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EVALUATION

Interim Evaluation of the Horizon Europe Framework Programme for Research and Innovation (2021 - 2024)

Accompanying the document

Communication from the Commission to the European Parliament and the Council

Horizon Europe: Research and Innovation at the heart of competitiveness

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Annex 19: Evaluation of SESAR 3 JU

Annex to the Commission's interim evaluation of Horizon Europe

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The Single European Sky Air Traffic Management Research (SESAR) project has been the flagship EU initiative to modernize the European Air Traffic Management (ATM) through the development and implementation of new generation technologies and organisation of the airspace.

The SESAR Joint Undertaking oversees the Research and Innovation activities of the SESAR project, in accordance with the Air Traffic Management (ATM) Master Plan[1], within a complete ATM innovation cycle. It is referred to as SESAR 2020 JU (shortened SJU, for the period 2014 until 2021) [2] or SESAR 3 JU (shortened S3JU, as from 2021).

Both SJU and S3JU stand out for being three-party JUs – the Union and private sector are joined by an international organisation in the domain of ATM – EUROCONTROL.[3] The participation of EUROCONTROL has enabled availability of the best knowledge base relating to ATM and has increased the resources available for the ATM research projects (details in chapter 3 below).

SESAR Joint Undertaking coordinated the European ATM policy and ensured the widespread buy-in of relevant ATM stakeholders in Europe and internationally. However, some of planned research was not concluded and is currently undertaken in the Digital European Sky (DES) programme.[4]

SESAR 3 Joint Undertaking (S3JU) has brought together 57 members representing a variety of actors from the aviation sector (see details in chapter 4).

1. Effectiveness

SESAR policy framework and the European ATM Master Plan

The SESAR project is the technological pillar of the Single European Sky (SES)[5]. Therefore, the effectiveness of the SESAR project is not solely linked to the results of the research projects, but to the overall modernisation of the European ATM.

In accordance with Article 1.5 of the Regulation (EU) 721/2014, the SESAR Joint Undertaking is the EU body responsible for the European ATM Master Plan (ATM MP), the agreed roadmap that connects ATM research and development activities with deployment scenarios to achieve the performance objectives of the SES. This task was also assigned to the S3JU in the Single Basic Act[6]. This evaluation covers two ATM MP versions (2015[7] and 2020[8]) and preparation of the 2025 update of the ATM MP.

[1] More about the ATM Master Plan: https://www.sesarju.eu/MasterPlan2025
2 Council Regulation (EU) No 721/2014 of 16 June 2014 amending Regulation (EC) No 219/2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system (SESAR) as regards the extension of the Joint Undertaking until 2024, OJ L 192, 1.7.2014, p. 1–8.
[3] EUROCONTROL is a pan-European, civil-military organisation dedicated to supporting European aviation.
[4] 'Digital European Sky' refers to the vision of the European ATM Master Plan, seeking to transform Europe's aviation infrastructure enabling it to handle the future growth and diversity of air traffic safely and efficiently, while minimising environmental impact. For more see: https://op.europa.eu/publication-detail/-/publication/c9771e7f-5555-11eb-b59f-01aa75ed71a1
[5] For the concept and the elements of the SES policy see: https://transport.ec.europa.eu/transport-modes/air/single-european-sky_en
[6] 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. 17–119.
[7] European ATM master plan – Edition 2015, https://data.europa.eu/doi/10.2829/240873
[8] European ATM master plan – 2020 edition, https://data.europa.eu/doi/10.2829/695700

The 2015 edition of the ATM MP was a significant refinement of the initial vision from 2009, bringing together performance aspects and technological enablers. The time horizon of the European ATM Master Plan was extended up to 2035. It also referred to the key features of the SESAR2020 programme and to the Pilot Common Project[9].

The 2020 edition of the ATM MP was a response to critical factors affecting air navigation in Europe, such as the increase of traffic, the growing concern on environmental topics, and the new entrants as users of the European airspace. This 2020 edition of the European ATM Master Plan describes four phases (from A to D) extending from 2020 to 2040. The phases reflect the gradual move towards a new ATM service model which will rely on further assistance of intelligent IT systems, extensive information exchange between air and ground operators and introduction of high level of automation.

The Phase A addressed known critical network performance deficiencies by delivering solutions that enhance collaboration between stakeholders, including across state borders and with aircraft, implementing initial system-wide information management, and introducing network capacity and demand balancing measures.

Phase B added efficient services and infrastructure delivery through the launch of first ATM data services, the introduction of cross-border free-route operations, and the integration of advanced airport performance management into the network and the provision of initial U-space services.

The Phase C, which was the focus of the SJU, tackled defragmentation European skies through virtualisation and dynamic airspace configuration, supported by the gradual introduction of higher levels of automation support, the full integration of airports into ATM at network level and the management of routine drone operations.

Phase D aims for Digital European sky with a fully scalable, highly automated ATM system leading to a safety level above current levels.

The above evolution of the ATM MP vision, and timeline poses a challenge for evaluating the real-life effectiveness of the SESAR project. The lead time from a concept entering the exploratory research phase to its full deployment across European ATM takes on average longer than the duration of one SESAR programme. However, the SESAR project has proven through the establishment of the SESAR innovation cycle and the institution of the common projects to establish and keep the link between research and deployment. The ATM MP update introduced the concept of SESAR Deployment Objectives (SDOs), which in systematic manner enables the evaluation of the state of deployment of the SJU and S3JU research results[10].

Effectiveness of the SJU (2014 – 2021)

From its launch in 2014, the objective of the SJU with its SESAR2020 programme[11] was to ensure the modernisation of the European ATM system by coordinating and concentrating the relevant research and development efforts in the European Union. The SESAR 2020 programme mission statement included modernising the European ATM system to address

[9] Commission Implementing Regulation (EU) No 409/2013 of 3 May 2013 on the definition of common projects, the establishment of governance and the identification of incentives supporting the implementation of the European Air Traffic Management Master Plan.
[10] The 2025 edition of the ATM Master Plan is available here: https://www.sesarju.eu/MasterPlan2025
[11] https://www.sesarju.eu/sites/default/files/-factsheet_SESAR-final-web.pdf

the fragmentation of the European airspace and improving its performance in terms of capacity, punctuality, efficiency, and environmental footprint.

Over its period of activity, the SJU supported 156[12] projects which led to the definition and development of 137 technological solutions, up to a technical readiness level (TRL) 6 or above[13]. SESAR solutions are in most cases ATM technologies that lead to efficiency gains of the ATM operation in Europe, increasing the capacity of the European skies or reducing the environmental impact of the aviation[14] as a whole and the ATM sector more specifically. SJU also maintained the ATM MP with two updated versions, elaborated with the active involvement of the ATM sector.

SJU was successful in fulfilling its objective of coordination and concentration of ATM related research in Europe. A survey of the State Representative Group of the S3JU on the national research programmes15 concluded that by 2024 no significant alternative to the SESAR project in the domain of the ATM exists in the EU. The SESAR 2020 programme channelled most of the European ATM research efforts into a single research programme[16], thus ensuring a cohesion and alignment towards the ambition of the Master Plan, and of the Single European Sky.

However, the solutions developed under the SJU programme cover 44% of the Phase C vision of the ATM MP[17], with 55 Phase C key SESAR Solutions not completing TRL 6 at the end of the programme and falling short of the original ambition of 84 solutions by 2023 due to the negative impact of the COVID 19 crisis and R&D challenges[18].

The first industrial research call launched by the S3JU under the DES programme included a specific work area and budget to complete the research and development activities of the Phase C of the ATM MP. The selected projects will complete 22 SESAR solutions needed to achieve the remaining share of the ATM MP Phase C vision and its performance ambitions.

In terms of **scientific impact**, the external evaluation of the SJU and S3JU[19], provides results of the bibliometric research outputs for the Jus compared to the average of other programmes. SJU achieved 56% of international co-publications, against 39% in Societal Challenge 4 overall domain (SC4) and 34% at the EU research programmes level. SJU also shows a higher disciplinary diversity of authors (factor 1.4) compared to SC4 (factor 1.1) and the EU27 (factor 1.1). SESAR 2020 publications were nearly 5 times (4.7) more often amongst

[12] This includes 149 projects funded under Horizon 2020, six projects under the Connecting Europe Facility and one project under
assigned revenues from the European Parliament.

[13] Full list of SESAR solutions can be found at: https://www.sesarju.eu/catalogue.

[14] The benefits deriving from the implementation of the SESAR solutions can be found: https://assets.ctfassets.net/krj50g99u3hm/2VsoMwtGJGE6WDj1v4UG8m/ed68ba4e8a3fb3497b62c634080227dd/SESAR_Deployment_Manager_Factsheet_April_2024.docx.pdf

[15] https://www.sesarju.eu/news/limited-national-initiatives-confirm-sesar-ju-leadership-european-atm-research

[16] European Commission: Directorate-General for Research and Innovation and Brodnik, C., *Partnership evaluation report – The Single European Sky ATM Research 3 Joint Undertaking – Horizon Europe and the Green Transition – Interim evaluation support study*, Publications Office of the European Union, 2024, p.21, https://data.europa.eu/doi/10.2777/7895247

[17] https://www.sesarju.eu/sesar2020%20closure%20report, p. 7

[18] On the negative impact of Covid on the projects, see details in the Consolidated Activity Reports 2021 (https://www.sesar.eu/node/4164) and 2022 (https://www.sesarju.eu/node/4509)

[19] European Commission: Directorate-General for Research and Innovation and Brodnik, C., *Partnership evaluation report – The Single European Sky ATM Research 3 Joint Undertaking – Horizon Europe and the Green Transition – Interim evaluation support study*, Publications Office of the European Union, 2024, p.20. https://data.europa.eu/doi/10.2777/7895247

highly cited publications at the 5% threshold within their subfield and year compared to almost two times the world level in SC4.

The external evaluation also pointed out that the percentage share of SESAR 2020 academic-private co-publications is at 23% compared to SC4 with 17% and the EU27 with 13%. A proportion of 64% of SESAR 2020 publications was available under open access, against 62% at the SC4 level and 44% at the EU27 overall level. SESAR 2020 publications receiving citations from patents, two was comparable to the SC4 baseline (factor 2.2).

However, the same bibliometric analysis[20] also revealed some weaknesses in the following dimension: SESAR 2020 publications recorded lower levels in all altimetric dimensions (mentions in journalistic pieces, on Facebook, on Twitter and Wikipedia). The share of SESAR 2020 publications mentioned in journalistic pieces is half (1.2) that of the baseline in SC4 (2.3). This value is also slightly lower compared to the share of relevant EU27 publications mentioned in journalistic pieces (1.5). The reasons for the poor performance can be linked to the specific nature of the ATM research and very well-defined target groups for the project results.

Effectiveness of the S3JU (as from 2021)

S3JU has in general similar objectives to its predecessor: to contribute to achieving the SES policy objectives through coordination of the European ATM research activities and by supporting research projects and maintaining and updating the ATM MP. The Single Basic Act entrusts the S3JU with new specific objectives: a) lead the whole SESAR framework into a more digital mindset, and b) further enhance the link between the development and deployment of the innovative ATM solutions, c) development of standards for the industrialisation of SESAR solutions. The new programme requires the S3JU to focus on enabling the DES vision.

Based on the Single Basic Act establishing the JU (Article 174(9)), the S3JU took over SJU activities and closed in 2023 the last remaining projects funded under SESAR 2020 programme. By 1 July 2024, 76 research projects are in execution from the DES programme. 68 projects are funded under Horizon Europe (Exploratory Research, Industrial Research and Validation and Fast-Track) and eight projects under the Connecting Europe Facility[21] (Digital Sky Demonstrators). These projects are expected to deliver results as of the end of 2026. This means that a new wave of SESAR Solutions should complement the 137 already existing ones which are being or could be deployed[22].

Conclusion

During the timeframe of this evaluation, the two JUs have ensured the maintenance of the ATM MP, as required in the legislation. The work of the SJU and S3JU allowed over the period to deliver validated ATM solutions up to TRL6 allowing to cover - if deployed - 100% of the phase B and 44% of the phase C of the ATM MP. The research activities enabled by the JUs have delivered ATM solutions which will once fully deployed deliver the expected enhancements of the European ATM.

[20] Ibid, p. 21
[21] Connecting Europe Facility (CEF) is managed by an EU executive agency CINEA.
[22] More information on the SESAR 3 JU projects portfolio can be found on the SESAR Projects Portal: https://www.sesarju.eu/projects/portal

2. Additionality

Additionality of the SJU

The investments into the SESAR2020 programme[23] were estimated to be €1585 million, including €85 million for exploratory research, €1.2 billion for applied research and pre-industrial development, and €300 million for large-scale demonstrations. The total planned contribution from all partners amounted to €1.4 billion. As a significant additional task, the European Commission allocated to the SJU an additional €10 million from the CEF funds to organise a call for proposals on U-space[24] demonstrations.

At the end of the SESAR 2020 programme, the overall contribution of the partners, reached a total of €1 213,38 million (see Table 1). With this figure, the actual overall investment reached 88% of the initially planned amount. The contribution by Eurocontrol was lower than expected (70% of the planned level), caused by the effects of the COVID-19 pandemic which did not allow research teams to jointly work on certain solutions. In turn, this led to lower than foreseen consumption of research resources, hence also lower net contribution to SJU. In line with this, it led to the leverage (the ratio between EU contribution and combined contribution by industry and EUROCONTROL) of the SJU not reaching its planned target of 1.35 but remaining at 1.14. The private Members exceeded their planned commitments by 2.5%.

Table 1: Planned and realised total net contribution of members other that the Union and EUROCONTROL (Data from S3JU as of the closure of the SJU programme in 2023)

		Industry	EUROCONTROL	Union	TOTAL
Total Net Contribution (EUR million)	Planned	297.13	492.25	585	1,374.38
	Realised	304.27	343.05	566.06	1,213.38

The leverage achieved by the SJU was impacted by the absence, by regulation establishing the SJU, of In-Kind Contributions for Additional Activities (IKAA) option - contrary to several other JUs such as Clean Aviation, Fuel Cell and Hydrogen Joint Undertaking, Bio-Based Industries JU or Shift2Rail - and the effect of the SJU providing funding of Exploratory Research and open calls for Very Large-scale Demonstration activities for which no in-kind contribution was expected.

Additionality of the S3JU

The expected leverage effect for the S3JU based on the budget included into the SBA (Single Basic Act) is 1.67. It is based on the assumption that the Union will make a financial contribution of €600 million to the S3JU budget, which will be matched by at least €500 million contribution of the private members and up to €500 million contributions of EUROCONTROL. The Union contribution includes €100 million dedicated to basic research, which was not matched by the partners' contribution. At the time of setting up the partnership, the private members provided the S3JU with the letters of commitment in which they estimated their total contribution to SESAR partnership to exceed €1.6 billion.

This investment is targeted towards contributing to the DES programme through in-cash and in-Kind contributions, encompassing both In-Kind Contributions for Operational Projects

[23] SESAR 2020 closure report, https://www.sesarju.eu/sesar2020%20closure%20report
[24] U-SPACE refers to dedicated airspace for drones' operations.

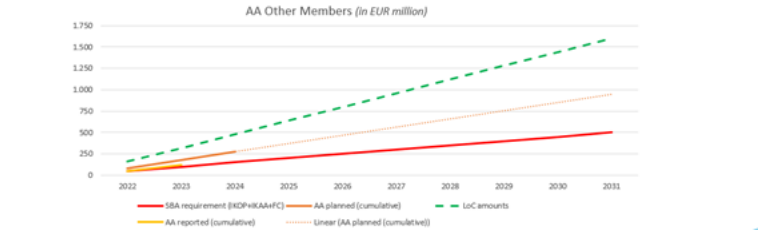
(IKOP) and IKAA. The SBA specifies several potential sources for the IKAA (additional tasks carried out at the research projects, dissemination, and promotion of SESAR solutions, etc.)

As of the end of 2023, the total amount of declared IKAA contributions stand at €124.5 million. Both figures are below the expected values at the launch of the JU but above the SBA minimum requirements of the SBA (see Figure 1). They include IKAA from private members, but not Eurocontrol. The leverage effect of the S3JU so far is 1.78 which is one of the highest among the joint undertakings established in the Single Basic Act.

However, the reasons for this below expected declaration of the IKAA is not related to the lack of underlying investments but to the complexity of integrating the IKAA declarations and reporting into the financial reporting systems of multi-national complex enterprises.

Figure 1 Planned and reported IKAA by private members of the S3JU (Source: S3JU reports)

(in EUR Million)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
LoC amounts letter of commitment	160,0	320,0	480,0	640,0	800,0	960,0	1120,0	1280,0	1440,0	1600,0
SBA requirement (IKOP+IKAA+FC)	50,0	100,0	150,0	200,0	250,0	300,0	350,0	400,0	450,0	500,0
IKOP estimated (30% of 500M€)			21,4	42,9	64,3	85,7	107,1	128,6	150,0	
AA planned (cumulative)	83,5	175,6	275,5							
AA reported (cumulative)	50,7	**124,5**								



The key element of additionality for the SESAR project is its close link between the research activities and their deployment (see Table 2). The S3JU issues its 'SESAR solutions catalogue' with all the validated solutions resulting from its research programme that have reached at least the TRL6 maturity level.

Table 2 The Union investment into SESAR Deployment Phase in € million (Source: EC)

2014-2022	Pilot common project implementation	1 349
	Other ATM implementation projects (non-PCP)	302
	SESAR Deployment Manager	43
2021-2027 (Estimate)	Common Project One and other ATM projects	500
	SESAR Deployment Manager	20
	Digital Sky Demonstrators	150
	European Union Aviation Safety Agency (EASA) support (2021-2025)	2
TOTAL € million		**2 366**

The Union has incentivised the deployment of SESAR solutions mainly using another fund (Connecting Europe Facility). The total Union investment in the deployment is projected to exceed €2 billion (see Table 2). On the private sector-related side, this amount is estimated to generate a co-investment amounting €4 billion[25]. The deployment projects currently in operation following the implementation of the Common Projects, driven by the SESAR solutions, are projected to save €9.8 billion by 2030 and deliver a total benefit of €14.2

[25] https://transport.ec.europa.eu/document/download/a197696f-0705-4127-8e71-b85ce0dd0f20_en?filename=2020-cp1-cba-update.pdf

billion[26]. The main benefits have been reaped by deploying the Free Route Airspace and Arrival-Departure management solutions.[27]

Conclusion

The main additionality effect of the SESAR project derives from the cooperation arrangements between the ATM stakeholders, EU bodies and Eurocontrol, which create a direct link from development to deployment. The financial additionality of the SJU was below expected level due to lower than expected contributions by Eurocontrol because of the COVID-19 pandemic. So far, S3JU has achieved the leverage effect of 1.78 which is better than the SJU thanks to the possibility to declare the IKAA related to other SESAR activities, including the deployment of the SESAR solutions.

3. Transparency and openness

Transparency and openness aspects of the SJU

The SESAR partnership has been open to the ATM industry by increasing its membership and has reached out to all relevant stakeholders when discussing the paths for the ATM innovation in Europe. The calls launched by the SJU included both open procedures and ones exclusively targeting members.

SJU involved in addition to the Union and Eurocontrol another 15 private members. At its closure, the number of private members had increased to 19. The initial list of members was selected by the SJU Board following an open procedure foreseen in the regulation (EU) No 721/2014. Over the course of the activities of the SJU, three members either left or modified their set-up (ALENIA, NORACON, SELEX), while five new members were welcomed (AT-ONE, B4 Consortium, COOPANS, Dassault, LEONARDO).

In addition to the private members, the Union and Eurocontrol, the Administrative Board of the SJU benefitted by the participation of the representatives of:

- military stakeholders (represented by the European Defense Agency);
- Civil users of airspace;
- Air Navigation Service Providers (represented by CANSO);
- Equipment manufacturers;
- Airports;
- Staff in the ATM sector;
- Scientific community.

The main policy guidance of the SJU activities, the ATM MP, was consulted with the relevant ATM stakeholders to obtain an industry wide buy-in for the SESAR vision. All the decisions taken at the Administrative Board were published on the SJU website, as well as the minutes of the Administrative Board meetings[28].

Obtaining a gender balance is a challenging task in the ATM sector. According to the International Civil Aviation Organisation (ICAO) data, women comprise 20.6% of air traffic

[26] SESAR Deployment Manager: https://www.sesardeploymentmanager.eu/benefits/money
[27] https://assets.ctfassets.net/krj50g99u3hm/3W515Ug6vCrnRCrfP8WbOz/ca683d9cd41b0ef04f1cfcb8f71501d7/CP1_CBA_Update_2024_1.pdf
[28] https://www.sesarju.eu/governance/gb

controllers globally and 21.4% in Europe[29]. Nevertheless, 49% of SESAR 2020 research publications benefitted from the participation of at least one female researcher, against 37% in the Societal Challenge 4 in Horizon 2020 and 41% in the EU27 average. Finally, 19% of project participants and 17% of project coordinators were women[30].

Transparency and openness aspects of the S3JU

S3JU is open when it comes to stakeholder participation and membership. This is realised by not having a minimum financial membership contribution, which created a financial hurdle for some organisations in the past. Private members are expected collectively to cover the administrative costs of the S3JU in an amount of €25 million. At present, a larger number of members (currently 57 members) are part of S3JU, representing a broader perspective of ATM stakeholders, especially regarding new entrants in the field of unmanned air traffic (i.e. drones and U-Space).

Prior to the launch of the S3JU, an open call for membership led to over 60 companies signing up for becoming the founding members of the S3JU. During the preparatory process, some withdrawals happened and at the launch of the S3JU, it had in total 55 members, including 53 private members. The increase in the number of members between SJU (19) and S3JU shows its openness and indicates that the importance and potential benefits of the SESAR project had become widely known and appreciated among the ATM industry partners. The SESAR membership provides benefits that exceed beyond participation in research projects, which is possible without becoming a member.

The S3JU launched on the 15th of December 2023 an open call for expression of interest to become Associated Members of the S3JU. The call received four applications, of which two were not compliant with requirements of the SBA. Two met all conditions and therefore the S3JU has 55 private members and 57 in total. Unlike SJU, the S3JU launches only open calls for proposals. The analyses of the call results[31] (one industrial and two exploratory research calls) indicate that some 41% of the projects are led by entities without ties to the membership of the S3JU. 44% of the funded entities are newcomers. This indicates that the information about the support provided by the S3JU is widely available and that it is not obligatory to be a member to present high quality proposals.

Total number of beneficiaries in Horizon Europe funded projects as of 1st July 2024 was 809 (292 unique participants) of which 15.20% are SMEs (21.4% in CL5) and 12.83% of EU funding is received by those SMEs (17.7% in CL5), 57.2% are private for profit/large companies (44.8% in CL5) and 68.9% of EU funding received by those companies (47.5% in CL5). 4.3% are non-EU-non associated members' entities (4.1% in CL5). These entities do not receive funding.[32]

At the end of 2023, 54% of the 37 S3JU staff were female and 46% were male, with 12 nationalities represented. An analysis conducted on the SESAR 3 project portfolio reveals that 24% of project participants were female which is an improvement compared to the 19% of SESAR 2020 programme[33].

[29] https://www.sesarju.eu/news/mind-gap-why-gender-equality-air-traffic-management-matters
[30] SESAR 2020 JU Consolidated Annual Activity Report 2022, p. 106. https://www.sesarju.eu/node/4509
[31] S3JU Consolidated Annual Activity Report 2023. https://www.sesarju.eu/node/4722
[32] Information extracted from the Horizon Europe Dashboard by the S3JU
[33] European Commission: Directorate-General for Research and Innovation and Brodnik, C., *Partnership evaluation report – The Single European Sky ATM Research 3 Joint Undertaking – Horizon Europe and the*

Conclusion

Over the course of its activity SESAR JUs have been open and transparent about their activities. S3JU has further increased membership opportunities and is a very inclusive European Partnership. In addition, the open calls ensure that non-members also have access to research support. While the ATM sector would benefit from increased gender diversity, the S3JU is working towards improving its gender balance at management and governance level.

4. Efficiency

Efficiency aspects of the SJU

The table below includes the total **operational costs** (OC) (EU contributions; Validated IKOP; Financial contributions to operational activities by JU partners; Eligible project costs funded by non-JU members to project activities; Contribution from Member States and international organizations to project activities), **certified IKAA** and **running costs** (commitment appropriations EU voted budget and contributions from sources other than the EU) for the period 2014-2023. See also Annex 4.4.1 for a comparison of operational expenditure and administrative expenditure of Joint Undertakings and EIT KICs of the period 2014 -2023.

Table 3 Operational and administrative costs (source: CORDA database)

The table includes data for Single European Sky ATM & SESAR Joint Undertaking. ***OC****: Operational Costs;* ***IKAA****: Certified IKAA;* ***RC****: Running Costs*

	2014 [EUR]	2015 [EUR]	2016 [EUR]	2017 [EUR]	2018 [EUR]	2019 [EUR]	2020 [EUR]	2021 [EUR]	2022 [EUR]	2023 [EUR]	Total
OC	-	-	543,044,351	30,663,237	14,848,351	322,279,604	159,939,359	9,255,055	-	371,531,580	1,451,561,538
IKAA	-	-	-	-	-	-	-	-	14,706,000	30,615,000	45,321,000
RC	-	-	-	10,341,000	9,516,000	9,657,000	8,477,000	4,287,000	4,158,000	7,498,000	53,934,000

* *This table only includes costs linked to grants funded under Horizon 2020 and Horizon Europe. It excludes grants financed under the CEF and through assigned revenues from the European Parliament.*

The execution rate of the budget allocated to the research and innovation projects has reached 94%, with a cumulative residual error rate consistently under 2%. The three efficiency indicators required by the financial regulation are time-to-inform (TTI) and time-to-grant (TTG) as well as time-to-pay (TTP).

- Time to Inform (TTI) represents the time needed to manage the evaluation and selection phase from the call deadline to informing the participants. The average time to inform has been 116 days (target of 153 days);
- Time to Grant (TTG) represents the time between the call deadline and grant signature. The average time to grant was 233 days (target of 245 days);
- Time to Pay (TTP) represents the outcome of the process for the payment of costs claimed by beneficiaries. The average time to pay has been 77 days.

All 156 projects funded were assigned with specific performance goals deriving from the ATM MP, with results subsequently validated through SJU level evaluation processes (and consolidated in a yearly Release exercise). This method led to a significant acceleration of the

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Green Transition – Interim evaluation support study, Publications Office of the European Union, 2024, p.20. https://data.europa.eu/doi/10.2777/7895247

time to market and industrialisation (from TRL 0 to TRL 6) from 10 years under the first ever SESAR JU (2007 – 2013) to 7 years at the end of SESAR 2020 programme.

Efficiency aspects of the S3JU

Since its launch, the administrative costs of the S3JU have been comparable to those of the SJU, except for 2023 because of the onetime cost of moving the S3JU offices to the Eurocontrol Headquarter.

The S3JU has achieved further efficiency gains compared to SJU, notably with a reduction of its staff by 2 FTEs, and through back-office arrangements with other JUs (on HR and legal matters) and with EUROCONTROL (on IT).

Regarding the exploratory research (ER) and industrial research (IR) calls, compliance with the efficiency indicators was as follows[34]:

- For ER1 and IR1 calls, the average TTI has been 124 days, and 121 days for ER2, against a target of 153 days. 100% of project's applicants were informed on time.
- For ER1, ER2 and IR1, the average TTG has been 226, 230 and 242 respectively, against a target of 245 days. 100% of ER1 and ER2, and 93.3% of IR1 grants were signed on time.
- Payments for ER1 projects have been made in 4 days, while IR1 payments took an average of 7 days, both compared to a target of 30 days for prefinancing payments.

The S3JU planes its operational expenditure using bi-annual work programme tool (BAWP). The Governing Board approves a yearly budget via an amendment to the BAWP. The S3JU has successfully launched three calls for projects with the expected budget. It has also secured sufficient funds for running costs.

Conclusion

SJU managed its operations efficiently as it declared lower than expected running costs and exceeded the objectives for the other efficiency indicators. Building on this, The S3JU continued to meet the targets the grant management domain and obtained further efficiency gains through enhanced collaboration with other JUs and reduction of staff.

5. Coherence and synergies

Coherence of the SESAR project

SESAR is an integral part of the overall EU Sustainable and Smart Mobility Strategy[35]. It supports work towards achieving the EU climate goals as defined in the Fit for 55 package[36]. In addition, the SJU and S3JU have been cooperating with other partnerships towards integrated transport solutions and with international partners to promote European ATM solutions at the world level.

As mentioned above, the main policy instrument, elaborated by the S3JU, ensuring the coherence of the SESAR project is the ATM MP. This strategic policy document is the roadmap shared by all European ATM stakeholders to modernise the ATM systems in Europe and support investment decisions for development and deployment activities. The SESAR

[34] S3JU Consolidated Annual Activity Report 2023. https://www.sesarju.eu/node/4722
[35] COM/2020/789 final
[36] COM/2021/550 final

vision developed in the ATM MP (Digital European Sky) has direct impact for the development of supporting services and technologies, such as ground to ground and ground to air communication, global positioning services (including EU initiatives EGNOS and GALILEO[37]), airport services and airframe development.

Through the development and maintenance of the ATM MP, the SESAR JUs ensure the coherence of the SESAR vision within the whole ATM innovation cycle, with a specific focus on the development phase with its own programme (see Figure 2). Thanks to its cooperation with the SESAR Deployment Manager (SDM) and the other parties involved in the SESAR project cycle, the S3JU ensures that the process of implementing SESAR solutions is supported by the knowledge and documentation produced at the development phase of the SESAR project. To this end the S3JU proposed to introduce the SESAR Deployment Objectives (SDOs) into the latest update of the ATM MP planned to be adopted at the end of 2024.

Synergies of the SESAR project

Within Horizon Europe framework, S3JU is the primary instrument through which ATM R&I at European level is funded and administered, and it is the only partnership providing support for ATM related research. Still, as SESAR is an integral part of transport policy framework and the ATM is a key element supporting aviation, SJU and S3JU have cooperated with other JUs, with DG R&I, DG MOVE and other relevant stakeholders to find common ground and cooperation opportunities.

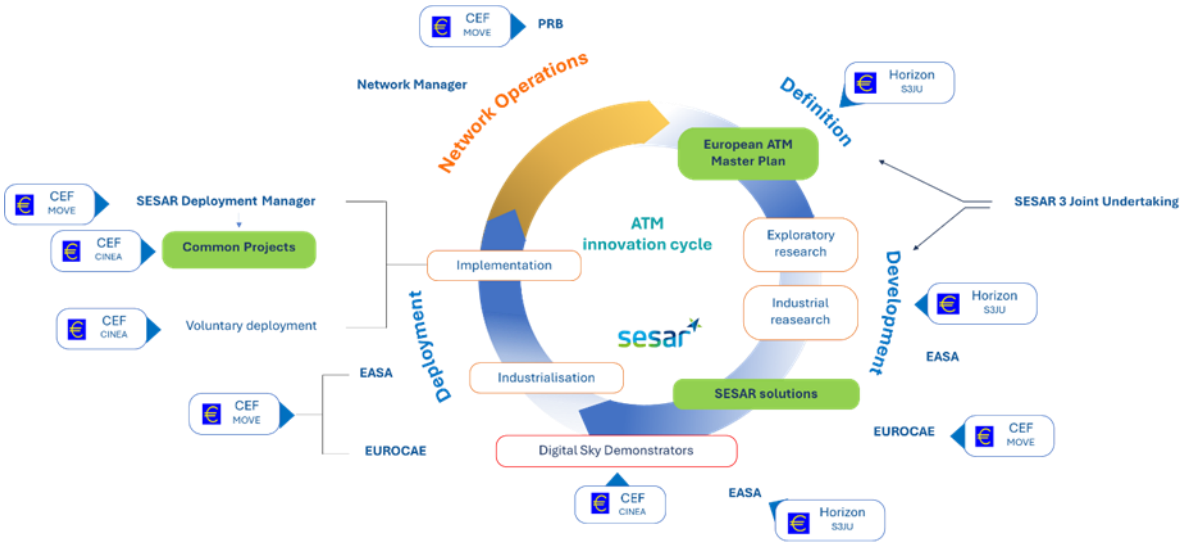
The main synergy with other EU initiatives is with the Connecting Europe Facility for the Digital Sky Demonstrators (DSD). The DSDs are an integral part of the DES and of the SESAR innovation pipeline that bridge the gap between development and deployment by putting technological solutions to the test in live environment. At the time of publishing 9 DSD projects were ongoing. Through an ad hoc administrative agreement with CINEA, the S3JU ensures the strategic orientation of the calls for proposals and supports the management of resulting grants through technical expertise during the call evaluation and grant management phases. Since the beginning of S3JU, around € 120 million from CEF funds have been funnelled into DES projects.

Between 2017 and 2020, a delegation agreement between the European Commission and the SJU led to several projects in the field of U-Space and geofencing for a total amount of around € 10 million.

In October 2023, EU-Rail JU and S3JU 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 are expected to improve door-to-door mobility for Europe's citizens and is a specific synergy between the air and rail innovation communities. With an EU contribution of up to EUR 5 million, this is the first ever joint call co-funded by two Joint Undertakings within the framework of the EU's Horizon Europe research programme.

[37] See https://www.euspa.europa.eu/eu-space-programme/egnos and https://www.euspa.europa.eu/eu-space-programme/galileo

Figure 2 the phases of the SESAR project and EU intervention tools for each phase (Source: EC)



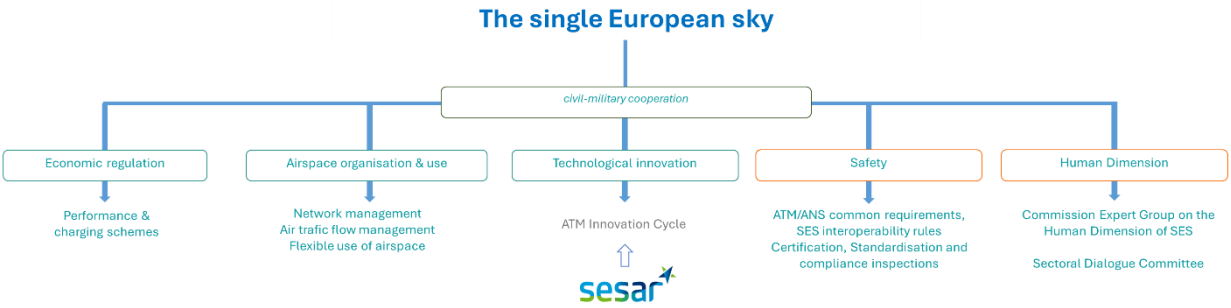
Conclusion

The two SESAR JUs have played a crucial role in modernizing European ATM by aligning research, development, and deployment efforts, by fostering synergies with other EU initiatives, and by ensuring coordination of all the relevant actors across the ATM innovation value chain. The SESAR project has helped to target the relevant ATM related investments from other EU funds, such as CEF and GALILEO programme.

6. EU added value

As an integral part of the SESAR project, the SJU and S3JU have constituted the technological pillar of the Single European Sky (see Figure 3). The JUs are incorporated into the EU policy framework and provide significant EU added value by coordinating all ATM related research in Europe. The JUs have delivered in the overall policy aims of the SES, that is to reduce the fragmentation of the European ATM systems, increase the efficiency of the ATM service provision and to reduce the environmental impact of the ATM.

Figure 3 The pillars of the Single European Sky policy framework (EC drawing)



SESAR project has brought together all ATM stakeholders in Europe through a public-private partnership. SESAR incorporates the entire ATM value chain, enables cross-border initiatives, and strengthens the link between ATM research and the SES policy initiative. The added value of the SESAR partnership is not only linked to the funds this initiative is able to

mobilize but also the creation of the co-operation platform between entities that otherwise would be competitors and between the suppliers and their future clients.[38]

The management of a portfolio of projects funded under different EU programmes (Horizon Europe and the Connecting Europe Facility) ensures cohesion and alignment with the ambition of the ATM MP and the Single European Sky. This approach generates a cumulative impact that exceeds the sum of individual projects, which is crucial as the development of solutions from idea to industrialisation takes longer than the duration of a single project.

The S3JU provides also EU added value by facilitating the link with standardisation and certification activities in view of an accelerated industrialisation of the solutions and a harmonisation of the ATM systems. For example, S3JU is actively participating in the EASA industrial forum specifying the deployment and standardisation efforts for ATM Functionality 6 of the CP1.[39]

Based on the work of the JU, the Commission, having established the SESAR Deployment framework, adopted Common Projects[40]. The existence of such a framework supports the implementation of SESAR solutions in a synchronised and coordinated manner.

The deployment experience has also exposed the weaknesses in the research processes. In a large-scale deployment, new challenges emerge which can be overlooked at the research phase of the given solutions. To tackle this, S3JU in cooperation with CINEA, is running number of large-scale demonstration projects. The experience from these projects, which target demonstration of SESAR solutions (in view to facilitate their deployment) ensures higher TRL levels of these solutions.

Conclusion

The EU added value of the S3JU compared to national action by Member states is that it represents an R&I policy lever that induces coordination and collaboration between ATM stakeholders along the entire innovation value chain, from research to deployment, which can ultimately change how air traffic is managed and regulated in the EU.

7. Relevance

The S3JU remains relevant as the European airspace is under extreme pressure from increasing demand while also experiencing reduced airspace capacity[41]. Compared to 2019 air traffic is at 97% and, with up to 20% of the Network's airspace unavailable due to Russia's full-scale invasion of Ukraine, nearly half (18) of the air navigation service

[38] European Commission: Directorate-General for Research and Innovation and Brodnik, C., *Partnership evaluation report – The Single European Sky ATM Research 3 Joint Undertaking – Horizon Europe and the Green Transition – Interim evaluation support study*, Publications Office of the European Union, 2024, p.20. https://data.europa.eu/doi/10.2777/7895247

[39] https://www.easa.europa.eu/en/newsroom-and-events/news/easa-publishes-final-report-industrialisation-initial-trajectory

[40] Commission Implementing Regulation (EU) No 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan OJ L 190, 28.6.2014, p. 19–44 (repealed);
Commission Implementing Regulation (EU) 2021/116 of 1 February 2021 on the establishment of the Common Project One supporting the implementation of the European Air Traffic Management Master Plan OJ L 36, 2.2.2021, p. 10–38.

[41] For trends in demand for ATM Services and the limitations of the European Airspace, see Eurocontrol Data Hub: https://www.eurocontrol.int/our-data

providers (ANSPs) are managing exceptional increases in traffic (some of which was not forecasted) of more than 15% above 2019 levels.

The ambition of building a Digital European Sky is defined in ATM MP, which serves as the strategic agenda for the S3JU. It matches the ambitions of the European Commission's Sustainable and Smart Mobility Strategy and its European Green Deal priorities as well as the aviation research priorities in Horizon Europe, namely climate neutrality by 2050 and digital transformation[42].

To increase the relevance of the S3JU and to better integrate the development and deployment phases of the SESAR project, the updated edition of the ATM MP, elaborated by the S3JU during 2024 and benefiting from stakeholder involvement, includes strategic development priorities and strategic deployment objectives[43]. This evolution indicates that the practical challenges of deployment need to be tackled already during the research and development phase of the technical innovation cycle.

To ensure relevance regarding the certification requirements, the S3JU has signed a comprehensive cooperation agreement with EASA, involving them early in the development phase and thereby ensuring informed certification process in the deployment pipeline, and accelerated industrialisation of the solutions when they come.

Conclusion

For the Union, SES objectives remain relevant to enable smooth functioning of the European aviation sector. The S3JU is constantly maintaining the focus of the SESAR project and of its own activities on the most relevant needs by regularly updating its key strategic and policy document – the ATM MP. The ATM stakeholders welcome the increasing integration of the SESAR development and deployment phases, which is further supported by a close cooperation with EASA.

8. Directionality

Whereas the DES programme is in its early phase and has not yet delivered new solutions, the SJU already developed, once implemented, will result in a significant performance improvement for ATM in line with the SES performance framework[44]. This estimation foresees that by 2035 the SESAR solutions would deliver:

- Increased punctuality of flights by 18% (target 10-30%)
- Cost efficiency increased by 30.3% (target 30-40%)
- Increased capacity of airports by 23% (target 10%)
- Terminal Manoeuvring Areas (TMA) increased by 36% (target 47%)
- En route capacity increased by 60% (target 49%)
- Reduction of additional flight time by 41% (target 50-55%)

[42]European Commission: Directorate-General for Research and Innovation and Brodnik, C., Partnership evaluation report – The Single European Sky ATM Research 3 Joint Undertaking – Horizon Europe and the Green Transition – Interim evaluation support study, Publications Office of the European Union, 2024, p.15. https://data.europa.eu/doi/10.2777/7895247

[43] https://www.sesarju.eu/sites/default/files/documents/reports/Declaration_SESAR_AnnualConference.pdf

[44] Commission Implementing Regulation (EU) No 409/2013

- Save 180 kg of fuel per flight (target 250-500 kg).[45]

This will translate into substantial economic benefits, increased competitiveness of the EU aviation industry, and improved overall passenger experience, while reducing the overall environment footprint of the sector. S3JUs efforts in reducing airspace fragmentation and enhancing the performance of ATM systems are not only vital for the advancement of Europe's ATM capabilities but also play a key role in supporting Europe's strategic autonomy and technological sovereignty in the global aviation sector.

Conclusion

The estimated impact of future SESAR solutions has been to shorten the flight paths, increase traffic capacity, and reduce the ATM-related delays and fuel consumption.

9. International positioning

S3JU aims for the EU aviation sector to speak with one voice at the international level. SJU and S3JU have been able to orientate/influence international policy by engaging with bi-lateral contacts across the globe and working in the aviation led international organisations to ensure the harmonisation of global ATM system aligned on the European standards.

SJU has over time signed number of cooperation agreements (see Table 4). The level intensity of these agreements is variable. The cooperation with USA, Singapore and Japan is leads to coordination meetings that take place several times per year, while the agreements with UAE, Qatar and Georgia have led to limited number of joint actions. As part of the EU external aviation policy, S3JU also supports EU technical cooperation projects by EASA for ATM-related aspects with various regions, including North Asia, Southeast Asia, South Asia, and Latin America.

Table 4 S3JU International Cooperative Arrangements (Source: S3JU)

Country		Arrangement	Date of signature
	USA	EU-US Memorandum of Cooperation for ATM Modernization, Civil Aviation Research & Development, and Global Interoperability	2011 (amended 2017)
	Japan	Memorandum of Cooperation between MLIT and DG MOVE	2011
	Singapore	Memorandum of Cooperation between CAAS and SJU	2012
	UAE	Memorandum of Cooperation between GCAA and SJU	2016
	Qatar	Memorandum of Cooperation between QCAA and SJU	2017
	Georgia	Letter of Intent between GCAA and SJU	2019

The S3JU's international engagement strives to synchronize the EU priorities with those at the ICAO level, involving direct participation in expert groups and close collaboration with

[45] European ATM Master Plan 2025 Edition, as adopted by the Governing Board of the S3JU on 12 December 2024.

the EC, EASA, and EUROCONTROL on ATM modernization. For example, to this end a major symposium on Trajectory Based Operations was held in June 2024 in Brussels[46].

Conclusion

Via the S3JU's bilateral cooperation arrangements, regional cooperation and joint efforts at the ICAO level, the European approach to ATM modernisation has a global reach.

10. Phasing-out preparedness

According to the Single Basic Act[47], all Joint Undertakings have the legal obligation to adopt a plan for the phasing-out of the partnership from Horizon Europe funding by the end of 2023. The aim of the plan is to ensure a smooth continuation of the JUs' activities in the scenario of no funds available under the next Framework Programme. In this perspective, JUs are asked to perform an in-depth reflection on a phasing out strategy leading to a lesser dependence from the Union contribution.

In detail, the plan should include administrative and operational adaptations, which should allow the JU to proceed with its activities in case of no Union funding under the next Framework Programme. In detail, the adaptations concern several aspects, such as legal status, staffing, accounting and cashflow, procurement, logistic and IT, follow up of the grant agreement obligations after the end of projects.

Also, concerning the policy aspects, the phasing out plan should include concrete reflections on short- and long-term targets, strategic alignment and financial sustainability. The aim is to develop a strategy enabling the JU to obtain the objectives beyond the duration of the Union's participation.

At its meeting on the 14th of December 2023 the S3JU Governing Board adopted the phasing out plan. The plan provided details about the legal and financial aspects of the closure of the partnership.

In detail, in the 2023 phasing out plan, the S3JU proposed the following possible future development scenarios:

- The extension of the S3JU under the next MFF with Union financial contribution. Sub-options are the merge of the S3JU with other existing JU's or the creation of a new JU. This option allows for continuation of the public-private partnership and ensures highest continuity.
- Entrusting EU ATM research to an Executive Agency of the European Commission. This option means the end of a public-private partnership, while it ensures a certain degree of continuity.
- Entrusting EU ATM research to EUROCONTROL, the legal and institutional consequences of such an approach needs to be further studied.
- Entrusting EU ATM research to a partnership under Article 185 of the TFEU. Article 185 initiatives are long term public-public partnerships established on a voluntary basis by EU Member States that are also eligible for a substantial financial contribution from the EU Research Framework Programme. They are established through the EU ordinary legislative procedure and require a Dedicated Implementation Structure.

[46] https://www.sesarju.eu/node/4616
[47] Council Regulation (EU) 2021/2085 establishing the Joint Undertakings under Horizon Europe.

- Coordination of ATM research and innovation by the sector without EU funding

The members of the Governing Board have expressed their support for the partnership and willingness to work with the Commission and Eurocontrol to find ways for continuing the partnership to ensure the delivery of the revised ATM MP. To provide factual and contextual input to the preparation of FP10, the Commission has launched a study to explore paths of future developments. The results of the study are expected in 2025.