023, the SESAR 3 JU strengthened its collaboration with European standardisation bodies such as EUROCAE, the European Air Traffic Management Standards Coordination Group (EASCG) and the European Unmanned Aerial System Standards Coordination Group (EUSCG), notably through the TCG. This collaboration aimed to enhance alignment between the standardisation needs identified by the SESAR Solutions and the ongoing standardisation activities by the various standards development organisations. The goal was to monitor the timely delivery of the standards required to facilitate the implementation of the SESAR Solutions and, ultimately, their market uptake.



European Organisation for Civil Aviation Equipment

In order to align more closely with the DES programme, a new MOC between the SESAR 3

JU and EUROCAE was signed in March 2023, to support the strategic planning and monitoring of standardisation activities and the exchange of information to support the delivery of standards.

The SESAR 3 JU continued to ensure ongoing alignment between its work and proposed standards developments, EUROCAE working

arrangements and EUROCAE planning through its active participation in the EUROCAE Council and Technical Advisory Committee under the terms of the 2012 MOC. Moreover, the SESAR 3 JU's representative has been selected to represent the European R & D community on the Technical Advisory Committee, further reinforcing the link with the SESAR programme. The SESAR 3 JU contributed to drafting parts of the EUROCAE technical work programme to ensure alignment with SESAR planning and needs, in particular to address the needs identified in its strategic R & I agenda (SRIA).

SESAR deliverables were made available to several EUROCAE working groups in 2023, to support the development of standards relating to several key areas of the DES programme.

In 2023, EUROCAE published several standards with contributions from and of direct relevance to SESAR Solutions.



European Air Traffic Management Standards Coordination Group

In 2023, the SESAR 3 JU continued to be an active participant in the European Air Traffic Management Standards Coordination Group (EASCG), chaired by EASA, with the objectives of coordinating standardisation activities, identifying their links with R & I activities and providing a forum for discussion.

Since the beginning of the DES programme, the SESAR 3 JU has made recommendations for standardisation to the EASCG and EUROCAE. These recommendations and conclusions remain a major input for the European ATM Standardisation Rolling Development Plan. This plan serves not only as the reference for ATM standardisation needs in Europe (including SESAR-specific needs), but also as the basis for European input into both the process and the content of the ICAO standardisation roadmap development.



European Unmanned Aerial System Standards Coordination Group

In 2023, the SESAR 3 JU continued as an active participant in the European Unmanned Aerial System Standards Coordination Group (EUSCG), with the objective of coordinating UAS-related standardisation activities and needs. The focus of the EUSCG, supported by the SESAR 3 JU, has been on defining means of compliance for the evolving U-space regulatory environment.

1.2.5.3 Cooperation with non-European Union countries and international organisations

The SESAR 3 JU's strategy for cooperation with non-EU countries and international organisations is pursued within the framework of the EU's sustainable and smart mobility strategy. In close coordination with the European Commission, the SESAR 3 JU aims to secure its position as a global leader in ATM modernisation in support of the ICAO GANP, promoting SESAR Solutions for global interoperability and harmonisation, and thereby supporting EU industrial leadership and competitiveness.

In 2023, the SESAR 3 JU participated actively in a number of ICAO groups: the GANP Study Group, which is preparing the next update of the GANP, to be adopted in 2025 by the 42nd ICAO Assembly; the UAS Advisory Group, which organises the annual ICAO Drone Enable event and contributes to the development of ICAO's UAS framework document, building on experience gained in SESAR U-space projects; and the newly established AAM Study Group, which will perform an assessment of the AAM ecosystem and develop recommendations for ICAO's future work related to AAM. The SESAR 3 JU also participated in the ICAO Air Traffic Management Requirements and Performance Panel to provide inputs on its R & D work related to TBOs. The SESAR 3 JU also participated in ICAO's Air Navigation World event in August 2023, and provided the moderator for three of the panel sessions on the topic of the information revolution.

The SESAR 3 JU continued to work with the FAA during 2023 under the EU-US MOC on ATM modernisation, civil aviation R & D and global interoperability. The coordination focused on four areas: the integration of new entrants, the development of performance-based technologies,

advancing innovation in ATM and ICAO coordination. In the domain of new entrants, two technical-level sessions were held, in February in Washington, DC, and in November in Seville, to have detailed exchanges on the progress of the two sides' research activities related to small UASs and UAM. In the area of TBOs, a joint SESAR/FAA tabletop exercise on flight and flow information for a collaborative environment release 2 was held at the end of May in Montreal. The coordination committee met in December 2023 to review progress across all four areas of work and to discuss priorities for the coming period.

Bilateral contacts with other key international partners were also maintained during 2023. Regular interactions with the Civil Aviation Authority of Singapore took place under the MOC signed in 2012. This included an online workshop

held in November on the campaign to update the European ATM Master Plan. Regarding Japan, a team of SESAR 3 JU experts, including colleagues from EUROCONTROL, Enaire, Centro de Referencia de Investigación, Desarrollo e Innovación ATM A.I.E. and Frequentis, visited Tokyo in June 2023 for detailed technical exchanges concerning research activities relating to U-space, UAS traffic management and UAM/AAM. This visit also included a bilateral meeting with the Japan Civil Aviation Bureau. In addition, the SESAR 3 JU participated in the EU–India aviation summit in Delhi in April 2023, and followed up with a bilateral meeting with the Indian Ministry of Civil Aviation to explore areas of shared interest.

Finally, the SESAR 3 JU continued to support EASA in its technical cooperation activities with various regions of the world.



1.3 Calls for proposals, grant information and other funded actions (calls for tenders, prizes)

1.3.1 Calls for proposals and grant information

In 2023, the SESAR 3 JU managed 24 grants that were still active at the beginning of the year under the SESAR 2020 programme. In addition, 50 grants were awarded under the DES programme in 2023: 18 grants under the ER1 call for a total cost of EUR 24.7 million, including EUR 22.3 million of EU contribution, and 32 grants awarded under the IR1 call for a total cost of EUR 374.4 million, including EUR 180.8 million of EU contribution. All these projects and the related grants were managed in accordance with the Horizon 2020

and Horizon Europe programme rules. More information about these projects is available in Section 1.2.

The third DES call for proposals (HORIZON-SESAR-2023-DES-ER-02) was launched on 29 June 2023. The call closed on 15 November 2023, with 100 proposals submitted, as outlined in Table 15. The breakdown of applicants by country and type of participant is in Table 16.

TABLE 15: PROPOSALS SUBMITTED TO THE DES-ER-02 CALL

Flagships	DES-ER-02-WA1		DES-ER-02-WA2	
	Topic	Nbr of proposals	Topic	Nbr of proposal
Connected and automated ATM	DES-ER-02-WA1-1	10	DES-ER-02-WA2-1	22
Air-ground integration and autonomy	DES-ER-02-WA1-2	0	DES-ER-02-WA2-2	9
Capacity on demand and dynamic airspace	DES-ER-02-WA1-3	3		
U-space and urban air mobility	DES-ER-02-WA1-4	12		
Virtualisation and cyber-secure data sharing	DES-ER-02-WA1-5	5		
Multimodality and passenger experience	DES-ER-02-WA1-6	6		
Aviation green deal	DES-ER-02-WA1-7	7	DES-ER-02-WA2-3	4
Artificial intelligence for aviation	DES-ER-02-WA1-8	6	DES-ER-02-WA2-4	14
Civil-military interoperability & coordination	DES-ER-02-WA1-9	2		
Total		51		49



TABLE 16: BREAKDOWN OF APPLICANTS IN THE DES-ER-02 CALL, BY PARTICIPANTS AND COUNTRY

HORIZON-SESAR-2022-DES-ER-02						
Country	Higher education institutions	Private for-profit companies	Public bodies	Research organisations	Other	Total
Austria	3	9	—	4	—	16
Belgium	3	5	—	13	5	26
Brazil	—	—	—	1	—	1
Canada	—	—	—	—	6	6
Croatia	5	3	—	—	—	8
Cyprus	—	6	—	—	—	6
Czechia	2	8	—	—	—	10
Denmark	2	1	—	—	—	3
Estonia	—	2	—	—	—	2
Finland	2	4	—	4	—	10
France	11	22	1	6	—	40
Germany	11	13	—	29	1	54
Greece	4	6	—	2	—	12

HORIZON-SESAR-2022-DES-ER-02						
Country	Higher education institutions	Private for-profit companies	Public bodies	Research organisations	Other	Total
Hungary	—	2	—	—	—	2
Iceland	—	2	—	—	—	2
Ireland	2	14	—	—	—	16
Israel	—	2	—	—	—	2
Italy	13	62	—	20	1	96
Latvia	—	1	—	1	—	2
Malta	1	3	—	—	—	4
Netherlands	17	4	—	7	—	28
Nigeria	—	—	—	1	—	1
North Macedonia	1	—	—	—	—	1
Norway	2	—	—	11	—	13
Poland	2	2	—	2	—	6
Portugal	2	2	—	1	—	5
Romania	—	1	—	1	—	2
Serbia	7	—	—	—	—	7
Singapore	1	—	—	—	—	1
Slovakia	1	4	—	—	—	5
Slovenia	1	—	—	—	—	1
Spain	36	41	7	21	—	105
South Korea	—	1	—	—	—	1
Sweden	8	7	15	—	—	30
Switzerland	8	—	—	4	1	13
Türkiye	6	4	—	1	2	13
Ukraine	—	1	—	—	—	1
United Kingdom	9	3	—	2	—	14
United States	—	—	3	—	—	3
Total	160	235	26	131	16	568

In October 2023, the SESAR 3 JU published a joint call with the EU-Rail JU. The call closed in February 2024, and results were subsequently notified in April 2024.

In addition, the SESAR 3 JU contributed its technical expertise during the evaluation phase of the second DSD call (CEF-T-2022-SIMOBGEN) launched under the CEF, which took place in March 2023. More Information on the DSD1b call is provided in Section 1.2.4.3.2.

1.3.2 Other funded actions (operational procurement and prizes)

In 2023, significant strides were supported by operational procurement actions, notably securing key expertise from civil stakeholders in the aviation sector (in particular, airspace users, PSOs and airports) that is essential for the effective

implementation of the programme. This pivotal year marked the signing of nine framework contracts and nine specific contracts (Table 17), ensuring the provision of essential services from an operational standpoint.

TABLE 17: OPERATIONAL PROCUREMENT FOR 2023

Subject of the contract	Type	Contractor	Procurement procedure (if applicable)	Signature date	Amount (EUR)
Provision of airspace user expertise to the DES programme	Framework	IATA España S.L.	Open call	7 July 2023	Max. 800 000
Provision of airspace user expertise to the DES programme	Framework	AOPA Germany	Open call	10 July 2023	Max. 400 000
Provision of airspace user expertise to the DES programme	Framework	European Business Aviation Association	Open call	5 October 2023	Max. 400 000
Provision of airspace user expertise to the DES programme	Specific	AOPA Germany	Framework contract	6 December 2023	Max. 199 375
Provision of airspace user expertise to the DES programme	Specific	IATA España S.L.	Framework contract	13 December 2023	Max. 399 728
Provision of PSO expertise to the DES programme	Framework	International Federation of Air Traffic Safety Electronics Associations Europe Region	Negotiated procedure	22 August 2023	Max. 200 000
Provision of PSO expertise to the DES programme	Framework	European Transport Workers' Federation	Negotiated procedure	29 June 2023	Max. 200 000
Provision of PSO expertise to the DES programme	Framework	European Cockpit Association	Negotiated procedure	30 June 2023	Max. 200 000
Provision of PSO expertise to the DES programme	Framework	International Federation of Air Traffic Controllers' Associations	Negotiated procedure	30 June 2023	Max. 200 000
Provision of PSO expertise to the DES programme	Framework	Air Traffic Controllers European Unions Coordination	Negotiated procedure	28 July 2023	Max. 200 000

Subject of the contract	Type	Contractor	Procurement procedure (if applicable)	Signature date	Amount (EUR)
Provision of PSO expertise to the DES programme – 2024 activities	Specific	International Federation of Air Traffic Safety Electronics Associations Europe Region	Framework contract	25 October 2023	Max. 100 000
Provision of PSO expertise to the DES programme – 2024 activities	Specific	European Cockpit Association	Framework contract	5 December 2023	Max. 100 000
Provision of PSO expertise to the DES programme – 2024 activities	Specific	Air Traffic Controllers European Unions Coordination	Framework contract	25 October 2023	Max. 100 000
Provision of PSO expertise to the DES programme – 2024 activities	Specific	European Transport Workers' Federation	Framework contract	7 November 2023	Max. 100 000
Provision of PSO expertise to the DES programme – 2024 activities	Specific	International Federation of Air Traffic Controllers' Associations	Framework contract	26 October 2023	Max. 100 000
Provision of consultancy and support to the SESAR 3 JU related to strategic management and facilitation of market uptake	Framework	Egis Avia SAS	Open call	24 July 2023	Max. 2 570 000
Provision of consultancy and support to the SESAR 3 JU related to strategic management and facilitation of market uptake	Specific	Egis Avia Group	Framework contract	11 September 2023	Max. 864 680
Provision of consultancy and support to the SESAR 3 JU related to strategic management and facilitation of market uptake	Specific	Egis Avia SAS	Framework contract	12 December 2023	Max. 54 980
SESAR Young Scientist Award (student category)	Prize	N/A	Contest	7 December 2023	1 500
SESAR Young Scientist Award (PhD category)	Prize	N/A	Contest	7 December 2023	5 000
Max. total for 2023					2 025 263 ^(a)

N/A, not applicable.

^(a) A framework contract is implemented through specific contracts. Framework contracts do not result in a charge to the SESAR 3 JU budget; only the specific contracts issued under framework contracts have budget implications. Therefore, the total amount of operational procurement presented in the table includes the specific contracts, but not the framework contracts.

1.4 Evaluation procedures and outcomes

The evaluation of proposals stemming from the second ER call for proposals (HORIZON-SESAR-2023-DES-ER-02) started immediately after the call closure, with the eligibility check performed by SESAR 3 JU staff. As a result, 7 proposals out of 100 submitted were found inadmissible or ineligible.

The selection of experts, drawn from an initial pool approved before the call deadline, was made by SESAR 3 JU staff to ensure the absence of any

conflict of interest. A total of 34 external experts were selected to guarantee a high level of skills, experience and knowledge in the areas of the calls. Special attention was placed on maintaining a balanced composition in terms of skills, experience, knowledge, geographical diversity, gender and public/private sector representation, alongside regular rotation. The evaluation process started on 8 December 2023 with a briefing for the experts. The evaluation continued in 2024.



1.5 Follow-up activities linked to past calls

Information on ER1, IR1, DSD1a and DSD1b projects that were active during the reporting period and financed from past calls is available in Section 1.2.

1.6 Openness, cooperation, synergies and cross-cutting themes and activities

Information on the collaboration with other European programmes and partnerships and synergies between the JU's actions and national

or regional initiatives and policies is provided in Section 1.2.5, in line with Articles 17(2)(p) and 26(2)(d) and (f) of the SBA.

1.7 Progress against key performance indicators

1.7.1 Progress against Horizon 2020 legacy key performance indicators

During the reporting period, the SESAR 3 JU managed the remaining 24 grants financed under the SESAR 2020 programme. For this reason, this edition of the CAAR still provides measurements of the Horizon 2020 legacy KPIs. In line with the previous editions of the CAAR, the yearly value for the reporting period has been provided in accordance with the methodology received by the European Commission⁽¹²⁾. Tables A4 to A6 in Annex 3 follow the instructions on annual activity reports for JUs that were operating under Horizon 2020. As 2023 marks the concluding year of implementation of the SESAR 2020 programme, a substantial number of KPIs and metrics used to measure the performance of the JU are now not applicable (N/A)⁽¹³⁾, while the performance of the others is limited by the small number of SESAR 2020 projects still active.

In 2023, the final payments for the remaining SESAR 2020 projects were completed on time (KPI 12), with only very few left for early 2024. It is important to mention that the 93 % of budget execution on commitment appropriations (KPI 14) came from assigned revenues. Finally, the error rate remained below the 5 % threshold (KPI 38).

The closure of the last 24 projects (KPI 41) and the final maturity assessment conducted through release 13 (KPI 42) mark the conclusion of the SESAR 2020 programme. With this completion, the SESAR 3 JU ceased monitoring and reporting on the Horizon 2020 KPIs. A report outlining the achievements of the entire SESAR 2020 programme is scheduled for publication by mid-2024.

1.7.2 Progress against general Horizon Europe key impact pathways

Horizon Europe incorporates a novel approach to capturing and communicating impacts by means of the key impact pathways (KIPs)⁽¹⁴⁾. The objective of this approach is to enable policymakers and the wider public to gain regular insights into the effects and benefits of the programme over time in relation to European science, economy and the wider society. The nine KIPs cover areas of scientific, societal and technological/economic impact, and focus on the impact of the Horizon Europe programme as a whole.

A full list of these KIPs can be found in Table A7 in Annex 4. The KIPs are not calculated directly by the JU, but automatically calculated and reported via

the Horizon Dashboard, based on the continuous reporting of the projects. The calculation follows the methodology presented in the [indicator methodology and metadata handbook](#). It should be noted that, as of the writing of this report, the data for several short-term KIPs and the majority of the medium-term KIPs were not yet available.

Since the Horizon Europe KIPs are automatically generated by the Horizon Dashboard, based on the Horizon Europe funded projects, they do not include the DSDs, which, although an integral part of the DES programme, are funded under the CEF budget.

1.7.3 Progress against Horizon Europe common key performance indicators for joint undertakings

Horizon Europe introduces common criteria for all JUs. They are complementary to the KIPs and each JU's specific KPIs. These indicators, which have been designed to capture quantitative and qualitative information and aspects of the

functioning of the JUs, can be grouped in four categories: additionality and directionality, transparency and openness, coherence and synergies, and international visibility and positioning.

⁽¹²⁾ Council Decision 2013/743/EU, Annexes II and III; *Horizon 2020 Indicators – Assessing the results and impact of Horizon 2020*; Guidelines on key performance indicators (KPI) for directors of EU decentralised agencies (SWD(2015)62); Commission communication on the strengthening of the governance of Union bodies under Article 70 of the Financial Regulation 2018/1046 and on the guidelines for the single programming document and the consolidated annual activity report (COM(2020) 2297) (see the template for the consolidated annual activity report).

⁽¹³⁾ The Horizon 2020 KPIs for which the result in 2023 is N/A have not been included in the KPI tables in Annex 3.

⁽¹⁴⁾ The general Horizon Europe KIPs are available in Annex V of Regulation (EU) 2021/695 establishing Horizon Europe.

1.7.3.1 Additionality and directionality

Additionality is fundamental to the EU partnership model, and SESAR 3 JU's members are complementing EU funding with investments and activities. Although precise data on the additional investments triggered by the EU contribution to the JU (KPI 2) will only be available following the completion of the first wave of projects, the contribution (both financial and in-kind) from its members (KPI 1) began materializing in 2022 and intensified in 2023, totalling an amount of EUR 154 million. In terms of directionality, the goals of the SESAR 3 JU align directly with the "European Green Deal" and the "Europe Fit for the Digital Age", resulting in the entirety of its budget being dedicated to the digital and green transition (KPI 3), which are core objectives of the DES programme.

1.7.3.2 Transparency and openness

In 2023, the number of members of the partnership remained the same as when it was created. However, an increase is expected in 2024 following the call for new associated members published at the end of 2023 (KPI 6). The first two calls under Horizon Europe (ER1 and IR1) resulted in the participation of more than 100 newcomers in funded projects that had not been involved in the SESAR 2020 activities (KPI 7).

The ER2 call, launched in 2023, demonstrated the attractiveness of the SESAR 3 JU, with 568 participations from 39 countries (KPI 5).

1.7.3.3 Coherence and synergies

In terms of synergies with other EU partnerships (KPI 8), the SESAR 3 JU published a joint call with the EU-Rail JU and developed a systematic collaboration with the Clean Aviation JU, through their respective SRGs (in line with Article 68.1 of the SBA). In addition, there are synergies with the other partnerships of the Clean Planet Inter-Partnership Assembly. Ad hoc collaborations have included back-office arrangements with other JUs for procurement support services, accounting services and human resources, as well as a service-level agreement with the Clean Aviation JU and the Clean Hydrogen JU for participation in the Transport Research Arena.

Over the reporting period, the SESAR 3 JU consistently sought collaborations and synergies with other R & I initiatives at the EU, national, regional and sectoral levels (KPI 9). The most important one is the collaboration with CINEA on the call for proposals for the DSD1b launched under the CEF, as an integral part of the DES. In 2023, the SESAR 3 JU expanded its network of collaborations with R & I stakeholders in Europe and across the world by adding an MOC with EUROCAE. Section 1.2.5.1 on synergies provides details on the ad hoc collaborations and activities with R & I initiatives.

The complementary funding triggered by the synergies with Union funds (KPI 10), which in the case of the SESAR 3 JU is essentially the CEF, amounts to EUR 68 759 717, covering the three



projects of the DSD1b call launched in 2023. This represents the equivalent of an additional 66.8 % to the budget of the JU for that year.

1.7.3.4 International visibility and positioning

The SESAR 3 JU conducts numerous activities aimed at increasing the visibility and awareness of its operations and results (KPI 11). This includes organising and participating in several

international events, numerous publications, newsletters, news items and social media activities. More information on these activities can be found in Section 2.1. These awareness-raising activities have been successful in attracting R & I stakeholders from beyond the EU Member States and associated countries to Horizon Europe, as evidenced by the participation of 15 entities in the projects currently active (KPI 4).

1.7.4 Progress against SESAR 3 JU-specific key performance indicators

The specific KPIs for the SESAR 3 JU are detailed in Table A10, Annex 6. These metrics evaluate the JU's performance across three main levels: (1) resources (input), processes and activities, (2) outcomes and (3) impacts. This logic chain creates a direct link between the activities of the JU and the achievement of the objectives of the DES programme. During the second half of 2023, the SESAR 3 JU used the opportunity of the 2024 biennial monitoring report (BMR) to refine its specific KPIs. The BMR is a Commission exercise aimed at providing a strong evidence base to guide the implementation of all partnerships under Horizon Europe. This helped the SESAR 3 JU to ensure that these KPIs are consistent and capable of effectively measuring performance against the objectives of the programme. As a result, the specific KPIs listed in the 2023 CAAR are now identical to those reported in the 2024 BMR.

No reporting on the SESAR 3 JU-specific KPIs was conducted in 2022, as the DES programme was in its launching phase. Consequently, 2023 is the first year of reporting on these indicators.

In the reporting period, the SESAR 3 JU managed 50 projects (18 ER1 and 32 IR1). In addition, eight DSD projects were funded under the CEF. The SESAR 3 JU is continuing its collaboration with other EU programmes and initiatives to maximise impact. This includes a new DSD call launched under the CEF and a synergy call with the EU-Rail JU launched at the end of 2023, indicating a proactive approach towards synergies. The synergy with the CEF has generated additional

funding exceeding EUR 116 million. Moreover, the SESAR 3 JU members' contributions total EUR 256 million, keeping the JU on track to meet end-programme objectives.

In terms of outcomes, measurable progress on the majority of KPIs is expected to materialise after the completion of the first wave of DES projects. Consequently, KPIs measuring the solutions delivered, the implementation of the Master Plan vision, and the solutions with supporting standards and regulations are not expected to show any progress before 2025. However, the market deployment of Phase C solutions, currently at 4 %, is on course towards the target of 20 % by the end of the programme, indicating alignment with the set objectives.

The impacts section of the KPIs contains a series of metrics designed to grasp the overall performance benefits anticipated from the deployment of the SESAR Solutions developed. The JU is on track to meet all its impact targets by the end of the programme. It is important to note, however, that these targets are based on the 2020 European ATM Master Plan. The update of the Master Plan planned in 2024 may lead to a reassessment of the SESAR 3 JU's priorities, potentially necessitating a revision of the specific KPIs and their associated targets.

The specific KPIs reported in 2023 suggest that performance is aligned with the targets, indicating a positive trajectory towards achieving the objectives by the DES programme's conclusion.

1.8 Dissemination and information about project results

In 2023, a series of actions were implemented aiming to raise awareness among beneficiaries about the importance of disseminating the projects' results and providing information about them. The activities implemented were tailored to

the specific situations of the projects, depending on the different projects' implementation stages. Project-specific information is available in Section 1.2.



2 Support to operations

In 2023, the SESAR 3 JU met its objectives related to support provided to operations, as set out in the 2022–2023 BAWP. This includes the following achievements and results.

- ▶ It promoted the DES vision and the added value of the SESAR 3 JU partnership, through publications, events, and online media. Most communication and dissemination activities were carried out in accordance with the BAWP with little or no deviation from the targets.
- ▶ Full compliance with programming and reporting requirements was ensured with the timely adoption of the 2022 CAAR, of the 2024–2025 BAWP and of the necessary amendments to the 2022–2023 BAWP.
- ▶ The legal and procurement activities were monitored and carried out in accordance with the agreed plans.
- ▶ No files were sent to the European Anti-Fraud Office (OLAF) for investigation.
- ▶ In 2023, the SESAR 3 JU received no ‘critical’ observations from the auditors.
- ▶ The outsourced infrastructure services for the SESAR 3 JU⁽¹⁵⁾ were generally provided as planned, with effective business continuity

measures in place. However, the number of incidents causing the loss of at least one critical service to the whole organisation was higher than planned in the 2022–2023 BAWP: 13 against a target of zero. The SESAR 3 JU systematically assessed incidents recorded at that level and formalised the assessment in a report dedicated to avoiding the reoccurrence of such issues.

- ▶ In terms of monitoring the efficiency and effectiveness of human resources management, the career development review, the setting of objectives and the reclassification exercise were completed in line with the BAWP.

As a result, the target indicators for measuring progress in support to operations were met, except for the level of quality of the information technology (IT) infrastructure and of some communication aspects. In particular, the SESAR 3 JU hosted only 6 out of the 8 events planned, and participated in 41 out of 50 external events. Additionally, it fell short on the SESAR publications, achieving 3 out of 4 planned, contributed to 9 out of 12 planned external publications, and organised only one meeting of the Communications Coordination Group, instead of the 2 planned.

2.1 Communication activities

2.1.1 Events and conferences

The SESAR 3 JU participated in over 40 external events and organised three major events during the year, averaging 400 participants per event.

2.1.1.1 Airspace World and SESAR 3 JU internal gathering, 7–10 March 2023, Geneva

The global ATM community gathered from 8 to 10 March at Airspace World in Geneva, where the SESAR 3 JU with its partners showcased results from the SESAR 2020 R & I programme. The event saw the JU join forces with the Europe for Aviation partners, hosting a wide range of briefings, exhibits and demos, illustrating collaboration in action

between the European aviation organisations working to implement the Single European Sky. In addition, Airspace World was also the backdrop to the annual gathering of the JU’s members and partners, which took place on 7 March.

Key highlights included the following.

In the **Europe for Aviation Theatre**, SESAR 3 JU staff participated in 10 sessions, offering a thought-leadership perspective on a wide range of topics, from TBO and controller licensing to drones, higher airspace operations and space-based ATM.

The **SESAR 2020 showcase and walking tours** featured 16 sessions and 9 walking tours addressing all areas of SESAR R & I. Participants

⁽¹⁵⁾ The SESAR 3 JU relies on two main providers of operational information and communications technology services: EUROCONTROL and the European Commission.

had a chance to see tangible examples of digital solutions that are in the pipeline and those already available for implementation.

Projects addressing sustainable air traffic operations, better weather forecasting enabled by AI and UAM received the top prizes in the **SESAR Digital European Sky Awards**. The winners were announced on 9 March during an awards ceremony:

- ▶ **SESAR Exploratory Research Award:** [Isobar](#) – Artificial intelligence solutions to meteo-based DCB imbalances for network operations planning,
- ▶ **SESAR Industrial Research Award:** [PJ18 - 4D Skyways](#) – Improving trajectory management for European air transport,
- ▶ **SESAR Demonstration Award:** [SAFIR-Med](#) – Safe
- ▶ and flexible integration of advanced U-space services focusing on medical air mobility,
- ▶ **People's Choice Award:** [ALBATROSS](#) – The most energy-efficient flying bird.



2.1.1.2 SESAR 3 JU annual conference

A total of 400 stakeholders gathered in Brussels on 10 October for the second SESAR 3 JU annual conference, which saw the launch of a campaign to update the European ATM Master Plan, the roadmap for the modernisation of Europe's ATM system to maximise its contribution to delivering the most efficient and environmentally friendly sky to fly in the world. The conference was also

the backdrop to the completion of the SESAR 2020 programme, with panellists highlighting the key achievements of the legacy R & I programme.

2.1.1.3 SESAR Innovation Days

Information on SESAR Innovation Days and on the Young Scientist Awards is provided in Section 1.2.2.3.



2.1.2 Press

In 2023, the SESAR 3 JU continued its outreach to trade press and member/partner media channels, with some 25 feature articles and interviews published in a range of magazines and online media, including specialised media.

In 2023, the SESAR 3 JU was mentioned in 1 700 articles, highlights of which are available on the SESAR 3 JU website. Through its contract with ACI Europe, the SESAR 3 JU promoted the

annual conference in a 1-week banner campaign on Euractiv and coordinated an article in the magazine *The Parliament*, featuring an interview with Marian-Jean Marinescu, Member of the European Parliament, and representatives from the JU members Aena, Romatsa and Ryanair. The media partnerships resulted in favourable visibility for the JU.

2.1.3 Publications

The SESAR 3 JU published several publications throughout the year, which were promoted through online channels and at key events.



The [2022 SESAR innovation pipeline](#) brochure provides highlights of some of key strategic developments, events as well as SESAR R & I activities that took place in 2022. It features updates from each strand of the programme: ER, IR and VLDs. Together, these strands form an innovation pipeline through which ideas are transformed into concrete solutions.



The joint [environment discussion paper](#) *Making Europe the most efficient and environmentally friendly to sky to fly in the world* was published at the launch of the campaign to update the European ATM Master Plan. The publication's aim is to guide discussions among Europe's aviation stakeholders and policymakers on the contribution that ATM needs to make towards aviation's climate neutrality ambitions.

2.1.4 Online communications

2.1.4.1 Website and e-news

In 2022, the SESAR 3 JU developed new content for its website, including 100 news items about programme-related developments and project results, and a dedicated interface on improving the environmental footprint of ATM. The website saw almost 170 000 unique visitors, with LinkedIn acting as the main platform driving traffic. The monthly e-news was sent to nearly 8 000 external contacts (in full compliance with the general data protection regulation). In addition, 39 dedicated event mailshots and press releases were distributed, attracting further traffic to the SESAR 3 JU website.

2.1.4.2 Social media

In 2022, the SESAR 3 JU's social media communication achieved positive results in terms of performance. The SESAR 3 JU published just over 1 000 posts across its social media channels with an increase in the number of followers across all channels, especially LinkedIn, and increased community engagement.

The improved performance can be explained by a series of scheduled promotion campaigns, which helped increase the visibility of the SESAR 3 JU across the channels on which it is active. These included campaigns to familiarise audiences with the new members of the SESAR 3 JU, its project areas, and key events such as the annual conference and SESAR Innovation Days.

2.1.4.3 Digital assets

In 2023, the SESAR 3 JU developed a number of videos and animations to promote the programme:

- ▶ [Best of SESAR 2020](#)
- ▶ [SESAR: Helping airports meet their sustainability goals](#)
- ▶ [SESAR: Optimising airport runways](#)
- ▶ [SESAR and regional airports](#)
- ▶ [SESAR: Total airport management.](#)



2.2 Legal and financial framework

The SESAR 3 JU was established on the basis of Article 187 of the Treaty on the Functioning of the European Union, and of the SBA.

The financial rules of the SESAR 3 JU, adopted by its GB under Decision GB(D)01-2021, comply with Commission Delegated Regulation (EU) 2019/887 on the model financial regulation for public-private partnership bodies.

2.2.1 Legal support provided to operations

After focusing in 2022 on establishing its membership, securing its governance and preparing for its move to EUROCONTROL premises in 2023, the SESAR 3 JU worked with its stakeholders mainly on governance, contributions and synergies, particularly synergies with EUROCONTROL and the other JUs.

Given this, 2023 was a year in which much was done to facilitate the involvement of certain aviation sector stakeholders, in particular airspace users, PSOs and airports, in the SESAR 3 JU's activities. The year was significant for securing the provision of key expertise for the effective achievement of its missions including on the development of the new European ATM Master Plan, in the field of industry standards for aviation (EUROCAE) and in areas such as cybersecurity.

This focus is reflected in the legal support provided to operations over 2023, which increased by more than 90 % in the procurement field with the signing of 72 new contracts (including 2 direct contracts, 11 framework contracts, 25 specific contracts and 11 amendments).

The relocation of the SESAR 3 JU to EUROCONTROL's building, which took place in February, also required increased legal support in negotiating the conditions for terminating the rental contract for the previous offices, moving the organisation and adapting facility support to be provided (i.e. delivery of reception and back-office support).

Furthermore, the reorganisation of the SESAR 3 JU Programme Office in July 2023 led to initiatives aimed at modernising the SESAR 3 JU's processes. This required an across-the-board analysis of its functioning and approval processes in the light of the applicable legislation. For example, in-depth legal analyses were required for the revision of the financial manual and of the internal delegation and approval mechanisms.

In parallel, the digitalisation of the legal support services continued with the deployment and use of new systems. These systems allow the digital management of submission processes, evaluation, planning and monitoring of our calls for tenders (with e-tendering from January 2023 and

the public procurement management tool from November 2023).

Finally, in 2023, the SESAR 3 JU enhanced its synergies with all other JUs in this field. This led to the launch in 2023 of the largest ever interinstitutional call for tenders in terms of the

number of JUs involved. This call for tenders for the provision of legal support in the field of data protection in 2024 will be led by the SESAR 3 JU (as leading authority) with the support of the Clean Aviation JU and the EU-Rail JU.

2.2.2 Data protection activities

During the reporting period, activities related to data protection were carried out in line with the plan outlined in the 2022–2023 BAWP.

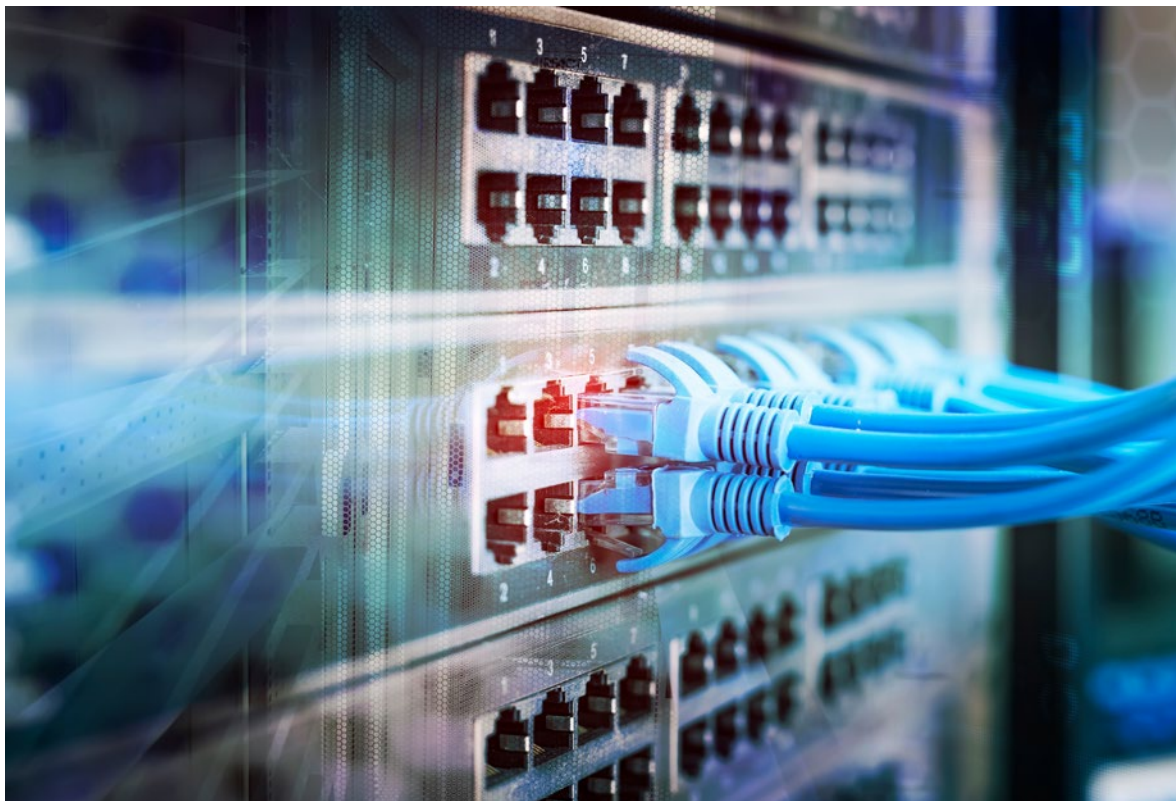
In 2023, the work focused on preparedness for launching the renewal of the temporary authorisation granted by the European Data Protection Supervisor (EDPS) to the data protection administrative arrangement (DPAA) concluded with EUROCONTROL in 2022, support to digitalisation of the SESAR 3 JU, and synergies with EUROCONTROL and other JUs.

Related to the renewal of the EDPS's authorisation and the implementation of the DPAA, an amendment to the current DPAA has been signed. The SESAR 3 JU and EUROCONTROL data protection officers (DPOs) have collaborated on a draft of a potential joint controllership arrangement.

The focus of the SESAR 3 JU on digitalisation and use of new technologies has required its DPO to

analyse new technologies in depth with respect to data protection. In close cooperation with EUROCONTROL, the SESAR 3 JU conducted a data protection impact assessment on Microsoft 365, which led to its compliant deployment. Furthermore, the DPO provided advice on the signing of joint or separate controllership arrangements for the use of European Commission corporate tools and software.

The DPO also supported the EDPS by conducting workshops on international data transfers and the outsourcing of data protection services, during the biannual meetings with the EDPS and the DPOs of all EU institutions. In relation to outsourcing data protection services, the DPO initiated the technical content and coordinated contributions from nine JUs to the interinstitutional call for tenders for the provision of legal and operational support in the field of data protection, as reported in Section 2.2.1.



2.3 Budgetary and financial management

On 15 December 2022, the GB adopted the 2023 budget through Decision GB(D)21-2022.

The first amending budget of 2023⁽¹⁶⁾ consisted mainly in the inscription of payment appropriations amounting to EUR 84 276 225 in Title 2 and Title 4. This occurred through the reinscription and transfer of unused appropriations (as recorded at the 2022 year-end accounts' closure) to ensure the payment of commitments carried over from 2022 to 2023 and the payment of the first pre-financing payments under the ER1 and IR1 calls.

The second amending budget of 2023⁽¹⁷⁾, consisting in an increase of EUR 3 571 500 in commitment appropriations and EUR 15 260 192 in payment appropriations, was necessary to reflect the final budget of the IR1 call

(EUR 181 345 600) following the selection of two additional proposals from its reserve list. It also authorised the inscription of payment appropriations amounting to EUR 8 893 813 from the European Commission to allow the closure of the SESAR 2020 programme. Lastly, it included an additional cash contribution of EUR 3 571 500 to Horizon's Europe's running costs requested from EUROCONTROL.

The third amending budget of 2023⁽¹⁸⁾ included an additional cash contribution of EUR 1 000 000 to Horizon Europe's running costs provided by EUROCONTROL. This amendment established the final 2023 budget of EUR 137 583 861 in commitment appropriations and EUR 238 120 278 in payment appropriations.



⁽¹⁶⁾ Decision GB(D)05-2023 of 2 June 2023.

⁽¹⁷⁾ Decision GB(D)12-2023 of 3 October 2023.

⁽¹⁸⁾ Decision GB(D)19-2023 of 14 December 2023.

TABLE 18: STATEMENT OF REVENUE FOR 2023

Statement of revenue: Heading	Initial 2023 budget		Amended 2023 budget	
	Commitment appropriations (EUR)	Payment appropriations (EUR)	Commitment appropriations (EUR)	Payment appropriations (EUR)
EU contribution excluding EFTA	86 511 174	88 246 348	86 511 174	97 140 221
of which administrative	3 545 534	7 118 152	3 648 000	7 220 678
of which operational	82 965 640	81 128 196	82 863 174	89 919 543
Third countries contribution including EFTA	2 500 171	2 478 276	2 500 173	2 478 275
of which administrative	102 466	189 995	0	87 529
of which administrative third countries excluding EFTA	0	0	0	0
of which operational	2 397 705	2 288 281	2 500 173	2 390 746
Industry financial contribution	4 226 324	4 226 324	8 797 825	9 616 163
of which administrative	4 226 324	4 226 324	8 797 825	9 616 163
of which operational	0	0	0	0
Other revenue	0	0	0	218 165¹⁹
SUB-TOTAL REVENUES	93 237 669	94 950 948	97 809 172	109 452 824
Reactivation of unused appropriations from administrative expenditure	5 160 147	1 500 000	5 160 145	3 250 000²⁰
of which from 2020	0	0	0	0
of which from 2021	0	0	0	0
of which from 2022	5 160 147	1 500 000	5 160 145	3 250 000
Reactivation of unused appropriations from operational expenditure	0	41 132 914	0	125 417 454
of which from 2020	0	21 132 914	0	19 871 932
of which from 2021	0	0	0	0
of which from 2022	0	20 000 000	0	105 545 522
TOTAL	98 397 817	137 583 861	102 969 317	238 120 278

EFTA, European Free Trade Association.

NB: Totals may differ by EUR 1 because of rounding.

⁽¹⁹⁾ Revenue mainly from ex-post audits adjustments.

⁽²⁰⁾ CEF funds EUR 1 750 000 included (received in 2022).

In terms of revenue, EUR 99.6 million was received from the EU to cover the SESAR 3 JU's outstanding operational obligations of 2023, and EUR 3.7 million from Horizon 2020 funds and EUR 3.6 million from Horizon Europe funds to cover the running costs. The EU contribution towards operational costs was composed of EUR 22.01 million (European Free Trade Association (EFTA) included) for Horizon 2020 and EUR 70.3 million (EFTA included) for Horizon Europe.

A total of EUR 6.4 million was received from EUROCONTROL (EUR 0.3 million under Horizon 2020 and EUR 6.1 million under Horizon Europe). The other members contributed EUR 3.2 million to the Horizon 2020 running costs.

The SESAR 3 JU also recovered exceptional revenues totalling EUR 1.6 million, which were mainly composed of:

- ▶ amounts from Horizon 2020 projects after audit corrections and reimbursement of the pre-financing by the Mutual Insurance Mechanism (guarantee fund) for Horizon 2020 projects after their final closure, totalling EUR 1.3 million;
- ▶ reimbursement of minor administrative costs, mostly linked to salary balances and reimbursement from suppliers, totalling EUR 0.3 million.

TABLE 19A: STATEMENT OF EXPENDITURE FOR 2023 – COMMITMENT APPROPRIATIONS

Statement of Expenditure (Commitment appropriations)	Initial 2023 budget (EUR)	Amended 2023 budget with transfers (EUR)	Executed 2023 budget (EUR)	Executed / amended (%)	Carried over to 2024 ⁽²¹⁾ (EUR)	Available for future use (N + 3 rule) ⁽²²⁾ (EUR)
Title 1 – Staff expenditure	6 295 604	6 295 604	5 877 272	93	135 101	628 838
Salaries and allowances	5 874 942	5 874 942	5 504 139	94	69 376	564 796
of which establishment plan posts	5 250 000	5 250 000	5 073 002	97	0	370 688
of which external personnel	624 942	624 942	431 137	69	69 376	194 108
Expenditure relating to staff recruitment	6 600	6 600	6 600	100	6 360	0
Mission expenses	230 000	230 000	230 000	100	51 974	16 321
Socio-medical infrastructure (including training)	0	0	0	0	0	0
Training	48 812	48 812	20 000	41	6 191	28 812

⁽²¹⁾ It is to be noted that the amounts reported in the column "Carried over to 2024" are remaining open amounts on 31 December 2023, from commitments in 2023 as well as from previous years.

⁽²²⁾ The column "Available for future use" reports on unused budget on 31 December 2023 that will be available for re-inscription up to "following three financial years" in accordance with Article 6.5 of SESAR 3 JU Financial rules.

Statement of Expenditure (Commitment appropriations)	Initial 2023 budget (EUR)	Amended 2023 budget with transfers (EUR)	Executed 2023 budget (EUR)	Executed / amended (%)	Carried over to 2024 ⁽²¹⁾ (EUR)	Available for future use (N + 3 rule) ⁽²²⁾ (EUR)
External services	82 250	97 208	97 208	100	0	0
Receptions, events and representation	0	0	0	0	0	0
Other staff-related expenditure	53 000	38 042	19 325	51	1 200	18 897
Title 2 – Infrastructure and operating expenditure	4 862 791	4 862 791	4 530 983	93	2 479 023	385 066
Rental of buildings and associated costs	2 014 967	2 025 967	2 025 765	100	207 808	41 836
Information and communications technology and data processing	1 862 024	1 862 024	1 762 825	95	1 920 091	101 402
Movable property and associated costs	5 000	12 000	5 000	42	5 000	7 000
Current administrative expenditure	456 600	390 193	164 786	42	51 544	230 847
Postage/ telecommunications	0	0	0	0	0	0
Expenditure on formal meetings	30 000	54 000	54 000	100	25 000	3 152
External communication, information and publishing	494 200	518 607	518 607	100	269 651	829
Title 3 – Operational expenditure on SESAR 2020	0	0	5 980 859 ⁽²³⁾	93	36 753 943	574 054
Previous years' calls / other funded actions	0	0	5 980 859	93	36 753 943	574 054
Title 4 – Operational expenditure on DES and SESAR 3 operations	85 363 346	85 363 346	85 363 346	100	55 141 716	1 437 686
Current year's calls / other funded actions	85 363 346	85 363 346	85 363 346	100	55 141 716	1 437 686

⁽²³⁾ This amount is composed of EUR 4 828 445 re-activated from assigned revenue already committed in 2021. The remaining amount was used to cover payment for a secondment, experts for Horizon 2020 closing grants, and the event for the closure of Horizon 2020 programme.

Statement of Expenditure (Commitment appropriations)	Initial 2023 budget (EUR)	Amended 2023 budget with transfers (EUR)	Executed 2023 budget (EUR)	Executed / amended (%)	Carried over to 2024 ⁽²¹⁾ (EUR)	Available for future use (N + 3 rule) ⁽²²⁾ (EUR)
Title 5 – Unused appropriations not required in current year ⁽²⁴⁾	1 876 076	6 447 576	0	0	0	8 197 577
TOTAL	98 397 817	102 969 317	101 752 460	92	94 509 784	11 223 220

TABLE 19B: STATEMENT OF EXPENDITURE FOR 2023 – PAYMENT APPROPRIATIONS

Statement of Expenditure (Payment appropriations)	Initial 2023 budget (EUR)	Amended 2023 budget with transfers (EUR)	Executed 2023 budget (EUR)	Executed / amended (%)	Carried over to 2024 (EUR)	Available for future use (N + 3 rule) (EUR)
Title 1 – Staff expenditure	6 495 604	6 835 090	5 871 152	86	0	963 939
Salaries and allowances	6 074 942	6 353 905	5 519 733	87	0	834 172
of which establishment plan posts	5 450 000	5 643 689	5 073 002	90	0	570 688
of which external personnel	624 942	710 216	446 732	63	0	263 484
Expenditure relating to staff recruitment	6 600	7 203	832	12	0	6 371
Mission expenses	230 000	287 7400	219 444	76	0	68 296
Socio-medical infrastructure (including training)	0	0		0	0	0
Training	48 8412	48 812	13 809	28	0	35 003
External services	82 250	99 208	99 208	100	0	0
Receptions, events and representation	0	0	0	0	0	0
Other staff-related expenditure	53 000	38 222	18 125	47	0	20 097
Title 2 – Infrastructure and operating expenditure	4 862 791	6 317 321	3 458 624	55	0	2 864 089
Rental of buildings and associated costs	2 014 967	2 118 815	1 881 502	89	0	238 644

⁽²⁴⁾ Title 5 is intended for gathering unused appropriations from previous years that can be reused in subsequent years (N + 3 rule). Therefore, there is no consumption during the year, in both commitment and payment appropriations.

Statement of Expenditure (Payment appropriations)	Initial 2023 budget (EUR)	Amended 2023 budget with transfers (EUR)	Executed 2023 budget (EUR)	Executed / amended (%)	Carried over to 2024 (EUR)	Available for future use (N + 3 rule) (EUR)
Information and communications technology and data processing	1 862 024	2 793 201	771 708	28	0	2 021 494
Movable property and associated costs	5 000	5 000	0	0	0	5 000
Current administrative expenditure	456 600	475 107	131 870	28	0	347 298
Postage/ telecommunications	0	0	0	0	0	0
Expenditure on formal meetings	30 000	36 023	30 443	85	0	5 580
External communication, information and publishing	494 200	889 174	643 102	72	0	246 073
Title 3 – Operational expenditure on SESAR 2020	50 469 584	41 221 512	30 017 593	70	0	12 814 619
Previous years' calls / other funded actions	50 469 584	41 221 512	30 017 593	70	0	12 814 619
Title 4 – Operational expenditure on DES and SESAR 3 operations	70 301 865	158 872 504	157 195 560	99	0	1 676 943
Current year's calls / other funded actions	70 301 865	158 872 504	157 195 560	99	0	1 676 943
Title 5 – Unused appropriations not required in current year ⁽²⁵⁾	5 454 017	24 873 852	0	0	0	26 623 852
TOTAL	137 583 861	238 120 278	196 542 929	81	0	44 943 442

Overall, in 2023, budget execution of commitment and payment appropriations reached 87 % and 81 % respectively. It should be noted that the execution in payments stems mainly from operational expenditure in Title 3 and Title 4. The last SESAR 2020 projects affected by the COVID-19 crisis, which were extended by 3 or 6 months, had their final payments postponed to 2023. Nevertheless, at the end of 2023, five projects were still not financially finalised and paid.

Concerning the DES programme, the late adoption of the SBA (on 19 November 2021) led to a subsequent delay in the adoption by the GB of the SESAR 3 JU's first BAWP. This delay, in turn, caused a postponement to the start of the first

call for proposals and projects. Consequently, the pre-financing payments of the first DES projects, initially planned for 2022, were entirely paid in 2023 (totalling EUR 153.6 million), resulting in 99 % payment appropriations consumed.

For Title 1 (staff expenditure) and Title 2 (infrastructure and operating expenditure) the implementation rates for commitments are 93 % for both titles, and for payment appropriations 86 % and 55 % respectively. The unspent amounts related to temporary staff, missions, training, recruitment expenditures, social and recreational activities, human resources support fees, IT services and charges for the building, among others, were carried forward to the next year.

The low implementation rate of payment for Title 2 is mainly due to expenditure incurred in 2023 (mainly IT services delivered by EUROCONTROL) for which the related invoices will be received in 2024, totalling an estimated EUR 2.5 million.

The 2023 payments executed for Horizon 2020 and Horizon Europe Programmes (EUR 187.2 million) are distributed as follows:

- ▶ EUR 28.9 million final payments for wave 2, wave 3, second VLD projects and ER4 (Horizon 2020);

- ▶ EUR 8.9 million for pre-financing under ER1 (Horizon Europe);
- ▶ EUR 144.6 million for pre-financing under IR1 (Horizon Europe);
- ▶ EUR 4.8 million of other operational activities (Horizon 2020 and Horizon Europe).

The unused payment appropriations will be reinscribed in 2024.

2.4 Financial and in-kind contributions from members other than the European Union

TABLE 20: CONTRIBUTIONS TO HORIZON 2020 FROM MEMBERS OTHER THAN THE EU, 2023

Nature	Amount
Financial contributions reported	EUR 3 591 195
IKOP reported	EUR 105 142 308
IKAA reported	N/A
IKAA reported and certified	N/A
TOTAL all contributions reported	EUR 108 733 503
TOTAL all contributions reported, including certified IKAA	N/A

NB: IKOP, in-kind contributions to operational activities; IKAA, in-kind contributions to additional activities.

N/A, not applicable.

TABLE 21: CONTRIBUTIONS TO HORIZON EUROPE FROM MEMBERS OTHER THAN THE EU, 2023

Nature	Amount
Financial contributions reported	EUR 6 071 500
IKOP reported	N/A ^(a)
IKAA reported	EUR 90 338 800
IKAA reported and certified	EUR 30 615 000
TOTAL all contributions reported	EUR 96 410 300
TOTAL all contributions reported, and certified IKAA	EUR 36 686 500

NB: IKOP, in-kind contributions to operational activities; IKAA, in-kind contributions to additional activities.

N/A, not applicable.

^(a) Not available in 2023, as there is no financial reporting on the costs incurred in 2023 yet.

TABLE 22: IN-KIND CONTRIBUTIONS TO OPERATIONAL ACTIVITIES (IKOP) FROM THE SESAR 2020 MEMBERS OTHER THAN THE EU (VALIDATED, CERTIFIED AND STILL TO BE VALIDATED) (EUR)

Member	Total amount committed for SESAR 2020 programme following membership agreement	Amount validated before 2023	Total amount related to 2022 and 2023 to be validated in 2024	Total amount of IKOP
Airbus	25 093 735	25 175 059	4 437 402	29 612 461
AT-One	11 867 806	10 911 454	5 141 917	16 053 371
B4	1 985 379	1 620 203	376 424	1 996 627
Coopans	8 676 061	5 409 365	1 344 768	6 754 133
Dassault	1 806 681	1 564 301	534 020	2 098 321
DFS	7 810 987	10 195 638	1 281 050	11 476 688
DSNA	9 190 202	7 758 567	1 512 441	9 271 008
Enaire	15 617 352	11 617 116	2 279 101	13 896 217
ENAV	7 499 310	6 058 849	1 553 242	7 612 091
EUROCONTROL	433 418 444	274 058 684	51 849 812	325 908 496
Frequentis	6 410 132	4 517 054	1 013 138	5 530 192
Honeywell	14 546 257	11 365 417	2 576 684	13 942 101
Indra	19 878 000	18 047 157	2 909 295	20 956 452
Leonardo	45 835 829	31 606 351	6 194 928	37 801 279
NATMIG	9 960 423	9 092 119	3 315 527	12 407 646
NATS	8 708 327	8 161 912	3 294 735	11 456 647
SEAC2020	2 351 979	1 512 621	355 556	1 868 177
Skyguide	1 373 305	1 210 341	402 952	1 613 293
Thales AVS	32 713 185	32 115 192	5 453 724	37 568 916
Thales LAS	48 700 000	35 839 866	9 310 944	45 150 810
Total	713 443 394	507 837 266	105 137 660	612 974 926

TABLE 23: VALUES OF CERTIFIED IKAA – EVOLUTION SINCE 2021 (EUR)

Year	Amount of certified IKAA
2021	N/A
2022	14 706 000
2023	30 615 000
TOTAL since 2021	45 321 000

2.5 Corporate programming and reporting

2.5.1 Corporate programming

On 17 March 2022, the GB adopted the 2022–2023 BAWP ⁽²⁵⁾. This BAWP was amended three times in 2022 and four times in 2023. The 2023 amendments related to the following factors:

- ▶ the reinscription of unused appropriations from previous years into the 2023 budget and the correction of the contribution from EUROCONTROL to the Horizon Europe programme (fourth amendment) ⁽²⁶⁾;
- ▶ the final figures and information on the way forward with the reserve lists of the ER1 and IR1 calls, the content description of the ER2 call with an increase of its indicative budget, the reference to the provision of expertise to CINEA for the technical specifications of the third CEF call (DSD2) and the reference to the EU-Rail–SESAR synergy call (fifth amendment) ⁽²⁷⁾;
- ▶ the top-up of the IR1 call budget (to allow the funding of two additional proposals), the inscription of payment appropriations for the closure of the SESAR 2020 programme and an additional cash contribution by EUROCONTROL (sixth amendment) ⁽²⁸⁾;
- ▶ the update of the budget to include an additional cash contribution from EUROCONTROL (seventh amendment) ⁽²⁹⁾.

2.5.2 Corporate reporting

In 2023, the SESAR 3 JU released its 2022 CAAR, which the GB approved at its meeting on 26 June 2023 ⁽³⁰⁾. Throughout the reporting period, the SESAR 3 JU regularly monitored and assessed, on a quarterly basis, progress on achieving the 2023 objectives as defined in the 2022–2023 BAWP.

During the reporting period, the SESAR 3 JU also prepared and submitted implementation reports for 2022 in response to two delegation agreements signed with the European Commission, namely on CEF U-space demonstrations and on geofencing demonstrations ⁽³¹⁾. The JU made no payments relating to those projects in 2023; therefore, the reports cover only the audit activities performed during the reporting period.

The SESAR 3 JU provided inputs to the European Commission in the framework of the 2024 BMR on partnerships in Horizon Europe. The 2024 BMR, which builds on the 2022 BMR, aims to monitor the progress of all partnerships, including the SESAR 3 JU, in relation to EU policy objectives using a set of common and individual indicators. It will also include a focus on two cross-cutting themes: technological sovereignty and international positioning.

In December 2022, the GB adopted an action paper proposing a simplified and strengthened Master- Planning approach. The strengthened approach envisages yearly monitoring of the development and deployment activities at the strategic level to show progress towards the DES vision. In this context, at the end of 2023, the SESAR 3 JU presented to the GB the 2023 strategic development monitoring report and the 2023 strategic deployment monitoring report. These reports present the progress of SESAR 3 JU development and deployment activities with regard to achieving the performance ambitions and vision of the 2020 European ATM Master Plan. The report on development considered activities up to the completion of the SESAR 2020 programme, while the report on deployment covered the activities up to the end of 2022. These reports were first attempts to stimulate feedback from the GB on the type of information that could be provided on the status of the development and deployment activities that will be delivered from 2024 with the adoption of the new European ATM Master Plan.

⁽²⁵⁾ Decision GB(D)03-2022 on the adoption of the 2022–2023 SESAR 3 JU BAWP.

⁽²⁶⁾ Decision GB(D)05-2023 on the adoption of the fourth amended version of the 2022–2023 SESAR 3 JU BAWP.

⁽²⁷⁾ Decision GB(D)07-2023 on the adoption of the fifth amended version of the 2022–2023 SESAR 3 JU BAWP.

⁽²⁸⁾ Decision GB(D)12-2023 on the adoption of the sixth amended version of the 2022–2023 SESAR 3 JU BAWP.

⁽²⁹⁾ Decision GB(D)19-2023 on the adoption of the seventh amended version of the 2022–2023 SESAR 3 JU BAWP.

⁽³⁰⁾ Decision GB(D)06-2023 approving the consolidated annual activity report for the year 2022.

⁽³¹⁾ EC / SESAR JU delegation agreement (reference: MOVE/E3/DA/2016-669/SI2.743803) signed on 6 December 2016, with a delegated budget of EUR 500 000 in assigned revenue to organise a call for proposals for geofencing demonstrations; and EC / SESAR JU delegation agreement (reference: MOVE/E3/DA/2017-564/si2.771010) signed on 13 December 2016, with a delegated budget of EUR 10 million in assigned revenue from CEF funds to organise a call for proposals on U-space demonstrations.

2.6 Administrative procurement and contracts

TABLE 24: ADMINISTRATIVE PROCUREMENT AND CONTRACTS IN 2023

Subject of the contract	Type of contract	Contractor	Procurement procedure (if applicable)	Signature date	Amount (EUR)
Running of complete staff engagement survey for an agency with 100 or fewer staff members	Specific	PwC EU Services EESV	Interinstitutional framework contract	2 August 2023	10 000
Provision of event support to the SESAR 3 JU for 2023 SESAR Innovation Days and 2024 event strategy	Specific	TMAB Business Events Public Limited Liability Company (NV-SA)	Interinstitutional framework contract	3 August 2023	92 968
Provision of reception front- and back-office services	Framework	Réceptel/Armonia	Open call	1 December 2023	Max. 610 000
Provision of reception front- and back-office services	Specific	Réceptel/Armonia	Framework contract	29 November 2023	78 000
Provision of strategy, editorial, media, press and publications	Specific	EU TURN SPRL	Interinstitutional framework contract	5 October 2023	54 807
Provision of cyber and information security services	Framework	Deloitte Consulting & Advisory BV/SRL	Open call	11 September 2023	Max. 460 000
Provision of information and communications technology coordination services	Direct	MG Management Consulting Sprl	Open call	19 September 2023	925 200
Network and Telecommunication Services (incl. voice over IP)	Specific	Proximus SA	Interinstitutional framework contract	19 October 2023	Max. 73 699.20
Joint review of the Benchmarked Staff Engagement Survey	Specific	PwC EU Services EESV	Interinstitutional framework contract	2 August 2023	10 000
Team-building dinner	Purchase order	Strofilia	Low-value contract	21 November 2023	7 200
Renewal of Adobe licences	Specific	Bechtle Brussels NV/SA	Interinstitutional framework contract	21 November 2023	10 228
Technical assistance in the field of audits and controls	Amendment to specific contract	Baker Tilly BV	Interinstitutional framework contract	6 December 2023	7 413

Subject of the contract	Type of contract	Contractor	Procurement procedure (if applicable)	Signature date	Amount (EUR)
Renewal of TESTA-NG II (Ext. FWC DI/07820 SC 151) for 1 January 2024 to 17 December 2024	Direct	Deutsche Telekom	Interinstitutional framework contract	18 December 2023	25 420
Provision of event support to the SESAR 3 JU for Airspace World 2024	Specific	TMAB Business Events Public Limited Liability Company (NV-SA)	Interinstitutional framework contract	22 December 2023	45 177
Organisation of and participation in the Transport Research Arena conference held in Dublin	Service-level agreement	Clean Aviation JU, EU-Rail JU, Clean Hydrogen JU	Interinstitutional procedure	21 December 2023	50 000
Provision of training services in the field of leadership and management skills development for the staff of the European institutions, offices, other bodies and EU agencies	Memorandum of understanding	European School of Administration	Interinstitutional procedure	3 April 2023	N/A
Fixed telephony	Specific	Proximus PLC and Post Telecom S.A.	Interinstitutional framework contract	19 October 2023	Max. 73 699.20
Consultancy services for those dealing with human resources in the EU institutions, agencies and other bodies	Memorandum of understanding	European Commission (DG Human Resources and Security)	N/A	6 September 2023	N/A
Services rendered to the SESAR 3 JU (staff matters)	Memorandum of understanding	European Commission (DG Human Resources and Security)	Interinstitutional framework contract	30 November 2023	N/A
Provision of temporary workers, 2024–2028	Memorandum of understanding	European Commission (DG Human Resources and Security)	Interinstitutional framework contract	21 December 2023	N/A
Events management services as from 2025	Memorandum of understanding	European Commission (DG Research and Innovation)	Interinstitutional framework contract	29 September 2023	N/A
Training on corporate finance and accounting IT	Memorandum of understanding	European Commission (DG Budget)	Interinstitutional framework contract	28 September 2023	N/A

Subject of the contract	Type of contract	Contractor	Procurement procedure (if applicable)	Signature date	Amount (EUR)
Travel agency services (2 lots)	Power of attorney	European Commission (DG Human Resources and Security)	Interinstitutional framework contract	22 March 2023	N/A
Learning and development services for staff of the institutions, bodies and agencies of the EU	Memorandum of understanding	European Commission (DG Human Resources and Security)	Interinstitutional framework contract	23 November 2023	N/A
Provision of event support / Airspace World 2023 and 2023 SESAR Innovation Days	Specific	TMAB Business Events Public Limited Liability Company (NV-SA)	Interinstitutional framework contract	27 January 2023	125 053
Indexation and change of structure	Amendment	Receptel nv/sa	Direct service contract	15 February 2023	6 000
Provision of event support to the SESAR 3 JU for Amsterdam Drone Week 2023	Specific	TMAB Business Events Public Limited Liability Company (NV-SA)	Interinstitutional framework contract	23 February 2023	17 875
Provision of web services from Q2 2023 to Q1 2024	Interinstitutional procedure	ESN	Specific contract	20 March 2023	129 855
Graphic design support to develop and produce visual elements for its website, printed material and events	Specific	EU TURN SPRL	Interinstitutional framework contract	17 April 2023	44 935
PC meetings, 14 and 15 June 2023	Purchase order	Van der Valk hotel Brussels Airport	Low-value contract	30 March 2023	6 686
Trans European Services for Telematics between Administrations	Specific	Deutsche Telekom Business Solutions GmbH	Interinstitutional framework contract	14 June 2023	13 207
Provision of digital communication services for upcoming SESAR 3 JU events and communication campaigns	Specific	ESN	Interinstitutional framework contract	17 May 2023	80 526
Provision of event support to the SESAR 3 JU	Specific	TMAB Business Events Public Limited Liability Company (NV-SA)	Interinstitutional framework contract	6 June 2023	51 843

Subject of the contract	Type of contract	Contractor	Procurement procedure (if applicable)	Signature date	Amount (EUR)
Provision of event support to the SESAR 3 JU 2023 Annual Conference	Specific	TMAB Business Events Public Limited Liability Company (NV-SA)	Interinstitutional framework contract	23 June 2023	87 043
Catering and rental of venue for Communications Coordination Group meeting on 11 October 2023	Purchase order	Brussels Airport Hotel NV Sheraton Brussels Airport Hotel Brussels National Airport	Low-value contract	28 July 2023	3 337
Graphic design support to develop and produce visual elements for its website, printed material and events	Specific	EU TURN SPRL	Interinstitutional framework contract	17 April 2023	54 560
Dinner at German Aerospace Center, 25 October 2023	Purchase order	German Aerospace Center / Fleischreich Goethes GmbH	Low-value contract	18 October 2023	2 548
Max. total for 2023					2 087 279.20^(a)

DG, Directorate-General.

^(a) A framework contract is implemented through specific contracts. Framework contracts do not result in a charge to the SESAR 3 JU budget; only the specific contracts issued under framework contracts represent a charge to the SESAR 3 JU budget. The total therefore does not include the value of framework contracts.



2.7 Information technology and logistics

2.7.1 Information and communications technology management

The SESAR 3 JU relied on two main providers of operational information and communications technology (ICT) services in 2023: EUROCONTROL, which delivered most of the services under a signed agreement, and the European Commission, with the JU using framework contracts established by the Directorate-General (DG) for Digital Services and managing them directly for some ICT services.

Among the major ICT developments in 2023, the following can be highlighted.

- ▶ The SESAR 3 JU clients, servers, ICT infrastructure and Trans European Services for Telematics between Administrations environment were successfully relocated to the new premises at EUROCONTROL Headquarters, ensuring the continuity of business during the transition period.
- ▶ Several projects were initiated to transform the JU into a more digital organisation. Notable achievements include deploying qualified electronic signatures, enhancing security with Defender for Office 365 and Defender for Servers, rolling out Microsoft 365 applications, creating a hybrid active directory, and purchasing and installing integrated audiovisual equipment for the meeting rooms (to be completed in 2024). Preparatory work for future projects has also commenced, such as deploying Defender for Endpoint and replacing Vasco tokens with the Microsoft multifactor authentication application.
- ▶ The SESAR 3 JU also leveraged synergies from the use of the European Commission's ICT

systems and services. The ICT systems supplied by the Commission are related in particular to:

- ▶ financial management and accounting (ABAC, but also Speedwell and Bluebell, which were implemented in 2023);
- ▶ human resources management (Sysper Job Information System module, DOC Engine module);
- ▶ the management of Horizon Europe calls for proposals and grants (SyGMA-Compass);
- ▶ procurement (e-procurement, but also the public procurement management tool, which was implemented in 2023);
- ▶ mission management (MIPS+ implemented in June 2023).
- ▶ Significant progress was achieved towards shaping and enacting the governance of the administrative agreement with EUROCONTROL in relation to IT services. This encompassed the development and introduction of new workflows and templates for service requests, offers, and orders, and is slated for completion in 2024⁽³²⁾.

The JU also contracted an external service provider of ICT coordination services to act as the focal point for users and to integrate all services into one coherent system. This provider managed cost claims for the SESAR 3 JU from EUROCONTROL and the European Commission, ensuring compliance with budget planning and maintaining sound financial management principles.

2.7.2 Facilities management

The physical move to the new premises, located in the EUROCONTROL Headquarters in Haren, finally took place during the second and third weeks of February 2023. The facilities team ensured that the relocation process was executed seamlessly, allowing the JU to resume operations swiftly and effectively in its new surroundings.

Activities linked to the change of premises required frequent negotiations with the landlord of the Cortenbergh offices, with EUROCONTROL, with insurance brokers, with the suppliers of services in Cortenbergh premises and with other JUs, among others. These activities resulted in:

- ▶ the termination of the Cortenbergh offices' rental contract and the updating of the 2023 budget to accommodate the resulting final payments;
- ▶ the termination of several facility-related contracts (e.g. cleaning or security) and the modification of others;
- ▶ the achievement of a successful result of the audit by the Office for Infrastructure and Logistics in Brussels;
- ▶ the finalisation of the SESAR 3 JU's modified physical security policy and the authorisation to proceed by the DG Human Resources and Security of the Commission.

⁽³²⁾ The delay in finalising the new workflow with EUROCONTROL necessitated the adoption of an exception report for ICT service provision by EUROCONTROL in 2024.

A new reception and back-office reception services framework contract was concluded on 22 September 2023. As a result, a specific

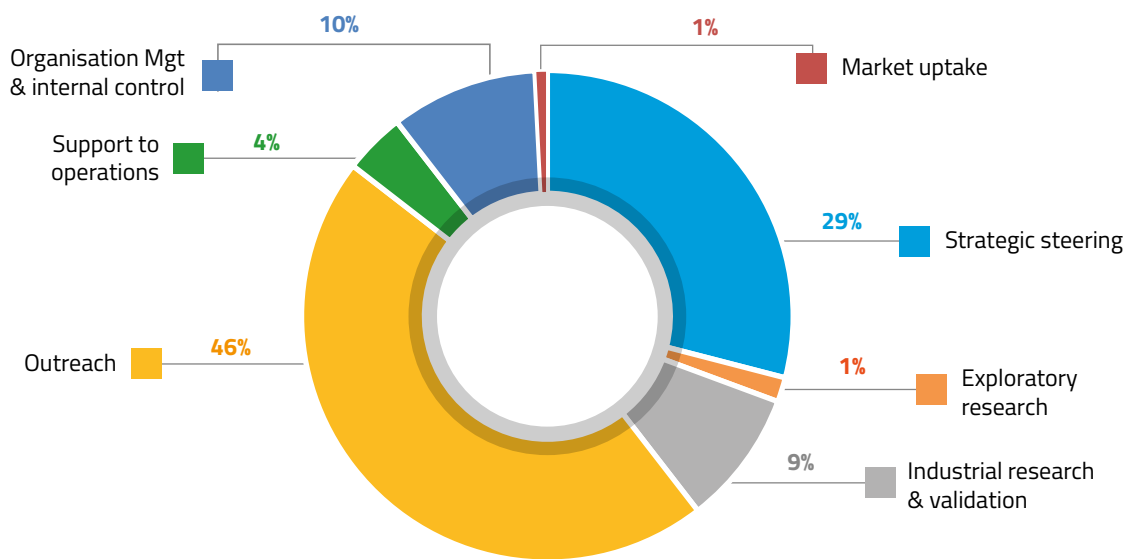
contract was signed on 30 November 2023 for the duration of a year. The facility team manages this contract from an operational perspective.

2.7.3 Travel coordination

In 2023, 124 missions took place, compared with 113 missions in 2022 (not including missions related to the activities managed by the Programme Management Unit under the SESAR 3 JU–EUROCONTROL agreement). Of the

124 missions carried out in 2023, 57 were related to SESAR 3 JU outreach (46 %) and 36 to strategic steering (29 %). Figure 3 shows the percentage for each area of activities.

FIGURE 3: MISSIONS BY AREA OF ACTIVITIES, 2023



During 2023, the SESAR 3 JU successfully onboarded MIPS+, the European Commission’s corporate IT tool for managing missions in a more efficient and cost-effective way.

2.8 Human resources

2.8.1 Human resources management



The SESAR 3 JU's approved 2023 staff establishment plan includes 37 temporary agents, one contract agent and two seconded national experts. The authorised staff establishment plan and its implementation are presented in Annex 2. The effective allocation of staff remained a priority for the SESAR 3 JU during 2023.

In 2023, efforts focused on the professional and career development of the SESAR 3 JU staff, in addition to ensuring that allocated human resources were used in the most optimal, cost-efficient and effective way.

The SESAR 3 JU conducted its appraisal exercise in accordance with the implementing rules. The reclassification exercise that was conducted resulted in seven temporary agents being reclassified.

In 2023, the SESAR 3 JU recruited a senior corporate services officer in March and a planning and reporting officer in October, through external selection processes.

The vacancy rate at the end of 2023 was 5.4 %, corresponding to two open positions⁽³³⁾: grant management assistant and grant manager. The first position was filled on 1 January 2024 and the second was published in early 2024, with the recruitment procedure finalised in March.

During 2023, the Sysper2 metrics and reporting

module and probation reports module were implemented.

Regarding gender and geographical balance, the SESAR 3 JU remained committed to ensuring that its overall balance remains stable. At the end of 2023, 54 % of the 37 active staff were female and 46 % were male, with 12 nationalities represented (Figure 4).

During 2023, the Programme Office was reorganised to reinforce its efficiency. In March, the GB adopted the new organisational structure proposed by its Executive Director⁽³⁴⁾. The new structure was implemented on 1 July 2023. The Programme Office now consists of two Units: the Unit "Technology & Strategy" aligns the activities deriving from the programme and the Master Plan, while the Unit "Resources" combines financial and budget services with administration affairs. In addition, the EUROCONTROL Unit deals with programme delivery, and another team works on External Affairs & Communication.

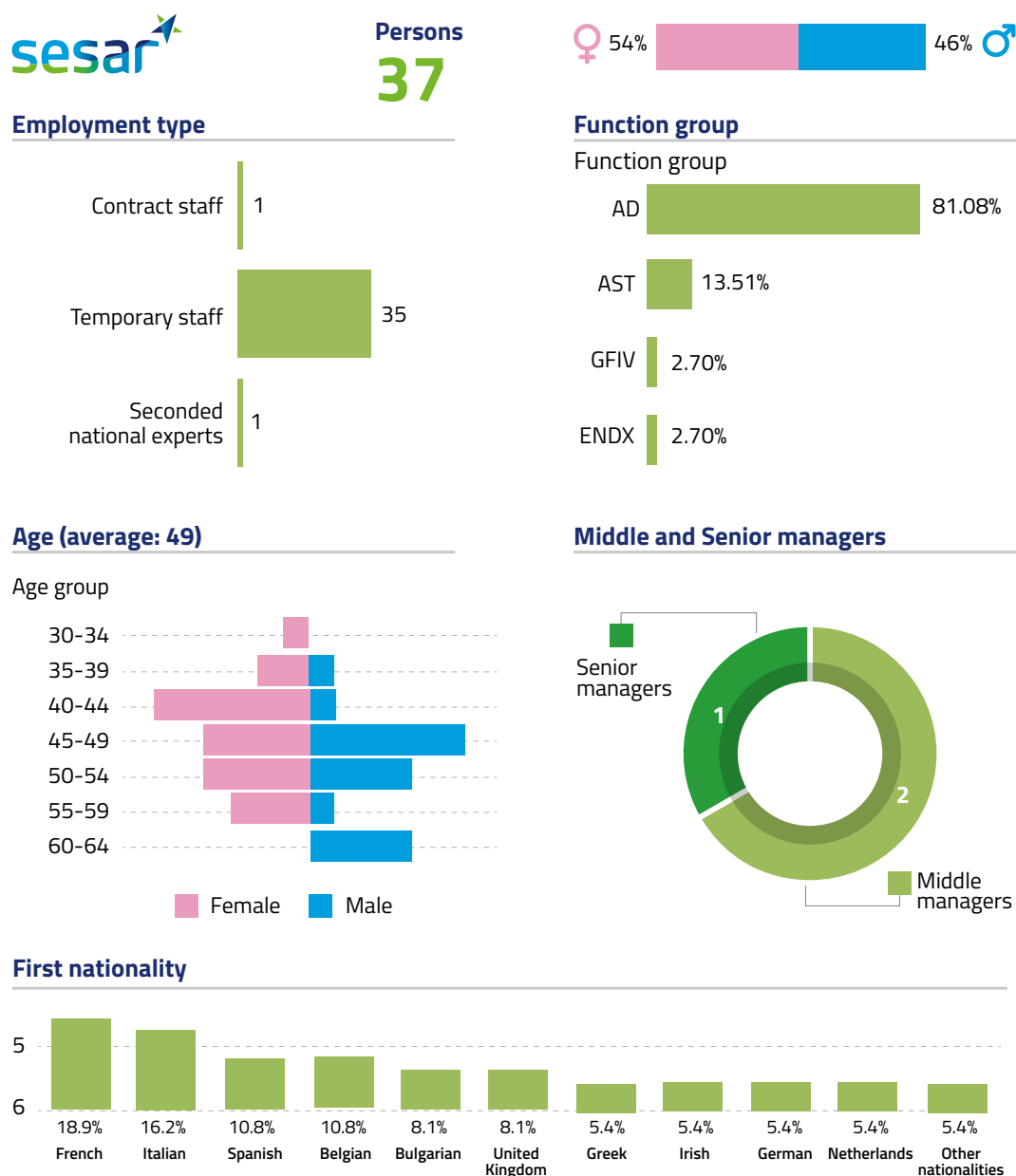
The biannual staff survey launched in September resulted in a high participation rate and overall very positive outcomes. The results of the survey were presented to the staff by the Executive Director in November, and the preparation of a follow-up plan has been launched.

Finally, the JUs' network of confidential counsellors has increased from 2 to 4 appointed counsellors.

⁽³³⁾ It should be noted that, as the SESAR 3 JU staff establishment plan has only 37 temporary agent positions, each temporary staff departure increases the relevant vacancy rate by 2.7 percentage points.

⁽³⁴⁾ Decision GB(D)04-2023 on the organisational structure of the Programme Office.

FIGURE 4: STAFF ACTIVE ON 31 DECEMBER 2023 – STATISTICS



2.9 Efficiency gains and synergies

As per Article 13 of the SBA, the JUs implement back-office arrangements. Although exempted from this provision⁽³⁵⁾, the SESAR 3 JU capitalises on shared back-office services and is actively involved in the back-office arrangements in the fields of human resource, accounting and procurement support services.

In application of Articles 157(g) and 158 of the SBA, the SESAR 3 JU established an agreement with EUROCONTROL in 2022, which governs the provision of infrastructure and logistics support, ICT and other services to the JU. On this basis, the SESAR 3 JU has sought maximum synergies with EUROCONTROL regarding the services that the latter can make available in this framework.

⁽³⁵⁾ As per Article 158 of the SBA.



3 Governance

In 2023, the SESAR 3 JU met its objectives related to the governance of implemented programmes, as set out in the 2022–2023 BAWP. This includes the following achievements and results.

- ▶ Effective and efficient governance of the programmes implemented by the SESAR 3 JU was ensured through meetings and activities of the governing, advisory and scientific bodies of the JU. The advisory and scientific bodies

provided support to the GB and the Executive Director in steering the operational activities of the SESAR 3 JU by, among other things, contributing strategic document reviews and participating in evaluation activities.

As a result, all five target indicators for measuring progress for the governance section were fully met.

3.1 Major developments

In December 2023, the SESAR 3 JU published an open call for expressions of interest with a view to selecting associated members with the potential to contribute to the achievement of its objectives⁽³⁶⁾. The call was open to any public or private entity or body, including those from third

countries that are associated with the Horizon Europe programme and have concluded at least one agreement with the EU in the field of air transport. The deadline for application was on 19 January 2024. The GB may select associated members by the end of the second quarter of 2024.



⁽³⁶⁾ Based on Articles 6, 7 and 144 of the SBA.

3.2 Governing Board

The SESAR 3 JU GB met on three occasions in 2023 and adopted 20 decisions either in meetings (17) or by written procedures (3).

To ensure informed decisions and strategic steering of the partnership, the GB has been regularly updated by the representative of the European Commission on the latest policy development relevant for the JU, and by the representative of EUROCONTROL on the traffic situation and the network. In addition, reports have been provided by the SRG and SC Chairs on their activities, and the SESAR 3 JU reported regularly on the implementation of both the SESAR 2020 and DES programmes. This included information on the upcoming calls and calls results, grant agreement preparations, projects, as well as events and outreach activities.

The GB members engaged in fruitful discussions on the campaign to update the European ATM Master Plan, and adopted the successful criteria for it. In December, the GB was presented with the first editions of development and deployment monitoring reports, which are tools to supervise the implementation of the Master Plan and

provide evidence-based support for the strategic steering of the partnership.

In December, in the context of the UK's association to Horizon Europe, which took effect on 1st January 2024, all members other than the Union and EUROCONTROL committed collectively to increase their contribution by up to EUR 30 million, in case the Union would decide to increase its in cash contribution to the partnership.

In compliance with its legal obligations ⁽³⁷⁾, the SESAR 3 JU elaborated a phasing-out plan. The phasing out plan defines a strategic vision on the process leading to independence from Horizon Europe funding at the end of the current programme, and does not prejudice in any case the continuation of the SESAR 3 JU under any possible future arrangement. The GB adopted the proposed phasing-out plan in December ⁽³⁸⁾ and agreed to further discuss this topic in 2024.

Other decisions of note were to approve the updated SESAR 3 JU Organisation Chart and the SESAR 3 JU Anti-Fraud Strategy.

3.3 Executive Director

Since 1 July 2022, the Executive Director of the SESAR 3 JU has been Mr Andreas Boschen. He is the legal representative and the Chief Executive

for the day-to-day management of the JU, in accordance with the decisions of the GB, in line with Articles 19 and 152 of the SBA.



⁽³⁷⁾ Article 17.2(a1) and 19.4(v) of the SBA.

⁽³⁸⁾ Decision GB(D)16-2023 on Approving the SESAR 3 Joint Undertaking phase out plan from Horizon Europe funding.

3.4 States' Representatives Group

The States' Representatives Group (SRG) met twice in 2023. During the first meeting, the SRG expressed a positive opinion on the call content of the second call for ER (HORIZON-SESAR-2023-DES-ER-02) and continued to discuss how to capture information from across the Member States on activities at the national level that could have synergies with the activities of the SESAR 3 JU.

During its second meeting, the SRG expressed a positive opinion on the 2024–2025 BAWP and was informed about the campaign to update the European ATM Master Plan.

In accordance with Article 68(1) of the SBA, the SRGs of the SESAR 3 JU and of the Clean Aviation

JU met on 28 September 2023. Representatives from DG Research and Innovation and from the Joint Research Centre also attended. During the meeting, a round-table discussion aimed to brainstorm possible coordination ideas, exchange information on national and regional funding programmes, and identify synergies.

At the GB meeting in December 2023, the Vice-chair of the SRG presented a report on national and regional initiatives and synergies with SESAR. This report indicated that, by the end of 2023, 7 Member States out of 27 had responded to the related consultation carried out by the SRG Chair. The SRG Vice-chair proposed additional efforts to consolidate this information.

3.5 Scientific Committee

The Scientific Committee (SC) met four times in 2023. It was consulted and expressed a positive opinion on the technical specifications of the ER2 call and provided advice on both the 2022 CAAR and the 2024–2025 BAWP. Some members were involved in the selection of the Young Scientist Awards 2023.

The SC established two task forces: one dedicated to the issue of open data in ATM research, and the second on performance. They liaised with the transversal projects to follow up on the activities carried out by the SESAR 2020 SC.

Members of the SC contributed to the Master Plan Steering Group meetings held in 2023, to provide the scientific community's point of view.

Finally, in Q3 2023, the SC started a reflection on the future of ATM research beyond 2028, aiming to produce a White Paper by the end of 2024.

In December 2023, the GB decided to appoint Mr Andrew Cook as an additional member of the committee, as of 1 January 2024.

3.6 Programme Committee

3.6.1 SESAR 2020 Programme Committee

Since its establishment in November 2016, the SESAR 2020 Programme Committee has assisted the Executive Director in defining and implementing effective programme management through strategic guidance and tactical steering of the JU's work programme. Two meetings were held in 2023, addressing the following main areas.

- ▶ The SESAR 2020 programme delivery approach is based on the release process, which identifies, on a yearly basis, the solutions that will be delivered at a specific maturity level, and the planned VLDs. The Programme Committee supported the SESAR 3 JU in the context of Release 13, outlined in Section 1.2.3.3. More specifically, it approved the release 13 plan. Until the closure of SESAR 2020 (June 2023), the

Programme Committee regularly monitored the progress of the solutions. At the closure of SESAR 2020, the monitoring of Release 13 was transferred to the SESAR 3 Programme Committee.

- ▶ As a result of the simplification of the European ATM Master Plan process, a stronger alignment between development and deployment activities, including industrialisation, led to the drafting of the strategic development and deployment monitoring reports. The development monitoring report looks at the solutions from an R & I point of view (up to TRL6), while the deployment monitoring report measures the progress on industrialisation and implementation (as of TRL7). The SESAR 2020

Programme Committee was invited to discuss and review the strategic development monitoring report. Taking into account the committee's feedback, a revised version of the report was presented to the SESAR 3 JU GB in December 2023.

- ▶ At the last Programme Committee meeting, held in June 2023, an overview of the main achievements of SESAR 2020 was presented to the members. They took the opportunity to present their own achievements and to draw some key conclusions regarding the execution of the SESAR 2020 programme:
 - ▶ the SESAR 3 JU stands out as a unique organisation, with a high level of technical

expertise, instrumental in supporting European ATM and making it smarter and more sustainable;

- ▶ the partnership is essential for collaboration in ATM R & I activities;
- ▶ early involvement of EASA in projects would be beneficial;
- ▶ it is crucial to insert the main achievements that have reached the appropriate maturity level into the future deployment plans, in order to continue the research life cycle through industrialisation;
- ▶ the transition from industrial research to deployment should be more agile and faster than it is today.



3.6.2 SESAR 3 Programme Committee

The SESAR 3 JU Programme Committee was established in June 2022. Four meetings were held in 2023, addressing the following main areas.

- ▶ As a result of the transfer of responsibility from the SESAR 2020 Programme Committee, the SESAR 3 Programme Committee ensured the release 13 monitoring as of July 2023. Regular reports were tabled, leading to the outcomes described in Section 1.2.3.3. The SESAR 3 JU Programme Committee was also briefed about the progress of the DES programme. In particular, the members were informed about the status of the ER1, IR1 and DSD1a projects together with the launch into operation of the three DSD1b projects dealing with the increased automation and virtual centres solutions.
- ▶ In accordance with the consultation process described in Section 6 of the multiannual work programme, the SESAR 3 Programme Committee members had the opportunity to contribute to the ER2 call's technical specifications. Their input was discussed and considered in the final version of the call specifications, which were introduced in the fifth amended version of the 2022–2023 BAWP.
- ▶ Following a request by the SRG, the SESAR 3 JU assessed the coverage of the European ATM Master Plan phase C at the closure of the SESAR 2020 programme. The SESAR 3 Programme Committee was briefed about the results of the analysis, which showed that a large number of the remaining solutions were addressed in the DES IR1 call, while a few critical solutions will be considered as initial inputs to the campaign to update the European ATM Master Plan.
- ▶ The SESAR 3 Programme Committee was briefed on the planning for the preparation and development of the 2024 European ATM Master Plan. The members were invited to actively contribute to the steering of the campaign to update the European ATM Master Plan and to the six working groups tasked to develop content-related working papers to be integrated in the 2024 European ATM Master Plan. Programme Committee members also participated to the SESAR vision workshop held in October, which launched the update campaign.
- ▶ The SESAR 3 Programme Committee was involved in the annual additional activities exercise. To help members and ensure that they shared a common understanding, the SESAR 3 JU developed a guidance document about in-kind contributions to additional activities (IKAA), which was presented to the SESAR 3 Programme Committee. In addition, Programme Committee members were invited to a dedicated workshop for sharing best practices.



4 Financial management and internal control

In 2023, progress towards the objectives in the area 'Strategy and plans for the organisational management and internal control systems', as set out in the 2022–2023 BAWP, was satisfactory overall, with some specific exceptions.

- ▶ In terms of monitoring the efficiency and effectiveness of the SESAR 3 JU's project audit activities, the activities were carried out in accordance with the plan.
- ▶ In terms of monitoring the efficiency and effectiveness of the SESAR 3 JU's corporate and management activities, the levels of compliance with the internal control framework and the risk management were optimal, while the lack of the quality manager continued to affect the operations, although the SESAR 3 JU ensured that the performance of tasks remained compliant with the minimum requirements.
- ▶ In terms of monitoring the efficiency and effectiveness of the budget and finance activities, (1) the budget request for 2023 was submitted on time, (2) the annual accounts

were completed and published within the regulatory deadlines and (3) the European Court of Auditors (ECA) gave an unqualified opinion on the 2022 accounts. There were also notable improvements in budget execution and payments compared with 2022, with results being on target or very close to the target (81 % against an 85 % target in payment appropriations, and 95 % of payments made against a target of 100 %), and in the proportion of late payments, significantly reduced from 19.2 % in 2022 to 5.2 % in 2023.

- ▶ In terms of monitoring the exceptions and non-compliance events registered in 2023, the SESAR 3 JU recorded three non-compliance event and four exceptions.

Therefore, all target indicators for measuring progress for the organisational management and internal control systems section were met, except for the quality management system and payments.

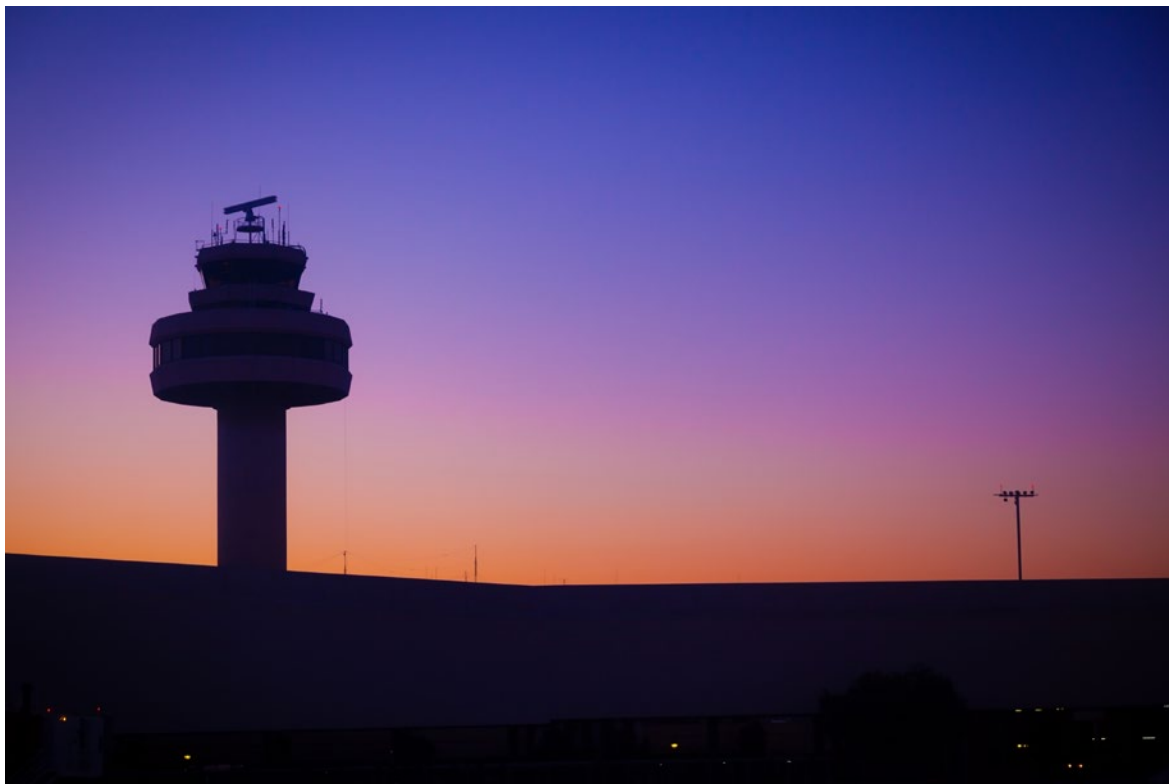
4.1 Control results

The SESAR 3 JU applies, *mutatis mutandis*, the components, principles and characteristics set forth in the European Commission's internal control framework. Internal control systems and procedures are applicable at all levels of the management and are designed to provide reasonable assurance of achieving the following objectives:

- ▶ effectiveness, efficiency and economy of operations,
- ▶ reliability of reporting,
- ▶ safeguarding of assets and information,
- ▶ prevention, detection, correction and follow-up of fraud and irregularities.



4.1.1 Effectiveness of controls



4.1.1.1 *Ex ante* controls on operational expenditure

For Horizon 2020, standard *ex ante* risk-based checks were performed as standard practice. These checks are documented in the risk management module of Sygma and encompass factors such as Early Detection and Exclusion System status, Horizon 2020 participation count, SME status, establishment year, reinforced monitoring and *ex post* audit findings. Among these, the Early Detection and Exclusion System status, reinforced monitoring and *ex post* audit results are the most pertinent to the SESAR 3 JU.

Regarding Horizon Europe, in the light of the significant changes introduced in the Commission's control strategy for Horizon Europe, which prevents JUs from establishing their own specific representative samples and calculating their specific representative and residual error rates, the JUs are drafting a common implementation approach, which will include the following elements:

- ▶ enhanced risk-based *ex ante* controls,
- ▶ risk-based *ex post* audits,
- ▶ feedback loop between the different building blocks of the internal control system (this means that risks spotted at the grant

agreement preparation, amendment or reporting and payment stage should be taken into account in all grant management cycles, and in particular when selecting cost claims for *ex post* audits; the results of the *ex post* audits should inform and refine future *ex ante* controls).

In parallel, the SESAR 3 JU has put in place a new risk-based approach for assessing risks at the project level. In 2023, the SESAR 3 JU launched its first initial risk assessment at the project level during the grant agreement preparation phase and before the signing of the first Horizon Europe grant agreements in 2023 with due consideration to risks stemming from SMEs or newcomers.

4.1.1.2 *Ex post* control of operational expenditure and error rates identified

The R & I family operates a common audit strategy intended to contribute to the legality and regularity of expenditure on a multiannual basis, including detection and correction of non-systemic and systemic errors.

For Horizon 2020, the Common Audit Service (CAS) of the Common Implementation Centre carries out all audits, including those concerning grants managed by the executive agencies and

the JUs. This is a major step towards ensuring efficiency gains, a harmonised approach, legal certainty, equality of treatment of beneficiaries and the least audit burden on beneficiaries.

The **main indicators** on the legality and regularity ⁽³⁹⁾ of EU framework programmes for R & I are:

- ▶ the **cumulative representative detected error rate**, based on errors detected by *ex post* audits on a common representative sample of cost claims across the R & I family;
- ▶ the **cumulative residual error rate**, which is the extrapolated level of error after corrective measures have been implemented by the Commission services following the audits, accumulated on a multiannual basis.

The **target** set for this control system for Horizon 2020 is to ensure that the cumulative residual error rate remains within a range of 2–5 %, aiming

to be as close as possible to 2 %. Progress against Horizon 2020 targets is assessed annually based on the results of the implementation of the *ex post* audit strategy and taking into account the frequency and importance of the detected errors along with cost–benefit considerations regarding the effort and resources needed to detect and correct the errors.

However, it should be noted that, given its multiannual nature, the effectiveness of the R & I family's control strategy can be fully measured and assessed only in the final stages of the EU framework programme, once the *ex post* audit strategy has been fully implemented, and once errors, including those of a systemic nature, have been detected and corrected.

The CAS managed to finalise audits on 648 participations, corresponding to 100.9 % of the 2023 target for Horizon 2020.



4.1.1.2.1 Results of the Horizon 2020 ex post audits

The Commission methodology for calculating the Horizon 2020 error rates is in line with the ECA's observations in its 2018 and 2019 annual reports ⁽⁴⁰⁾. Use of the methodology yielded the following error rates for Horizon 2020 ⁽⁴¹⁾ on 31 December 2023:

- ▶ cumulative representative detected error rate for the framework programme: 2.57 % ⁽⁴²⁾,
- ▶ cumulative residual error rate for the framework programme: 1.55 %.

Since R & I framework programmes are multiannual, the error rates, and the residual error rate in particular, should be considered over time. Specifically, the implementation of the audit results over time will tend to lower the cumulative residual error rate, thus increasing its difference from the representative detected error rate.

These error rates are calculated on the basis of the audit results available when drafting the annual activity report. They should be treated with caution, as they may change subject to the availability of additional data from audit results.

⁽³⁹⁾ These indicators are described in Annex 5 of the DG Research and Innovation *Annual Activity Report 2022*.

⁽⁴⁰⁾ As described in Annex 5 'Materiality criteria' of the DG Research and Innovation *Annual Activity Report 2022*.

⁽⁴¹⁾ The Horizon 2020 audit campaign started in 2016. Five common representative samples with a total of 788 expected results have been selected. By the end of 2023, cost claims amounting to EUR 49.2 billion had been submitted by the beneficiaries to the services. The audit coverage for Horizon 2020 is presented in Annex 7. In addition to the common representative samples, common risk samples and additional samples have also been selected. The audits of 4 707 participations were finalised by 31 December 2023 (648 of them in 2023).

⁽⁴²⁾ Based on the 581 representative results out of the 788 expected in the five common representative samples.

Given the results of the audit campaign, and the observations made by the ECA in its annual reports, the Common Implementation Centre in close cooperation with central Commission services, defined actions aimed at significantly simplifying the rules, and paving the way for a major reduction in the error rate in Horizon Europe, in addition to the use of a corporate model grant agreement and a corporate annotated grant agreement for all programmes directly managed by the Commission. Other actions under implementation, also targeting Horizon 2020 grants and beneficiaries, include further simplification, such as the increased use of simplified forms of funding (including lump sums and unit costs), communication campaigns focused on more error-prone types of beneficiaries with higher than average error rates, such as SMEs and newcomers, and enhanced training for external audit firms performing audits on behalf of the Commission. Focusing on the most common errors, these actions will be straightforward, reaching more participants and achieving a greater impact than previously⁽⁴³⁾.

4.1.1.2.2 Horizon Europe Framework Programme

The Horizon Europe Audit Strategy is risk-based and builds on the experiences and lessons learnt from Horizon 2020.

This was the third year of implementation of the Horizon Europe framework programme for the R & I family. As of 2023, no representative error rate for Horizon Europe has been established, since the *ex post* audit campaign for the programme is scheduled to commence in 2024, once a meaningful number of payments becomes available for auditing. Consequently, given the lack of data to assess the level of errors, and taking into account the simplifications introduced in Horizon Europe that aim to reduce the error rate, a 2 %⁽⁴⁴⁾ detected and residual error rate will be considered acceptable.

In 2023, the SESAR 3 JU awarded its first grants under the Horizon Europe framework programme. Therefore, no payment against incurred costs has been made so far. The first Horizon Europe audits are expected to take place in 2025.

4.1.1.2.3 Results of the SESAR-specific *ex post* audits

Even though the common representative sample is the appropriate indicator of the legality and regularity of the transactions for the entire R & I family, SESAR calculates specific results based on audits of its own population and its own expenditure in relation to SESAR 2020.

For the 2023 targets, one snapshot of the population of the SESAR 2020 activities was taken, on 10 June 2022. The amounts that had been paid by this cut-off date (a total of EUR 65 million) resulted in a sample of eight participations, with a total value of EUR 856 484, by eight beneficiaries and an audit coverage of 3 % (in relation to the cleaned entries amounting to EUR 23 797 141).

By 31 December 2023, the CAS finalised seven reports, covering seven participations. Out of those, four participations resulted in zero or positive adjustments in favour of the beneficiary, whereas three participations resulted in negative adjustments. These negative adjustments, with a nominal total value of EUR 34 749, caused a detected error rate of 4.79 %, with a systematic error rate of 4.30 % and a residual error rate of 4.73 %.

The sample selection of the 2023 targets is not considered representative of the SESAR 2020 population because it included small beneficiaries mainly from ER projects, whereas the majority of the programme's budget is allocated to Industrial Research projects involving large beneficiaries (including SESAR JU Members) of the aviation industry.

In the light of the multiannual nature of the SESAR 2020 programme, the cumulative error rate of the previous years gives the global and representative view of the error in relation to the entire population of the SESAR 3 JU. For this calculation the following factors are taken into account: (1) the method is based on the assumption that representative errors are corrected and recovered, so the costs claimed by a beneficiary for the period subsequent to an audit are assumed to be free from error and material misstatements, and (2) the residual error is assumed to affect all the non-audited cost claims of audited beneficiaries. The cumulative residual error rate for the entire SESAR 2020 programme (2016–2023) is calculated at 0.64 %.

⁽⁴³⁾ The CAS continues to analyse the root causes of errors that have been identified, and targeted actions are taken to address any identified weaknesses. Further information on the implementation of the action plans established to reduce the error rates of Horizon 2020 and Horizon Europe can be found in Annex 7 of the DG Research and Innovation *Annual Activity Report 2022*.

⁽⁴⁴⁾ These rates correspond to the objective set for Horizon Europe.

In 2023, one snapshot of the population was taken, on 25 July. The audit of the cost claims received and paid by this cut-off date resulted in a sample of 12 participations by 12 beneficiaries. The results of this audit will be available in 2024.

The SESAR 3 JU has in place an effective mechanism to correct errors through recoveries

and financial corrections. Table 25 presents the number of audit results processed since the beginning of Horizon 2020. In terms of audit result implementation, the SESAR 3 JU processed 98 % of the received audit results in a timely manner (i.e. within 6 months), as shown in Table 26.

TABLE 25: CUMULATIVE NUMBER OF IMPLEMENTED AUDIT RESULTS, 2017–2023

SESAR 3 JU	Audit results processed	% of audit results processed	Audit results pending	% of audit results pending	Total
Audits	120	100	0	0	120
Extensions	150	100	0	0	150
Total	270	100	0	0	270

TABLE 26: TIME TO IMPLEMENT CLOSED AUDIT RESULTS IN THE 2023 FINANCIAL YEAR

SESAR 3 JU	0–6 months	% of total number (0–6 months)	> 6 months	% of total number (> 6 months)	Total
Closed projects	22	96	1	4	23
Negative adjustments with recovery	12	92	1	7	13
Negative adjustments without recovery	2	100	0	0	2
Positive or zero adjustment	8	100	0	0	8
Ongoing projects	24	100	0	0	24
Negative adjustments	13	100	0	0	13
Positive or zero adjustment	11	100	0	0	11
Total	46	98	1	2	47

During the reporting year, recoveries and financial corrections following the results of *ex post* controls amounted to EUR 34 750, whereas the executed corrective capacity amounted to EUR 10 656 in total, representing 0.04 % of the relevant expenditure.

The relevant expenditure of the SESAR 3 JU, its estimated overall risk at payment, the estimated future corrections and the risk at closure are provided in Table 27.

TABLE 27: ESTIMATED RISK AT PAYMENT AND RISK AT CLOSURE (EUR)

Programme	Relevant expenditure	Estimated risk (error rate) at payment	Estimated future corrections	Estimated risk (error rate) at closure
Horizon 2020	30 018 000	1 437 862 (4.79 %)	24 094 (0.08 %)	1 413 768 (4.71 %)

The estimated overall risk at payment amounts to EUR 1.44 million, representing 4.79 % of the JU's total relevant SESAR 2020 expenditure for 2023. This is the authorising officer's best conservative estimate of the amount of relevant SESAR 2020 expenditure not in conformity with the contractual and regulatory provisions applicable at the time the payment was made. This expenditure will subsequently be subject to ex post controls, and a proportion of the underlying errors will be detected and corrected in subsequent years.

The conservatively estimated future corrections for 2023 expenditure related to SESAR 2020 represent EUR 24 094. The difference between those two amounts results in an estimated overall risk at closure of EUR 1.41 million, representing 4.71 % of the JU's total relevant SESAR 2020 expenditure for 2023.

The exposure is below the European Commission's de minimis threshold for financial annual activity report reservations of EUR 5 million; therefore, no reservation is considered necessary. Furthermore, 2023 is considered atypical; the detected error rate is not representative of the entire SESAR 2020 programme, and the percentages of estimated risk at payment and at closure do not depict the actual impact on the relevant expenditure for the entire programme.

4.1.1.2.4 Follow-up of the ex post audits in assigned revenues

Follow-up of the ex post audit for U-space

In 2023, the SESAR 3 JU followed up the cashing-in of recovery orders as a result of the audit findings ⁽⁴⁵⁾. Three recovery orders, amounting to a total of EUR 601 359, were not cashed in, as the entity declared insolvency. The SESAR 3 JU has lodged a claim with the insolvency administrator, but it is not expected that any funds will be recovered from the insolvency proceedings. Consequently, that amount is written off in the 2023 SESAR 3 JU annual accounts.

4.1.1.3 Legality and regularity of the financial transactions

The SESAR 3 JU uses a manual of financial circuits relating to budget implementation. The manual establishes the financial circuits within the JU, which allow the correct implementation of the budget for the revenue through recovery orders and forecasts of revenue, and for the expenditure

from the budgetary commitment until the payment of the expenditure to the decommitment and possible recovery orders.

The level of error is the main indicator for assessing whether financial operations have been implemented in compliance with the applicable regulatory and contractual provisions. In 2023 the error rates reported, annual and cumulative, stayed within the materiality threshold of 2–5 % defined for Horizon 2020.

4.1.1.4 Fraud prevention, detection and correction

The 2023–2026 SESAR 3 JU anti-fraud strategy was adopted by the GB in June 2023 ⁽⁴⁶⁾, and initial actions commenced upon the adoption of the strategy. The strategy builds on the actions performed over the last 6 years but takes into account the new setting. An important part of this strategy is the action plan. The SESAR 3 JU defined 11 actions, owned by different individuals in the organisation. Each action is linked to a fraud risk and has pertinent indicators and deadlines to allow the monitoring of its implementation. There are no values to report for 2023.

4.1.1.4.1 Follow-up of recommendations issued by the European Anti-Fraud Office

In 2023, the SESAR 3 JU was not under investigation by OLAF. Furthermore, no actions were needed to implement OLAF recommendations from previous years.

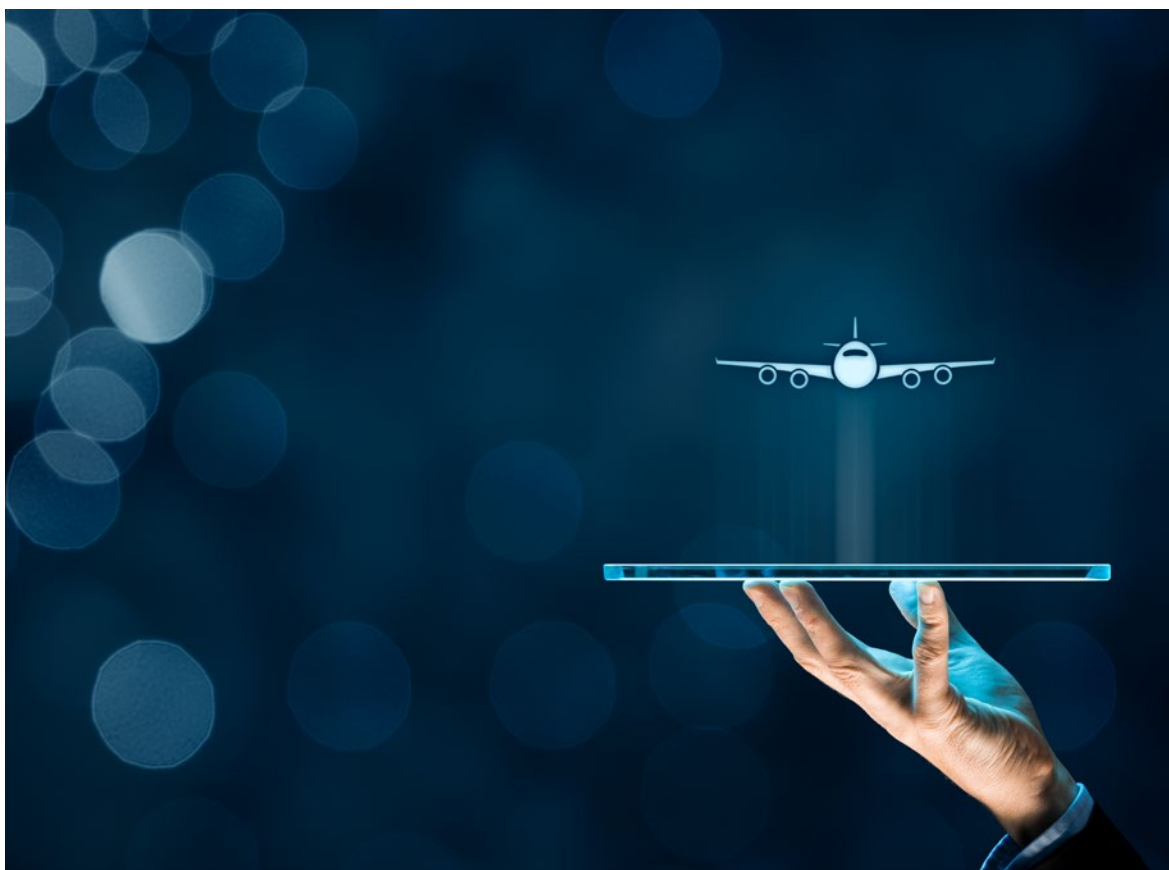
4.1.1.5 Assets and information, reliability of reporting

Physical assets are recorded in ABAC assets, while information assets are stored primarily in a local information and data management system on SharePoint (for local storage) and otherwise on a contractor-provided platform (for information assets shared with external parties).

In 2023, the SESAR 3 JU completed an inventory exercise, which resulted in a tracking rate of 99.72 % for IT assets (176 items) and 100 % for furniture assets (178 items). The total acquisition value of all tracked assets amounts to EUR 2 600 433.65. In 2023, 97 assets entered the inventory, and 774 assets were retired (including 18 IT assets). Almost all furniture assets (754) were retired following the relocation to the EUROCONTROL premises and were donated to Oxfam.

⁽⁴⁵⁾ Detailed information is provided in the CAAR 2021, p.172

⁽⁴⁶⁾ Decision GB(D)09-2023 – SESAR 3 Joint Undertaking's anti-fraud strategy 2023–2026, signed on 26 June 2023.



4.1.2 Efficiency of controls ('time to')

The three efficiency indicators required by the financial regulation are time to inform, time to grant (both Article 194(2)) and time to pay (Article 116(1)). Regarding the ER1 and IR1 calls, compliance with these indicators was as follows.

Time to inform represents the time needed to manage the evaluation and selection phase from the call deadline to informing the participants. For both calls, the average time has been 124 days, against a target of 153 days. 100 % of projects were informed on time.

Time to grant represents the time between the call deadline and grant signature. For ER1 and IR1, the average times have been 226 and 242 respectively, against a target of 245 days. 100 % of ER1 and 93.3 % of IR1 grants were signed on time⁽⁴⁷⁾.

Time to pay represents the outcome of the process for the payment of costs claimed by beneficiaries. Payments for ER1 projects have been made in 4 days, while IR1 payments have taken an average of 7 days, both compared with a target of 30 days for prefinancing payments.

For Horizon 2020, in 2023, only the time to pay is measurable. The average time for the remaining final payments for SESAR 2020 projects has been 75 days, compared with a 90-day target.

⁽⁴⁷⁾ The projects that were selected from the reserve list are not considered in the time to grant owing to their late selection.

4.1.3 Economy of controls

In 2023, the cost of *ex ante* control as a percentage of annual expenditure was 1.93 %. The total cost is calculated in terms of full-time equivalents (FTEs) performing the control activities for Horizon

2020 solely, as for Horizon Europe grants only pre-financing amounts were paid out. Details per sector of control are provided in Table 28.

TABLE 28: COST OF CONTROLS, 2023

Sector	Estimated FTEs allocated to controls	Cost (EUR)
Grant management	2.2	440 000
Finance	0.75	146 405
Total <i>ex ante</i> controls	2.95	586 405
<i>Ex post</i> control	0.3	60 000
Total	3.25	646 405

2023 budget	Payments (EUR)	% of total budget
Administrative expenditure	3 459 000	10
Operational expenditure	30 018 000	90
Total	33 477 000	100

Total estimated costs of controls	Cost of controls as % of annual expenditure
646 405	1.93



4.1.4 Register of exceptions and non-compliance events

The SESAR 3 JU has an exceptions and non-compliance events management process⁽⁴⁸⁾. Maintaining an exceptions and non-compliance events register ensures that all instances of overriding of controls or deviations from established processes and procedures are documented in exception reports, duly approved by the Executive Director before action is taken, and logged centrally.

In accordance with the abovementioned policy and process, in 2023 the SESAR 3 JU recorded:

- ▶ three non-compliance events resulting from:
 - ▶ the a posteriori signing of a purchase order under a framework contract for the provision of interim services,
 - ▶ the payment of an indexed price, without a formal contract amendment, for the provision of IT support services,
 - ▶ the “a posteriori extension of the duration of the contract governing the provision of IT support services, due to the change to the date of relocation of the SESAR 3 JU offices in EUROCONTROL premises;
- ▶ four exceptions, relating to:
 - ▶ the provision of key ICT-related services by EUROCONTROL to ensure business

continuity during 2024, without contractual coverage and an order in place with EUROCONTROL,

- ▶ the deviation from the selection criteria initially set under negotiated procurement procedure ref. S3JU/LC/012-CFT (lot 5) to allow the award of the resulting contract to the contacted economic operator in spite of its weak economic and financial capacity (unique technical capacity of this entity to provide this type of services to the SESAR 3 JU),
- ▶ a 4-month extension of the direct service contract covering the provision of reception and back-office reception services in order to ensure continuity of services after the relocation of the SESAR 3 JU to its new premises,
- ▶ a 6-month extension of the direct service contract for ICT coordination services to guarantee the continuity of the provision of such services after the SESAR 3 JU's relocation to its new premises.

The exceptions and non-compliance events register is available on request and is consulted by the ECA during audits.

4.1.5 Conclusion on the cost-effectiveness of controls

Overall, the controls present in the JU have been effective, leading to the effective accomplishment of goals, safeguarding the assets of the JU, and

ensuring the accuracy and reliability of data and the legality and regularity of the financial transactions.

⁽⁴⁸⁾ Executive Director Decision SJU/ED/762 of 15 November 2021, transferred to the SESAR 3 JU under Executive Director Decision S3JU/ED/0001 dated 30 November 2021.



4.2 Audit observations and recommendations

4.2.1 Internal Audit Service

In 2023, the Internal Audit Service (IAS) of the European Commission performed an audit on planning, budgeting, monitoring of activities and reporting. The auditors concluded that the management and control system put in place by the SESAR 3 JU for the planning, budgeting, monitoring and reporting of its activities is appropriately designed and efficiently and effectively implemented in line with the applicable rules.

While the audit did not result in the identification of any critical or very important issues, the auditors identified two risks, which relate on the one hand to the documentation of the planning and reporting processes and on the other hand to back-up arrangements. In view of these risks, the auditors issued two recommendations (Table 29), which are rated important.

TABLE 29: IAS RECOMMENDATIONS

Recommendation	Priority	Deadline
Improve the documentation, consistency and completeness of the planning and reporting processes	Important	15 July 2024
Establish back-up arrangements for all key functions and update the Business Continuity Management Plan	Important	31 December 2024

In order to address these recommendations and underlying risks, the SESAR 3 JU set up an action plan, which was approved by the IAS. It is expected that all actions will be implemented over the course of 2024.

In addition, in January 2023, the IAS performed a follow-up audit of open recommendations to assess the progress made in implementing five

recommendations issued by the IAS in 2021 during an audit on human resources management and ethics. Based on the results of this follow-up audit, the IAS concluded in March 2023 that the five recommendations have been adequately and effectively implemented. All recommendations stemming from this audit are now formally closed.

4.2.2 Internal Audit Capability

In 2023, the Internal Audit Capability (IAC) performed engagements and coordination activities in line with its 2023 annual audit plan⁽⁴⁹⁾. The activities of the IAC in 2023 did not lead to any recommendations.

The work of the IAC focused on consulting engagements, anti-fraud-related activities, and the coordination of the work of the IAS, the ECA and other relevant audit bodies. In this context,

the IAC provided advice on efficient and effective management, ethics, delegations of authority and ABAC user authorisations. The IAC also drafted and prepared for adoption the 2023–2026 SESAR 3 JU anti-fraud strategy. Furthermore, it monitored the implementation of past recommendations, followed up on the discharge procedure and represented the JU in anti-fraud and audit-related networks.

4.2.3 Audit by the European Court of Auditors

During 2023, the ECA audited the SESAR 3 JU accounts 2022. In the final audit report⁽⁵⁰⁾, the ECA provides an unqualified opinion on the SESAR 3 JU and concludes that the JU's accounts present fairly the financial position of the SESAR 3 JU, the results of its operations, its cash flows and the changes in net assets for 2022, and that the revenue and payments underlying the accounts for 2022 are legal and regular in all material respects.

Chapter 2 of the report presents an overview of the results for all JUs for the 2022 financial year. In that chapter, the ECA suggests seven actions to be taken by all JUs. In Chapter 3, which is specific to the SESAR 3 JU, the ECA makes observations regarding insufficient information on members' contributions, the implementation of Horizon 2020 and Horizon Europe, and management and control systems.

4.2.4 Follow-up of observations from the discharge authorities

4.2.4.1 Discharge for the 2021 and 2022 financial years

In May 2023, the European Parliament granted discharge to the SESAR 3 JU in respect to the implementation of the budget for the 2021 financial year and approved the closure of the 2021 accounts.

In its resolution, the European Parliament made observations regarding budgetary and financial management (implementation rate, COVID-19 crisis), performance (key policy and operational objectives), procurement and staff (pension

schemes, gender balance, interim staff), internal control (error rates, SMEs, non-compliance events) conflicts of interest, fraud prevention and internal audit.

The SESAR 3 JU formally acknowledged these observations in Q3 2023, outlining the measures it intends to adopt to address these observations. The full discharge report and the reply of the SESAR 3 JU are published on the website of the European Parliament⁽⁵¹⁾. The discharge decision in respect to the implementation of the budget for the 2022 financial year is expected in Q2 2024.

⁽⁴⁹⁾ Decision GB(D)3-2023 – IAC annual audit plan 2023.

⁽⁵⁰⁾ <https://www.eca.europa.eu/en/publications/SAR-JUS-2022>.

⁽⁵¹⁾ The text adopted by the European Parliament is available at: https://www.europarl.europa.eu/doceo/document/TA-9-2023-0181_EN.html. The reply of the SESAR 3 JU, entitled 'Follow-up report on measures taken in light of the European Parliament recommendations Discharge 2021', is available via this link: <https://www.europarl.europa.eu/committees/en/cont/discharge-procedure/discharge-2022?tabCode=jus>.



4.3 Assessment of the effectiveness of internal control systems

4.3.1 Continuous monitoring

In view of the annual self-assessment and monitoring of the effectiveness of the control activities required by the internal control framework, the JU developed indicators for all internal control principles and related characteristics. The SESAR 3 JU continuously monitors the indicators and performs an

assessment on a yearly basis to identify areas for improvement.

The SESAR 3 JU used these indicators to run the assessment for 2023. The result of the assessment for 2023 is available in Annex 7.

4.3.2 Risk assessment and management

Risk management aims to enable an organisation to fulfil its mission and objectives in the most efficient and effective way by ensuring the timely and adequate identification, assessment (analysis and evaluation), management (treatment and escalation, as required), monitoring and controlling of the risks and opportunities.

In 2023, the JU implemented a risk management process based on the findings of the risk assessment exercise conducted in 2022. In addition, two formal risk management workshops took place in June and October. The workshops confirmed the effectiveness of the streamlined approach to risk management introduced in 2022. Moreover, they led to the introduction of some improvements to the risk register. As a result, the risk register contributes more

efficiently to achieving an enhanced performance framework within the JU, reflecting the SESAR 3 JU's reorganisation and linking risks with the new strategic objectives of the 2024–2025 BAWP.

The risk assessment exercise carried out in 2023 identified potential risks that could be detrimental to achieving the JU's objectives. These risks were included in the risk register, and the most significant ones were included in the 2024–2025 BAWP. Key risks identified include:

- ▶ the potential negative impact of high inflation, which could result in diminished delivery of the DES, and in the escalation of procurement and staff costs,
- ▶ the limited resources of the JU, which may be unable to engage as actively as necessary in international activities, in particular at the

ICAO level, to ensure the global interoperability that would support the acceptability of SESAR Solutions.

In Q4 2022, the SESAR 3 JU performed a fraud risk assessment. The most significant risks

documented in the stand-alone fraud risk register were considered during the two risk management workshops in 2023.

Both the risk register and the fraud risk register are available to auditors on request.

4.3.3 Prevention of conflict of interest

In December 2021, the SESAR 3 JU GB adopted rules on confidentiality and the prevention, avoidance and management of conflicts of interest⁽⁵²⁾. These set out the rules specific to GB members, SC members, SRG members, members of other advisory or working groups,

staff members, other members of the SESAR 3 JU workforce, consultants and external experts. In 2023, the SESAR 3 JU conducted an exercise in which all staff members were asked to disclose any personal interests through a written declaration.

4.4 Conclusion on assurance

On the basis of the above elements, the management provides reasonable assurance that all necessary internal control procedures are in place to guarantee the legality and regularity of the SESAR 3 JU's activities, in line with the principles of economy, efficiency and effectiveness.

In conclusion, the management provides reasonable assurance that, overall, suitable controls are in place and are working as intended, risks are being appropriately monitored and mitigated, and necessary improvements and reinforcements are being implemented.

Therefore, the Executive Director, in his capacity as authorising officer, has signed the declaration of assurance presented in Section 4.5.3.

⁽⁵²⁾ Decision GB(D)03-2021 on confidentiality, prevention, avoidance and the management of conflicts of interest.

4.5 Statement of assurance

4.5.1 Assessment of the consolidated annual activity report by the Governing Board

The Governing Board assessed the 2023 CAAR at its meeting on 25 June 2024 and highlighted the following features:

The Governing Board

Welcomes the successful closure of the SESAR 2020 programme and the acceleration of the implementation of the Digital European Sky programme.

Welcomes the launch into execution and effective monitoring of the projects awarded under the ER1 and IR1 calls, complemented by the DSD projects, as well as the launch of the ER2 call and the synergy call with EU-Rail JU.

Commends the substantial efforts put into the update of the European ATM Master Plan and the role of the JU in orchestrating the collective commitment of the European aviation community to this ambitious ATM modernization roadmap.

Appreciates the JU's active engagement with stakeholders, notably through its annual event, the SESAR Innovation Days, and its active participation in major events at EU and global levels, and **recognises** its efforts to engage the international community in collaborating towards a more harmonised ATM system.

Encourages the JU to continue its efforts to facilitate the swift deployment across the EU of the SESAR Solutions that have reached the adequate maturity level.

Encourages members to uphold their commitments by continuing to provide in-kind contributions as per the initial agreements and ensuring timely reporting for the Digital European Sky programme.

Express satisfaction with the significant reduction of late payments.

Acknowledges that the corporate and back-end services to support the operations were carried out efficiently and effectively in line with best practices, standards, and applicable regulatory frameworks.

Welcomes the absence of critical audit recommendations and of critical risks that could jeopardize the delivery of the SESAR 3 JU's key objectives, underscoring the robustness of the JU's risk management, quality assurance processes and the strength of its internal control environment.

Consequently, based on the information provided, the Governing Board concluded that the 2023 CAAR accurately and adequately reflects the implementation of the 2023 activities from both an operational and administrative point of view, and that the objectives for 2023 as outlined in the 2022-2023 BAWP have been met in compliance with the principles of legality and regularity of operations.

4.5.2 Reservations

No reservations were reported in 2023.

4.5.3 Declaration of assurance

I, the undersigned, Executive Director of the SESAR 3 JU,

In my capacity as authorising officer,

Declare that the information contained in this report gives a true and fair view.

State that I have reasonable assurance that the resources assigned to the activities described in this report have been used for their intended purpose and in accordance with the principles of sound financial management, and that the control procedures put in place give the necessary guarantees concerning the legality and regularity of the underlying transactions.

This reasonable assurance is based on my own judgement and on the information at my disposal, such as the results of the self-assessment, ex post controls, the work of the Internal Audit Capability, the observations of the Internal Audit Service and the lessons learnt from the reports of the Court of Auditors for years prior to the year of this declaration.

Confirm that I am not aware of anything not reported here which could harm the interests of the Joint Undertaking.

Brussels, 25 June 2024

(signed)

Andreas Boschen
Executive Director
SESAR 3 JU

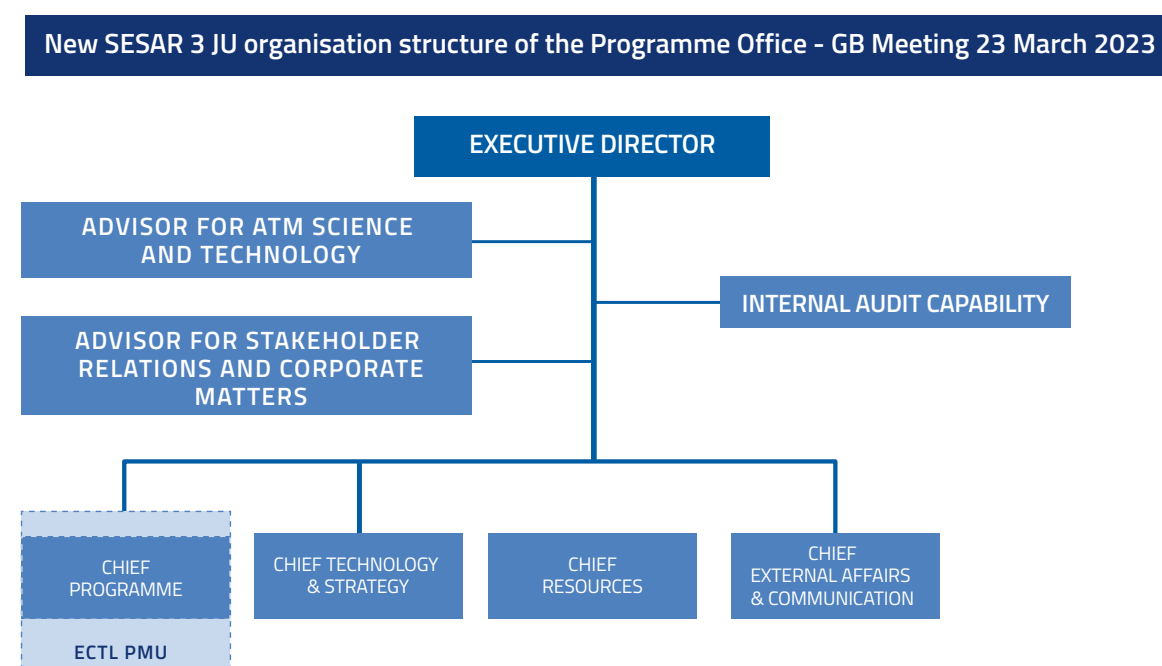


Annexes

1. Organisational chart

Figure A1 shows the organisational structure of the Programme Office as approved by the GB in March 2023⁽⁵³⁾.

FIGURE A1: ORGANISATIONAL CHART



⁽⁵³⁾ Decision GB(D)04-2023 on the organisational structure of the Programme Office.

2. Staff establishment plan, contract agents, seconded national experts

TABLE A1: STAFF ESTABLISHMENT PLAN 2023

Function group and grade	Authorised		Actually filled as of 31 December 2023	
	Permanent posts	Temporary posts	Permanent posts	Temporary posts
AD 16	—	—	—	—
AD 15	—	—	—	—
AD 14	—	1	—	1
AD 13	—	2	—	1
AD 12	—	3	—	3
AD 11	—	5	—	3
AD 10	—	2	—	2
AD 9	—	8	—	6
AD 8	—	7	—	5
AD 7	—	3	—	5
AD 6	—	—	—	3
AD 5	—	—	—	1
TOTAL AD		31		30
AST 11	—	—	—	—
AST10	—	—	—	—
AST 9	—	1	—	1
AST 8	—	—	—	—
AST 7	—	1	—	—
AST 6	—	—	—	—
AST 5	—	3	—	2
AST 4	—	1	—	1
AST 3	—	—	—	—
AST 2	—	—	—	1
AST 1	—	—	—	—
TOTAL AST		6		5

AST/SC 6	—	—	—	—
AST/SC 5	—	—	—	—
AST/SC 4	—	—	—	—
AST/SC 3	—	—	—	—
AST/SC 2	—	—	—	—
AST/SC 1	—	—	—	—
TOTAL AST/SC		0		0
TOTAL AD+AST+ AST/SC	0	37	0	35
GRAND TOTAL		37		35

AD, administrator; AST, assistant; SC, secretary.

TABLE A2: CONTRACT AGENTS

Function group	Authorised	Actually filled as of 31 December 2023
IV	1	1
III	—	—
II	—	—
I	—	—
TOTAL	1	1

TABLE A3: SECONDED NATIONAL EXPERTS

	Authorised	Actually filled as of 31 December 2023
TOTAL	2	1

3. Scoreboard of Horizon 2020 legacy Key Performance Indicators

TABLE A4: SCOREBOARD OF HORIZON 2020 COMMON KPIS

No	Horizon 2020 KPI	Definition	Data provided by the JU? ^(a)	Value in 2023
1	SMEs – proportion of participating SMEs introducing innovations new to the company or the market (covering the period of the project end date within reporting year + 3 years) (number of SMEs that have introduced innovations)	Number and percentage of participating SMEs that have introduced innovations to the company or to the market	No	15 (23 %)
2	SMEs – growth and job creation in participating SMEs (turnover of company, number of employees)	Turnover of company Number of employees	No	Turnover: EUR 354 878 354 Employees: 3 949
3	Number of publications in peer-reviewed, high-impact journals	Percentage of papers published in the top 10 % of journals, ranked by impact factor, by subject category	No	16 (70 %)
4	Patent applications and patents awarded in the area of the joint technology initiative (number of patents awarded)	Number of patent applications by theme Number of awarded patents by theme	No	Patent applications: 0 Awarded patents: 0
5	Number of prototypes, testing activities and clinical trials	Number of prototypes, testing (feasibility/demonstration) activities and clinical trials	No	Prototypes: 468 Feasibility activities: 836 Clinical trials: N/A
6	Number of joint public–private publications in projects	Number of joint public–private publications and percentage of all relevant publications	No	2 (9 %)
7	New products, processes and methods launched into the market	Number of projects with new innovative products, processes and methods	No	Innovative products: 59 Innovative processes: 50 Innovative methods: 54

No	Horizon 2020 KPI	Definition	Data provided by the JU? ^(a)	Value in 2023
12	Time to pay (percentage of payments that were on time) for pre-financing, interim payment and final payment	Average number of days for pre-financing (target: 30 days), interim payment (target: 90 days) and final payment (target: 90 days) Average number of days for administrative payments Number of experts appointed	Yes	Average number of days for pre-financing: N/A Average number of days for interim payment: N/A Average number of days for final payment: 75 Average number of days for administrative payments: N/A Experts contracted: 7
13	Vacancy rate (%)	Vacancy rate during the reporting period (%)	Yes	5.4 %
14	Budget implementation/execution: percentage of commitment to total budget percentage of payment to total budget	Realistic yearly budget proposal and possibility to monitor and report on its execution, both in commitment and in payments, in line with the sound financial management principle	Yes	93 % 70 %

N/A, not applicable.

^(a) Data not provided by the SESAR 3 JU are provided by beneficiaries through project reporting.

TABLE A5: HORIZON 2020 INDICATORS FOR MONITORING CROSS-CUTTING ISSUES

No	Horizon 2020 KPI	Definition	Data provided by the JU?	Value in 2023
23	Percentage of women in European Commission advisory groups, expert groups, evaluation panels, individual experts, etc.	Percentage of female members in advisory groups, panels, etc.	Yes	GB: 15 out of 131 (11.5 %) Evaluation panel: N/A SC: 4 out of 9 (44 %) External observers: N/A
28	Scale of impact of projects (high TRL)	Number of projects between TRL4 and TRL6 and between TRL5 and TRL7	Yes	Projects up to TRL2 or equivalent operational concept maturity level (ER): 1 Projects at TRL2 to TRL6 or equivalent operational concept maturity level: 13 Projects at TRL6 or TRL7 or equivalent operational concept maturity level: 8 Projects addressing transversal activities (i.e. non-directly TRL- or operational-concept-related activities): 2

31	EU financial contribution for public–private partnerships (Article 187)	EU contribution to public–private partnerships (Article 187)	Yes	EUR 549 209 833 ^(a)
32	Public–private partnerships leverage: total amount of funds leveraged through Article 187 initiatives, including additional activities, divided by the EU contribution	Total funding from private actors involved in public–private partnerships: in-kind contributions already committed by private members to projects selected for funding additional activities (i.e. research expenditure / investment of industry in the sector, compared with previous year)	Yes	See indicator 40
33	Dissemination and outreach activities other than publications in peer-reviewed journals	Type of dissemination activity can be chosen from a drop-down list. Number of events, funding amount and number of people reached thanks to the dissemination activities	No	Events: 92 Open days: 15 Other media: 44 Publications: 30 Social media: 56
38	Error rate (for Horizon 2020 grants)	Representative error rate (%) Residual error rate (%)	Yes	Representative error rate: 4.79 % Residual error rate: 4.73 %
39	Implementation of <i>ex post</i> audit results for Horizon 2020 projects	Percentage of cases implemented out of total cases (total EUR million)	Yes	31 % (EUR 10 656 / EUR 34 749)

N/A, not applicable.

^(a) Cumulative amounts referring to projects with a start date in 2016–2021. There were no projects with a start date in 2022 or 2023.

TABLE A6: HORIZON 2020 KPIS SPECIFIC TO THE SESAR 3 JU

No	Horizon 2020 KPI	Definition	Value in 2023
40	Public-private partnerships leverage: in-kind contributions committed by private members to SESAR 2020 projects selected for funding	Ratio of private to public funding in all project types using methods established for (1) interim evaluation, (2) ECA, (3) Horizon 2020 reporting	Programme leverage: Method 1 (interim evaluation): 1.10 Method 2 (EU body leverage): 1.15 Method 3 (Horizon 2020): 2.15 Partnership leverage (Horizon 2020): 2.63
41	Completion of SESAR 2020 programme	Actual versus planned percentage of each project that had been completed as of the end of the reporting period	No call for proposals in 2023 24 grants completed 0 grants active
42	Delivery of SESAR 2020 solutions	Solutions ready for pre-industrialisation (V3/TRL6) as a percentage of those in the plan ^(a)	84 %

^(a) Based on the results of release 13, against plans for releases 7–13.

4. Scoreboard of Horizon Europe common Key Impact Pathway Indicators (KIPs)

This annex is based on Annex V to Regulation 2021/695/EU.

TABLE A7: SCOREBOARD OF HORIZON EUROPE COMMON KIPS

KIP	Short-term	Medium-term	Longer-term	Detail per action or globally for 2023 ^(a)
Towards scientific impact				
1. Creating high-quality new knowledge	Publications: Number of peer-reviewed scientific publications resulting from the Programme	Citations: Field-Weighted Citation Index of peer-reviewed Publications resulting from the Programme	World-class science: Number and share of peer-reviewed publications resulting from the projects funded by the Programme that are core contribution to scientific fields	0 Publication
2. Strengthening human capital in R & I	Skills: Number of researchers involved in upskilling (training, mentoring/coaching, mobility and access to R & I infrastructures) activities in projects funded by the Programme	Careers: Number and share of upskilled researchers involved in the Programme with increased individual impact in their R & I field	Working conditions: Number and share of upskilled researchers involved in the Programme with improved working conditions, including researchers' salaries	413 researchers
3. Fostering diffusion of knowledge and open science	Shared knowledge: Share of research outputs (open data, publications, software, etc.) resulting from the Programme shared through open knowledge infrastructures	Knowledge diffusion: Share of open access research outputs resulting from the Programme actively used / cited	New collaborations: Share of Programme beneficiaries that have developed new transdisciplinary/ trans-sectoral collaborations with users of their open access research outputs resulting from the Programme	—

KIP	Short-term	Medium-term	Longer-term	Detail per action or globally for 2023 ^(a)
Towards societal impact				
4. Addressing Union policy priorities and global challenges through R & I	Results: Number and share of results aimed at addressing identified Union policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority), including: Number and share of climate-relevant results aimed at delivering on the Union's commitment under the Paris Agreement	Solutions: Number and share of innovations and research outcomes addressing identified Union policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority), including: Number and share of climate-relevant innovations and research outcomes delivering on Union's commitment under the Paris Agreement	Benefits: Aggregated estimated effects from use/exploitation of results funded by the Programme on tackling identified Union policy priorities and global challenges (including SDGs), including contribution to the policy and law-making cycle (e.g. norms and standards) (multidimensional: for each identified priority), including: Aggregated estimated effects from use/exploitation of climate-relevant results funded by the Programme on delivering on the Union's commitment under the Paris Agreement including contribution to the policy and law-making cycle (e.g. norms and standards)	—
5. Delivering benefits and impact through R & I missions	R & I mission results: -Results in specific R & I missions (multidimensional: for each identified mission)	R & I mission outcomes: Outcomes in specific R & I missions (multidimensional: for each identified mission)	R & I mission targets met: -Targets achieved in specific R & I missions (multidimensional: for each identified mission)	Not applicable for the JUs
6. Strengthening the uptake of R & I in society	Co-creation: Number and share of projects funded by the Programme in which Union citizens and end users contribute to the co-creation of R & I content	Engagement: Number and share of participating legal entities that have citizen and end user engagement mechanisms in place after the end of projects funded by the Programme	Societal R & I uptake: Uptake and outreach of co-created scientific results and innovative solutions generated under the Programme	—

KIP	Short-term	Medium-term	Longer-term	Detail per action or globally for 2023 ^(a)
Towards technological/economic impact				
7. Generating innovation-based growth	Innovative results: Number of innovative products, processes or methods resulting from the Programme (by type of innovation) and intellectual property rights (IPR) applications	Innovations: Number of innovations resulting from the projects funded by the Programme (by type of innovation) including from awarded IPRs	Economic growth: Creation, growth and market shares of companies having developed innovations in the Programme	0 innovative products
8. Creating more and better jobs	Supported employment: Numbers of FTE jobs created and jobs maintained in participating legal entities for the project funded by the Programme (by type of job)	Sustained employment: Increase in FTE jobs in participating legal entities following the project funded by the Programme (by type of job)	Total employment: Number of direct and indirect jobs created or maintained thanks to diffusion of results from the Programme (by type of job)	0 FTE
9. Leveraging investments in R & I	Co-investment: Amount of public and private investment mobilised with the initial investment from the Programme	Scaling-up: Amount of public and private investment mobilised to exploit or scale up results from the Programme (including foreign direct investments)	Contribution to '3 % target': Union progress towards 3 % GDP target due to the Programme	EUR 154 million

N/A, not applicable.

^(a) Figures in this column are reporting on the short-term KIPs. The calculation follows the methodology presented in the [indicator methodology and metadata handbook](#). Any values marked with '—' will be included once the data are available.

5. Horizon Europe Partnership common Key Performance Indicators

This annex is based on Section 5 and Appendix 1 of the Commission experts' report *A robust and harmonised framework for reporting and monitoring European partnerships in Horizon Europe: First interim report*.

TABLE A8: HORIZON EUROPE PARTNERSHIP COMMON INDICATORS

No	Criterion addressed	Proposed common indicators	Baseline	Results for 2023	Target 2027
1	Additionality	Progress towards (financial and in-kind) contributions from partners other than the Union – i.e. committed vs actual ^(a)	0	EUR 154 million	EUR 1 000 million
2	Additionality/ Synergies	Additional investments triggered by the EU contribution, including qualitative impacts related to additional activities ^(b)	0	—	—
3	Directionality	Overall (public and private, in-kind and cash) investments mobilised towards EU priorities	N/A	100% on "Green Deal" and "Europe Fit for the Digital Age"	N/A
4	International visibility and positioning	International actors involved ^(c)	N/A	15 unique participants (28 participations) ^(d)	N/A
5	Transparency and openness	Share and type of stakeholders and countries invited/ engaged ^(e)	N/A	See Table 16 in Section 1.3.1	N/A
6	Transparency and openness	Number and types of newcomer members of partnerships and their countries of origin (geographical coverage)	55 ^(f)	55	N/A
7	Transparency and openness	Number and types of newcomer beneficiaries in funded projects (in terms of types and countries of origin) ^(g)	N/A	105 newcomers (details in Table A9)	N/A
8	Coherence and synergies	Number and types of coordinated and joint activities with other European partnerships	N/A	1 Coordinated call for proposals 2 Systematic collaborations 4 Ad hoc collaborations	N/A

No	Criterion addressed	Proposed common indicators	Baseline	Results for 2023	Target 2027
9	Coherence and synergies	Number and types of coordinated and joint activities with other R & I initiatives at the EU/national/regional/sectoral level	N/A	1 Coordinated call for proposals 1 Memorandum of Understanding 1 Ad hoc collaboration 14 Various activities	N/A
10	Coherence and synergies	Complementary and cumulative funding from other Union funds (Horizon Europe, ERDF, RRF, other cohesion policy funds, CEF, digital Europe programme, LIFE, other) and national funding	N/A	66.8 %	N/A
11	International visibility and positioning	Visibility of the partnership in national, European and international policy/industry cycles ^(h)	N/A	6 International events hosted 41 Events attended 24 Digital assets produced 12 Publications and articles 141 Newsletters/items 1142 Social media posts	N/A

N/A, not applicable.

- ^(a) This KPI measures the amount of certified IKAA, in-kind contributions to operational activities and in-cash contributions as per the reporting deadline of 31 May of the reporting year + 1.
- ^(b) This KPI is measured and reported by the projects in their final reports. Therefore, nothing will be reported on this KPI before the closure of the first ER1 and IR1 projects.
- ^(c) This KPI measures the entities participating in the SESAR 3 JU's projects that are from neither a Member State nor an associated country of Horizon Europe.
- ^(d) This figure reports the participations in the ER1 and IR1 projects.
- ^(e) This KPI measures the participations in the SESAR 3 JU call for proposals funded under Horizon Europe in the reporting year.
- ^(f) The baseline is the number of members at the creation of the SESAR 3 JU.
- ^(g) For this KPI, newcomers are defined as entities that did not participate in SESAR 2020 projects.
- ^(h) The activities reported in this KPI are further developed and detailed in Section 2.1.

TABLE A9: KPI 7 – NUMBERS AND TYPES OF NEWCOMER BENEFICIARIES IN FUNDED PROJECTS (BY TYPES AND COUNTRIES OF ORIGIN) IN 2023 (ER1 AND IR1 CALLS)

Country	Higher education institutions	Private for-profit companies	Public bodies	Research organisations	Other	Total
Austria	—	2	—	—	—	2
Belgium	1	9	—	2	5	17
Canada	—	—	—	—	1	1
Switzerland	—	2	—	—	—	2
Cyprus	—	—	—	—	—	0
Czechia	—	—	—	1	—	1
Germany	2	8	—	1	—	11
Denmark	—	2	—	—	—	2
Estonia	—	3	1	—	—	4
Greece	—	4	1	1	—	6
Spain	1	9	1	1	1	13
Finland	—	—	—	1	—	1
France	—	6	—	1	—	7
Ireland	—	2	—	—	—	2
Israel	—	1	—	—	—	1
Iceland	—	1	—	—	—	1
Italy	—	10	—	1	—	11
Lithuania	—	—	—	1	—	1
Luxembourg	—	1	—	—	—	1
Latvia	—	1	—	—	—	1
Malta	1	—	—	—	—	1
Netherlands	—	2	1	—	—	3
Portugal	1	—	—	—	—	1
Romania	—	—	—	1	—	1
Singapore	1	—	—	—	—	1
Slovakia	—	1	—	—	—	1
Türkiye	—	2	1	—	—	3
Ukraine	—	1	—	—	—	1
United Kingdom	2	4	—	—	—	6
United States	—	1	1	—	—	2
Total	9	72	6	11	7	105

6. Scoreboard of Key Performance Indicators specific to the SESAR 3 JU

TABLE A10: SESAR 3 JU KPI SCOREBOARD

KPI name	Unit of measurement	Baseline (2020)	Result for 2023	Target for 2027	Ambition beyond 2027
Resources (input), processes and activities^(a)					
Signed grants	Number	0	50	140	140
Calls capturing synergies with other EU programmes and initiatives	Number	0	4	10	10
Complementary funding (mainly CEF)	Million EUR	0	116	400	600
Partners' contribution	Million EUR	0	154	928	1600
Outcomes					
Key Solutions delivered at TRL6	Number	0	0	32	77
Progress of delivering development activities against the European ATM Master Plan vision (SESAR 1, SESAR 2020, DES programme)	%	39 ^(b)	64	86	100
Key Solutions with supporting standards & regulations ^(c)	Number	0	0	21	50
Market deployment of Phase C Key Solutions	%	0	4	10	20
Impacts					
Contribution to Capacity:					
Airports	% increase (peak	21.4	23	(Achieved)	10
TMA	hourly throughput)	27.6	36	36.5	47
En Route		48.8	60	(Achieved)	49
Contribution to Punctuality (reduction of minutes of delay per departure)	% increase	11	18	—	10–30
Contribution to Fuel savings (and CO ₂ emissions)	Kilograms of fuel per flight	147.4	180.8	204.5	250–500
Contribution to ATCO Productivity	% increase	74.7	85	103.3	97.7
Contribution to Technology Cost reduction per flight	% reduction	30.8	31	—	43.4

^(a) Except for the KPIs measured in %, the figures reported under 'Resources (input), processes and activities' and 'Outcomes' are cumulative.

^(b) For this indicator, the baseline is 2019.

^(c) Solutions at TRL6.

7. Assessment of the internal control system

TABLE A11: ASSESSMENT OF THE SESAR 3 JU INTERNAL CONTROL SYSTEM IN 2023

ID	Control description	Type	Target	Measured value ^(a)	Measurement frequency	Date of latest measurement
CONTROL ENVIRONMENT						
1. The SESAR 3 JU demonstrates a commitment to integrity and ethical values						
C1P01-01	% of managers/staff who participated in the SESAR 3 JU corporate training on ethics	Min. %	100 %	0 %	Yearly	31 December 2023
C1P01-02	An annual reminder about declaring conflicts of interest was sent to all managers and staff	Score (0–3) ^(b)	3	3	Yearly	31 December 2023
C1P01-03	A code of conduct / ethical guidance exists and all staff members have access to it in the information and document management system	Score (0–3)	3	3	Yearly	31 December 2023
2. The board demonstrates independence from management and exercises oversight of the development and performance of internal control						
C1P02-01	The SESAR 3 JU provides information and participates in regular coordination mechanisms so that the Commission, and in particular DG Mobility and Transport, exercises effective oversight of the SESAR 3 JU's activities	Score (0–3)	3	3	Quarterly	31 December 2023
C1P02-02	GB meetings regularly deal with the topics of risk management, risk allocation and internal control	Score (0–3)	3	3	Yearly	31 December 2023
C1P02-03	The management has a clear view of the specific activities they are responsible for, in compliance with their job description, and keeps track of the main issues identified	Score (0–3)	3	3	Yearly	31 December 2023
C1P02-04	The Head of Unit in charge of risk management and internal control signs Appendix 8 — Statement of the Head of Unit in charge of risk management and internal control A declaration of assurance (Appendix 2 of ICF) is signed annually by the Authorizing Officer.	Score (0–3)	3	3	Yearly	31 December 2023

ID	Control description	Type	Target	Measured value ^(a)	Measurement frequency	Date of latest measurement
3. Management establishes, with political oversight, structures, reporting lines, and appropriate authorities and responsibilities in the pursuit of objectives						
C1P03-01	Clear management structures are established and implemented at every level of the organisation; notably, roles and tasks are clearly defined in the financial circuits The supervisory activities focus particularly on high-risk areas	Score (0–3)	3	3	Quarterly	31 December 2023
C1P03-02	Each job in the SESAR 3 JU is linked with the SESAR 3 JU's objectives and priorities	Score (0–3)	3	3	Yearly	31 December 2023
C1P03-03	Managers have a clear view of the activities within their teams and keep track of the main issues identified through regular team meetings	Score (0–3)	3	3	Half-yearly	31 December 2023
4. The SESAR 3 JU demonstrates a commitment to attracting, developing and retaining competent individuals in alignment with objectives						
C1P04-02	The catalogue of training course sessions takes into account the skills needed at the SESAR 3 JU level in accordance with the learning and development policy	Score (0–3)	3	3	Yearly	31 December 2023
C1P04-03	The SESAR 3 JU complies with the rules on promotion within the organisation, and vacancies are open to internal candidates	Score (0–3)	3	3	Yearly	31 December 2023
5. The SESAR 3 JU holds individuals accountable for their internal control responsibilities in the pursuit of objectives						
C1P05-01	The SESAR 3 JU implements a career development review for SESAR 3 JU staff where: mutual expectations are set and responsibilities are clearly allocated; performance is reviewed and assessed on a yearly basis; reclassification is decided	Score (0–3)	3	3	Yearly	31 December 2023
RISK ASSESSMENT						
6. The SESAR 3 JU specifies objectives with sufficient clarity to enable the identification and assessment of risks relating to objectives						
C2P06-01	Number of critical and very important recommendations from internal auditors	Max. number	1	0	Yearly	31 December 2023
C2P06-02	Number of financial/non-financial exceptions and non-compliance events	Max. number	4	3	Yearly	31 December 2023

ID	Control description	Type	Target	Measured value ^(a)	Measurement frequency	Date of latest measurement
C2P06-03	The SESAR 3 JU has a mission statement, clearly stated in a formalised document and easily accessible to all	Score (0–3)	3	3	Yearly	31 December 2023
C2P06-04	The BAWP clearly states the order of priorities among the main tasks in case of significant changes	Score (0–3)	3	3	Yearly	31 December 2023
C2P06-05	The SESAR 3 JU monitors the achievement of objectives through the indicators; the management ensures that all abnormalities in the progress of the objectives' achievement are reported when appropriate	Score (0–3)	3	3	Quarterly	31 December 2023
7. The SESAR 3 JU identifies risks to the achievement of its objectives across the organisation and analyses risks as a basis for determining how the risks should be managed						
C2P07-01	Management regularly reviews progress towards the specific objectives, and strategic and operational risks in the SESAR 3 JU have been identified/assessed at the appropriate level	Score (0–3)	3	3	Half-yearly	31 December 2023
C2P07-02	Management puts mitigation plans in place for the risks identified in the risk register, and regularly monitors their implementation	Score (0–3)	3	3	Half-yearly	31 December 2023
8. The SESAR 3 JU considers the potential for fraud in assessing risks to the achievement of objectives						
C2P08-01	The SESAR 3 JU has an up-to-date anti-fraud strategy (not older than 3 years), which is based on a stand-alone risk assessment	Score (0–3)	3	3	Yearly	31 December 2023
C2P08-02	Number of opened and ongoing OLAF cases during the reporting year	Max, number	0	0	Yearly	31 December 2023
C2P08-03	The SESAR 3 JU informs its staff about the rules relating to conflict of interests, fraud prevention and reporting of irregularities	Score (0–3)	3	3	Yearly	31 December 2023
9. The SESAR 3 JU identifies and assesses changes that could significantly impact the internal control system						
C2P09-01	A procedure exists for updating the objectives to take into account significant changes in activities and priorities	Score (0–3)	3	3	Quarterly	31 December 2023

ID	Control description	Type	Target	Measured value ^(a)	Measurement frequency	Date of latest measurement
CONTROL ACTIVITIES						
10. The SESAR 3 JU selects and develops control activities that contribute to the mitigation of risks to the achievement of objectives to acceptable levels						
C3P10-01	A control strategy exists and has been reviewed/updated, and staff have been made aware of it	Score (0–3)	3	2	Yearly	31 December 2023
C3P10-02	Number of business continuity exercises performed during the year for which lessons learnt are documented and implemented	Min. number	0	0	Yearly	31 December 2023
C3P10-03	Number of security exercises performed during the year for which lessons learnt are documented and implemented	Min. number	1	0	Yearly	31 December 2023
C3P10-04	ABAC access rights are reviewed once a year	Score (0–3)	3	3	Yearly	31 December 2023
C3P10-05	A list of critical functions exists	Score (0–3)	3	3	Yearly	31 December 2023
C3P10-06	The SESAR 3 JU has a business continuity plan	Score (0–3)	3	3	Yearly	31 December 2023
11. The SESAR 3 JU selects and develops general control activities over technology to support the achievement of objectives						
C3P11-01	Number of IT security incidents reported during the year with impact on the confidentiality, integrity or availability of information systems	Max. number	0	0	Monthly	31 December 2023
C3P11-02	Statistics on system downtime, server capacity and other performance indicators are regularly analysed. System performance issues are reported to the appropriate management level	Score (0–3)	3	3	Monthly	31 December 2023
C3P11-03	Feedback from IT users regarding system performance is collected and analysed	Score (0–3)	3	3	Yearly	31 December 2023
C3P11-04	The SESAR 3 JU has defined and operates an appropriate organisation for the management of the information systems it uses (generally in the form of an IT steering committee). Each information system owned by the SESAR 3 JU possesses a clearly identified business owner (and is overseen by a steering committee). The IT steering committee takes appropriate action if necessary	Score (0–3)	3	3	Quarterly	31 December 2023

ID	Control description	Type	Target	Measured value ^(a)	Measurement frequency	Date of latest measurement
12. The SESAR 3 JU deploys control activities through corporate policies that establish what is expected and in procedures that put policies into action						
C3P12-01	Exceptions and non-compliance events are systematically reported in the exception register according to defined and documented procedures	Score (0–3)	3	3	Yearly	31 December 2023
C3P12-02	A policy, processes and procedures for information security exist, and staff have been made aware of them	Score (0–3)	3	3	Yearly	31 December 2023
C3P12-03	A policy, processes and procedures for document management exist, and staff have been made aware of them	Score (0–3)	3	2	Yearly	31 December 2023
C3P12-04	A policy, processes and procedures for data protection exist, and staff have been made aware of them	Score (0–3)	3	3	Yearly	31 December 2023
C3P12-05	A policy, processes and procedures for public access to documents exist, and staff have been made aware of them	Score (0–3)	3	3	Yearly	31 December 2023
C3P12-06	Appropriate control procedures are in place for the SESAR 3 JU's main operational and financial processes and for the main ICT systems and services	Score (0–3)	3	3	Yearly	31 December 2023
C3P12-07	The main SESAR 3 JU processes are defined and described/ documented and are applied in practice	Score (0–3)	3	2	Half-yearly	31 December 2023
INFORMATION AND COMMUNICATION						
13. The SESAR 3 JU obtains or generates and uses relevant quality information to support the functioning of internal control						
C4P13-01	The SESAR 3 JU implements a quality policy and quality manual that includes reference to internal control and its monitoring	Score (0–3)	3	1	Yearly	31 December 2023
14. The SESAR 3 JU internally communicates information, including objectives and responsibilities for internal control, necessary to support the functioning of internal control						
C4P14-01	The SESAR 3 JU has an internal communication strategy in place	Score (0–3)	3	3	Yearly	31 December 2023
C4P14-02	Regular team meetings and staff briefings take place to share information within the teams at various levels	Score (0–3)	3	3	Quarterly	31 December 2023

ID	Control description	Type	Target	Measured value ^(a)	Measurement frequency	Date of latest measurement
C4P14-03	Arrangements are in place to ensure that management and staff are informed of other units' or departments', or the SESAR 3 JU's, decisions/projects/initiatives that may affect their responsibilities and tasks	Score (0–3)	3	3	Half-yearly	31 December 2023
15. The SESAR 3 JU communicates with external parties about matters affecting the functioning of internal control						
C4P15-01	Communication activities are aligned with the European Commission's political priorities	Score (0–3)	3	3	Half-yearly	31 December 2023
C4P15-02	The chief external affairs and communication brings the communication planning to the corporate management team for approval	Score (0–3)	3	3	Yearly	31-01-2023
C4P15-03	An external communication strategy and implementation plan exist	Score (0–3)	3	3	Yearly	31-10-2023
MONITORING ACTIVITIES						
16. The SESAR 3 JU selects, develops and performs ongoing and/or separate assessments to ascertain whether the components of internal control are present and functioning						
C5P16-01	Specific and continuous assessment exercises have been coordinated horizontally in the context of the ICF	Score (0–3)	3	3	Yearly	31 December 2023
C5P16-02	The SESAR 3 JU performs regular staff surveys (every 2–3 years) to monitor the commitment and satisfaction of staff	Score (0–3)	3	3	Yearly	31 December 2023
17. The SESAR 3 JU assesses and communicates internal control deficiencies in a timely manner to those parties responsible for taking corrective action, including senior management, as appropriate						
C5P17-01	The results of the continuous and specific assessment have been discussed with the senior management and the board	Score (0–3)	3	3	Yearly	31 December 2023
C5P17-02	The results of the continuous and specific assessment of internal control have been properly disclosed in the CAAR	Score (0–3)	3	3	Yearly	31 December 2023

^(a) Colour shading of cells based on measured value figures: green, measured value equals target; yellow, measured value is slightly less than target but not 0; red, measured value is well below target or is 0.

^(b) 0, not implemented; 1, limited implementation; 2, implementation in progress; 3, fully implemented.

8. Statement of the manager in charge of risk management and internal control

I, the undersigned,

Head of unit in charge of risk management and internal control within the SESAR 3 JU,

In my capacity as manager in charge of risk management and internal control, declare that, in accordance with the SESAR 3 JU's internal control framework, I have reported my advice and recommendations on the overall state of internal control in the joint undertaking to the Executive Director.

I hereby certify that the information provided in the present CAAR and in its annexes is, to the best of my knowledge, accurate, reliable and complete.

Brussels, 25 June 2024

(Signed)

Alain Siebert

Chief Technology and Strategy

Head of Unit in charge of risk management and
internal control

SESAR 3 Joint Undertaking

9. In-kind contributions to additional activities report

OVERVIEW ACTUAL AA FOR 2023 – EUROCONTROL (in M EUR)								
Category of the additional activities (AA)	Description of the AAs	Contribution to JU objectives or KPIs of the JU	Link to specific JU project/ call/topic	Total estimated value AA (in M€) as submitted in the AA Plan in October 2023	Total actual value AA (in M€)	Of which Certified actual value AA (in M€)	Total actual value AA (in M€) - Rejected by GB	Total actual value AA (in M€) - Accepted by GB
Support to additional R&I				3,523	5,231	5,231	0,000	5,231
Scale up of technologies				0,540	0,753	0,753	0,000	0,753
Demonstrators				1,560	1,772	1,772	0,000	1,772
Creating new business opportunities				0,100	0,130	0,130	0,000	0,130
Training & skilling development				0,000	0,000	0,000	0,000	0,000
Contribution to the development of new standards, regulations and policies				4,534	6,764	6,764	0,000	6,764
Supporting ecosystem development				1,327	1,528	1,528	0,000	1,528
Communication, dissemination, awareness raising, citizen engagement				0,166	0,333	0,333	0,000	0,333
Others				0,000	0,000	0,000	0,000	0,000
TOTAL ACTUAL IKAA				€11,750	€16,512	€16,512	€0,000	€16,512

OVERVIEW ACTUAL AA FOR 2023 - Other Members (in M EUR)								
Category of the additional activities (AA)	Description of the AAs	Contribution to JU objectives or KPIs of the JU	Link to specific JU project/ call/topic	Total estimated value AA (in M€) as submitted in the AA Plan in October 2023	Total actual value AA (in M€)	Of which Certified actual value AA (in M€)	Total actual value AA (in M€) - Rejected by GB	Total actual value AA (in M€) - Accepted by GB
Support to additional R&I								
				5,076	5,564	0,974	0,000	5,564
Scale up of technologies								
				19,561	11,084	2,188	0,000	11,084
Demonstrators								
				1,283	1,061	0,175	0,000	1,061
Creating new business opportunities								
				0,023	0,054	0,000	0,000	0,054
Training & skilling development								
				0,000	0,000	0,000	0,000	0,000
Contribution to the development of new standards, regulations and policies								
				0,112	6,651	0,000	0,000	6,651
Supporting ecosystem development								
				21,750	17,745	9,935	0,000	17,745
Communication, dissemination, awareness raising, citizen engagement								
				0,180	0,802	0,000	0,000	0,802
Others								
				44,136	30,866	0,831	0,000	30,866
TOTAL ACTUAL IKAA				€92,120	€73,827	€14,103	€0,000	€73,827

NB: AA, additional activities.

TOTAL IKAA 2021-2023 (Evolution- Value in M€)		
Planned IKAA	Reported IKAA with pending certification	Certified IKAA
194.7	148.0	45.3

10. Final annual accounts

The tables below present an extract of the final accounts of the SESAR 3 JU for 2023, which were handed over, as a separate document, to the budgetary authorities, the ECA and the external auditors. The final annual accounts 2023 have been published on the [SESAR 3 JU website](#).

Balance Sheet

	Note	31.12.2023	31.12.2022
NON-CURRENT ASSETS			
<i>Intangible assets</i>	2.1	1,620.00	-
<i>Property, plant and equipment</i>	2.2	71,391.00	101,544.00
<i>Long term pre-financing</i>	2.3	79,638,577.57	-
		79,711,588.57	101,544.00
CURRENT ASSETS			
<i>Short term pre-financing</i>	2.3	63,488,157.22	10,492,214.12
<i>Exchange receivables and non-exchange recoverables</i>	2.4	21,689,892.52	109,044,624.46
<i>Cash and cash equivalents</i>	2.5	4,892.69	9,232.43
		85,182,942.43	119,546,071.01
TOTAL ASSETS		164,894,531.00	119,647,615.01
CURRENT LIABILITIES			
<i>Short term provisions</i>	2.6	—	1,533,666.83
<i>Payables and other liabilities</i>	2.7	36,797,548.67	175,730,904.81
<i>Accrued charges and deferred income</i>	2.8	22,767,797.32	28,098,946.51
TOTAL LIABILITIES		59,565,345.99	205,363,518,15
NET ASSETS			
<i>Contribution from Members</i>	2.9	3,072,510,792.39	2,776,715,639.04
<i>Accumulated deficit</i>		(2,862,431,542.18)	(2,673,233,664.21)
<i>Economic result of the year</i>		(104,750,065.20)	(189,197,877.97)
TOTAL NET ASSETS		105,329,185.01	(85,715,903.14)
LIABILITIES AND NET ASSETS		164,894,531.00	119,647,615.01

Statement of financial performance

	Note	2023	2022
REVENUE			
Revenue from non-exchange transactions			
<i>Recovery of operating expenses</i>	3.1	735,726.31	1,358,726.30
Revenue from exchange transactions			
<i>Other exchange revenue</i>	3.3	24,155.20	44.01
Total revenue		777,881.51	1,358,770.31
EXPENSES			
<i>Operating costs</i>	3.4	(96,240,456.56)	(180,509,553.75)
<i>Staff costs</i>	3.5	(5,321,636.14)	(4,532,034.86)
<i>Finance expenses</i>	3.6	(604,724.34)	(14,775.09)
<i>Other expenses</i>	3.7	(3,361,129.67)	(5,500,284.58)
Total expenses		(105,527,312.86)	(190,556,648.28)
ECONOMIC RESULT OF THE YEAR		(104,750,065.20)	(189,197,877.97)

Cash flow statement

	2023	2022
Economic result of the year	(104,750,065.20)	(189,197,877.97)
Operating activities		
<i>Depreciation and amortization</i>	53,987.24	54,385.39
<i>(Increase)/decrease in pre-financing</i>	(132,634,520.67)	80,981,540.99
<i>(Increase)/decrease in exchange receivables and non-exchange recoverables</i>	87,354,731.94	(54,986,140.14)
<i>Increase/(decrease) in payables</i>	(138,933,356.14)	78,548,424.16
<i>Increase/(decrease) in accrued charges & deferred income</i>	(5,331,149.19)	(7,552,416.79)
<i>Increase/(decrease) in cash contributions</i>	190,657,493.27	5,809,031.57
<i>Increase/(decrease) in in-kind contributions</i>	105,137,660.08	84,827,978.58
<i>Other non-cash movements</i>	(1,533,666.83)	1,533,666.83
Investing activities		
<i>(Increase)/decrease in intangible assets and property, plant and equipment</i>	(25,454,24)	(13,507.57)
NET CASHFLOW	4,339.74	5,087,05
<i>Net increase/(decrease) in cash and cash equivalents</i>	4,339.74	5,087,05
<i>Cash and cash equivalents at the beginning of the year</i>	9,232,43	4,145,38
<i>Cash and cash equivalents at year-end</i>	4,892.69	9,232,43

Statement of changes in net assets

	Contribution from Members	Accumulated Surplus/ (Deficit)	Economic result of the year	Net Assets
BALANCE AS AT 31.12.2021	2,686,078,628.89	(2,497,254,441.81)	(175,979,222.40)	12,844,964.68
<i>Allocation 2021 economic result</i>	-	(175,979,222.40)	175,979,222.40	-
<i>Cash contribution</i>	57,334,755.41	—	—	57,334,755.41
<i>Contribution in kind</i>	84,827,978.58	—	—	84,827,978.58
<i>Unpaid cash contributions</i>	(51,525,723.84)			(51,525,723.84)
<i>Economic result of the year</i>	—	—	(189,197,877.97)	(189,197,877.97)
BALANCE AS AT 31.12.2022	2,776,715,639.04	(2,673,233,664.21)	(189,197,877.97)	(85,715,903.14)
<i>Allocation 2022 economic result</i>	—	(189,197,877.97)	189,197,877.97	-
<i>Cash contribution</i>	190,657,493.27	—	—	190,657,493.27
<i>Contribution in kind</i>	105,137,660.08	—	—	105,137,660.08
<i>Economic result of the year</i>	—	—	(104,750,065.20)	(104,750,065.20)
BALANCE AS AT 31.12.2023	3,072,510,792.39	(2,862,431,542.18)	(104,750,065.20)	105,329,185.01

11. Materiality criteria

The assessment of the effectiveness of the SESAR 3 JU control system for Horizon 2020 grants is based mainly, but not exclusively, on the results of *ex post* audits. Effectiveness is expressed in terms of detected and residual error rates, calculated using a representative sample on an annual basis and on a multiannual basis.

The starting point for determining the effectiveness of the controls in place is the cumulative level of error, expressed as the percentage of errors in favour of the SESAR 3 JU, detected by *ex post* audits, measured with respect to the amounts accepted after *ex ante* controls.

To take into account the impact of the *ex post* controls, this error level is adjusted by subtracting:

- ▶ errors detected and corrected as a result of the implementation of audit conclusions;
- ▶ errors corrected as a result of the extension of audit results to non-audited contracts with the same beneficiary.

This results in a residual error rate, which is calculated as follows:

$$\text{ResER}\% = \frac{(\text{RepER}\% * (P - A)) - (\text{RepERSys}\% * E)}{P}$$

where:

- ▶ **ResER%** represents the residual error rate, expressed as a percentage;
- ▶ **RepER%** represents the representative error rate, or error rate detected in the representative sample, in the form of a weighted average error rate, expressed as a percentage and calculated as described below;
- ▶ **RepERSys%** represents the portion of the RepER% representing negative systematic errors, expressed as a percentage;
- ▶ **P** represents the total requested SESAR contribution (EUR) in the auditable population (i.e. all paid financial statements);
- ▶ **A** represents the total requested SESAR contribution (EUR), as approved by financial officers, of all audited financial statements (this is collected from audit results);
- ▶ **E** represents the total non-audited requested SESAR contribution (EUR) of all audited beneficiaries.

The representative error rate is established as a weighted average error rate identified for an audited representative sample.

The weighted average error rate is calculated according to the following formula:

$$\text{RepER}\% = \frac{\Sigma(er)}{A}$$

where:

- ▶ **Σ(er)** represents the sum of all individual errors of the sample – only the errors in favour of the JU will be taken into consideration;
- ▶ **A** represents the total amount (EUR) of the audited sample.

Multiannual approach

As a result of the multiannual nature of the SESAR 3 JU, the effectiveness of its controls can be fully measured and assessed only in the final stages of the programme's lifetime, once the *ex post* audit strategy has been fully implemented and systematic errors have been detected and corrected.

The control objective is to ensure, for the SESAR Horizon 2020 programme, that the residual error rate, which represents the level of errors that remain undetected and uncorrected, does not exceed 2 % of the total expense recognised until the end of the programme.

If the residual error rate is higher than 5 %, a reservation should be made and an additional action plan should be drawn up.

These thresholds are consistent with those established by the Commission and by the ECA for its annual assessment of the effectiveness of the control systems operated by the Commission.

Notwithstanding the multiannual span of the control strategy, the Executive Director is required to sign a statement of assurance for each financial year. In order to determine whether this statement of assurance should be qualified with a reservation, the effectiveness of the control systems in place needs to be assessed not only for the year of reference, but also from a multiannual perspective, to determine whether it is possible to reasonably conclude that the control objective will be met in the future as planned.

In view of the crucial role of *ex post* audits, this assessment needs to check, in particular, whether the scope and results of the *ex post* audits carried out until the end of the reporting period are sufficient and adequate, respectively, to meet the multiannual control strategy goals.

Adequacy of the scope

The adequacy of the scope of the (cumulative) audit effort carried out until the end of each year is to be measured by comparing the planned with the actual volume of audits completed.

The data are to be shown per year and cumulated, in line with the current annual activity report presentation of error rates.

The Executive Director should form a qualitative opinion to determine whether deviations from the plan are of such significance that they seriously endanger the achievement of the control objective for the programmes. If this were the case, the Executive Director would be expected to qualify their annual statement of assurance with a reservation.

Audit coverage: SESAR-specific Horizon 2020 audits

By the end of 2023, the SESAR 3 JU had audited 124 participations, covering 11.3 % of its Horizon 2020 expenditure to date. This percentage refers to the value of the participations of the audited beneficiaries, also referred to as the 'direct' coverage. The non-audited participations of the audited beneficiaries, also referred to as the 'indirect' coverage, which after the full treatment of audit results are considered clean from systemic errors, are calculated as 73.5 %, with a total (direct and indirect) coverage of 85 %.

12. Abbreviations

Abbreviation	Definition
AAM	advanced air mobility
ABAC	attribute-based access control
ACI	Airports Council International
ADS-C	automatic dependent surveillance contract
AI	artificial intelligence
AOP	airport operations plan
ATC	air traffic control
ATCO	air traffic controller
ATFM	air traffic flow management
ATM	air traffic management
ATS	air traffic service
ATSU	air traffic service unit
AZEA	Alliance for Zero-Emission Aviation
BAWP	biannual work programme
BMR	biennial monitoring report
CAAR	consolidated annual activity report
CANSO	Civil Air Navigation Services Organisation
CAS	Common Audit Service
CEF	Connecting Europe Facility
CINEA	European Climate, Infrastructure and Environment Executive Agency
CNS	communication, navigation and surveillance
CO2	carbon dioxide
DAC	dynamic airspace configuration
DCB	demand–capacity balancing
DES	Digital European Sky
DPAA	data protection administrative arrangement
DPO	data protection officer
DSD	Digital Sky Demonstrator
EASA	European Union Aviation Safety Agency
ECA	European Court of Auditors
EDA	European Defence Agency
EDPS	European Data Protection Supervisor
EFTA	European Free Trade Association
ER	exploratory research
ESA	European Space Agency

Abbreviation	Definition
EU-Rail JU	Europe's Rail Joint Undertaking
EUROCAE	European Organisation for Civil Aviation Equipment
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAA	Federal Aviation Administration
FTE	full-time equivalent
GANP	global air navigation plan
GB	Governing Board
IAC	Internal Audit Capability
IAS	Internal Audit Service
ICAO	International Civil Aviation Organization
ICT	information and communications technology
IFR	instrument flight rules
IKAA	in-kind contributions to additional activities
IKOP	in-kind contributions to operational activities
IR	industrial research and validation
IT	information technology
KIP	key impact pathway
KPI	key performance indicator
LDACS	L-band digital aeronautical communications system
MOC	memorandum of cooperation
N/A	not applicable
NOP	network operations plan
OLAF	European Anti-Fraud Office
PSO	professional staff organisation
R & D	research and development
R & I	research and innovation
RPAS	remotely piloted aircraft system
SBA	Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the joint undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014 (OJ L 427, 30.11.2021, p. 17), as amended by Council Regulation (EU) 2023/1782 of 25 July 2023 amending Regulation (EU) 2021/2085 establishing the joint undertakings under Horizon Europe, as regards the Chips Joint Undertaking (OJ L 229, 18.9.2023, p. 55) (single basic act)
SC	Scientific Committee
SDM	SESAR Deployment Manager
SESAR	Single European Sky ATM Research
SESAR 2020	SESAR 2020 innovation R & I programme, also referred to as the 'SESAR 2020 Programme' or 'SESAR 2020 R & I Programme'. It is the coordinated set of activities described in this document, being undertaken by the SESAR 3 JU Members and managed by the SESAR 3 JU

Abbreviation	Definition
SESAR JU	Single European Sky ATM Research Joint Undertaking, established as a joint undertaking within the meaning of Article 187 of the Treaty on the Functioning of the European Union, established under Council Regulation (EC) No 219/2007 of 27 February 2007 (OJ L 64, 2.3.2007, p. 1) on the establishment of a joint undertaking to develop the new generation European air traffic management system (SESAR), as amended by Council Regulation (EC) No 1361/2008 of 16 December 2008 (OJ L 352, 31.12.2008, p. 12) and by Council Regulation (EU) No 721/2014 of 16 June 2014 (OJ L 192, 1.7.2014, p. 1)
SESAR 3 JU	Single European Sky ATM Research 3 Joint Undertaking
SMEs	small and medium-sized enterprises
SPO	single-pilot operations
SRG	States' Representatives Group
TBO	Trajectory based operation
TCG	Technical Coordination Group
TMA	terminal manoeuvring area
TRL	technology readiness level
UAM	urban air mobility
UAS	unmanned aerial system
VHF	very high frequency
VLD	very large-scale demonstration
WER	wake energy retrieval



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