

2014 ANNUAL REPORT



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IMPRINT

Print: ISBN 978-92-9216-032-6 – ISSN 1831-631X – doi:10.2829/46431
Pdf: ISBN 978-92-9216-029-6 – ISSN 2443-5783 – doi:10.2829/11145

© SESAR Joint Undertaking, 2015

Publisher

Luxembourg: Publications
Office of the European Union,
2015

More information on the
European Union is available
on the Internet
(<http://europa.eu>)

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2014 Annual Report

Why SESAR

Air Traffic Management (ATM) is an essential component in the air transport system, which is worth €8.4 billion/year* and involves:



Today's complex infrastructure means that Europe's ATM is not running as efficiently as it could:



In 2010 en-route flights were delayed by an estimated **19.4 million minutes.****



On average, each flight was **49km longer** than direct flights.**



Estimated costs of airspace fragmentation: up to **€4 billion a year.****

With traffic expected to grow, Europe needs to take advantage of technological developments in order to keep the aviation industry sustainable.

2014



9.6
million flights*

1.8
billion passengers***

2030



13.5
million flights*

3
billion passengers***

with **SESAR**

SESAR is researching and developing innovative ATM solutions that **benefit Europe's society and wider economy.**



A **positive impact** on the EU's GDP.*



Creation of **additional jobs** in air transport industries.*



More direct flights will shorten flight times by approximately 10 %, **9 minutes per flight** on average.*



A reduction in the environmental impact of flights by **10 %**, through shorter waiting and taxi times, more direct trajectories and smoother landing approaches.**



Fewer cancellations and delays and increased predictability and punctuality on arrivals and departures.*



TIMELINE



2007

27/02
SESAR JU created under European Union Law

12/10
Appointment of the Executive Director

2008

21/02
Start of negotiations with 15 pre-selected members

06/05
Public release of SESAR Master Plan

17/11
First AIRE contracts signed

16/12
Adoption of the amended Council regulation recognising SESAR JU as a Union body

2009

30/03
Signature of administrative agreement between the SESAR JU and the Kingdom of Belgium.
Endorsement of the European ATM Master Plan by the Council

03/06
SESAR programme technical kick-off

12/06
SESAR JU signs working agreements with 16 partners totaling €1.9 billion

15/09
Major airlines, business & general aviation, associations participate in SESAR

14/12
First four SESAR projects start research and development

2010

04/01
1000th contributor working on SESAR

08/04
AIRE: first complete (gate-to-gate) transatlantic flights

31/05
First 100 SESAR projects in execution

19/07
Associate partners join SESAR family

17/09
AIRE 2010/11: Successful start of new green aviation trials

08/11
Memorandum of Understanding with Mexico signed

10/11
EASA and SESAR seal cooperation agreements

2011

28/01
OPTIMI presents recommendations for better aircraft tracking

03/03
EU-US Memorandum of Cooperation in aviation research signed

08/03
SESAR Release 2011 officially presented

11/04
Memorandum of Understanding with State Aviation Administration of Ukraine signed

09/06
Airspace users engaged in Work Package 11 (WP11)

01/07
Macro-economic study shows positive economic impact of SESAR in EU Member States and beyond

03/08
Eight consortia join SESAR as new Associate Partners

05/10
ATM Master Plan Update officially kicked-off

29/11
First SESAR Innovation Days

2012

02/12
The world's first 4D Flight successfully validates the capability of the aircraft system to comply with time constraints

05/12
SESAR top-down Programme prioritisation

06/12
First SWIM Master Class launched

10/12
European ATM Master Plan 2012 adopted

11/12
Demonstration activities, including second phase of AIRE, are launched

11/12
Memorandum of Cooperation with Civil Aviation Authority of the Republic of Singapore signed

11/12
First live SWIM demonstration

12/12
Second SESAR Innovation Days

2013

13/02
The European ATM Master Plan 2010 wins prestigious IHS Jane's air traffic control (ATC) award

14/02
Successful live demonstration of SWIM at the World ATM Congress in Madrid

26/06
Nine demonstration projects are launched on the safe integration of civil remotely piloted aircraft systems (RPAS) in the European ATM System

10/07
European Commission invests €600 million in new research to unblock congestion in Europe's airspace

1/09
Patrick Ky moves on to new heights at European Aviation Safety Agency (EASA) and Claude Chêne takes up duties as SJU Executive Director

10/10
EU transport ministers agree on SJU extension

26-28/11
Third SESAR Innovation Days

2014

02/14
Florian Guillermet appointed SJU Executive Director

03/14
Second successful i4D flight trial from Toulouse to Copenhagen

05/14
João Aguiar Machado appointed Director-General of DG Mobility and Transport and Chairman of the SJU Administrative Board

06/14
SJU mandate extended until 2024

07/14
Call for Expression of Interest for candidate members to participate in the SESAR 2020 programme

09/14
18 SESAR Large Scale Demonstrations launched. RPAS Definition Phase starts

12/14
4th SESAR Innovation Days

12/14
Kick-off of European ATM Master Plan review campaign



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Message from the Chairman of the SJU Administrative Board

João Aguiar Machado, Director-General for Mobility and Transport, European Commission



In 2014, I took up the role of Chairman of the SJU Administrative Board with great interest and motivation. In these past twelve months, I have become increasingly convinced that the successful implementation of the Single European Sky (SES) is the collective responsibility of all aviation stakeholders, who together must develop, implement and manage the necessary changes in European Air Traffic Management (ATM). The European Commission has set out dedicated legal and cooperative mechanisms to support this work and to allow for the timely and effective implementation of the SES.

The activities detailed in this annual report clearly demonstrate the added-value of the SJU's formula of pooling public and private resources, and coordinating European ATM research and innovation (R & I) activities. In recognition of this successful collaboration, in June 2014 the mandate of the SJU was extended up until the end of 2024, signalling the EU's long-term commitment to ATM R&I to the benefit of a modernised European aviation and ATM system.

Some notable achievements of the SJU over the course of 2014 include:

Delivering a growing portfolio of SESAR Solutions, some of which are already under

implementation or have recently been implemented, such as the Remote Tower Services, Airport Operations Centre and Time-Based Separation.

Supporting preparations for SESAR deployment through the provision of technical support to the European Commission for the finalisation of the Pilot Common Project ⁽¹⁾, and the launch of a series of large-scale demonstrations.

Contributing to the integration of Remotely Piloted Aircraft Systems (RPAS) into the European civil aviation and ATM system, through the launch of the RPAS R&D Definition Phase and ongoing demonstrations across Europe.

Strengthening the ATM R & I pipeline through the definition of the SESAR 2020 work programme that connects exploratory, industrial and applied research, and a call for a renewed SJU partnership.

Recognising the evolving challenges faced by the ATM community through the launch of a 2015 campaign to update the European ATM Master Plan that involves all ATM stakeholders and which takes into account SESAR's results so far.

Creating synergies with other world region modernisation programmes and international organisations through increased stakeholder relations and global outreach activities.

The SJU has built significant momentum over the years. These latest achievements are clearly indicative of this continued drive and of the positive and transformative effect that SESAR is now having on ATM and aviation in Europe.

I would like to take this opportunity to commend the SJU Management Team, as well as the members and partners for their ongoing commitment and collaborative spirit, which is really the driving force behind the progress outlined in this report.

⁽¹⁾ 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 Text with EEA relevance.



Foreword

Florian Guillermet, Executive Director, SESAR Joint Undertaking

2014 was a critically important year for the SESAR Joint Undertaking (SJU) and its members, since it saw the partnership's mandate extended until the end of 2024. This was in recognition of the successful outcomes of our collaboration to date, as well as of the need to foster ongoing ATM R & I in Europe. ATM is now clearly seen as a core element in the value chain for a high-performing and competitive European aviation industry.

When looking back over the year, 2014 was clearly not 'business as usual'. In parallel with the current programme, with the support of technical experts from across the ATM community, the SJU worked intensively on the definition of the SESAR 2020 programme, building on the results of the current programme, orientating content towards deployment and taking into account new challenges to ATM. In parallel, a call was opened for renewed membership, from which 19 candidates were selected as part of an ongoing procedure. With SESAR 2020, the ATM community will have access to a formidable pipeline, into which innovative and ground-breaking ideas can flow from the exploratory research strand right through to the programme's applied and industrial research activities.

While a lot of resources were dedicated to SESAR 2020, the SJU and its members succeeded in completing a significant amount of activities under the current programme over the course of the year, leading to the delivery of new SESAR Solutions. Other major areas of activities this year were the launch of the European ATM Master Plan update campaign and the RPAS R & D Definition Phase. These activities brought together unprecedented numbers of stakeholders from all areas of the ATM and aviation community, which proves the effectiveness of our partnership model.

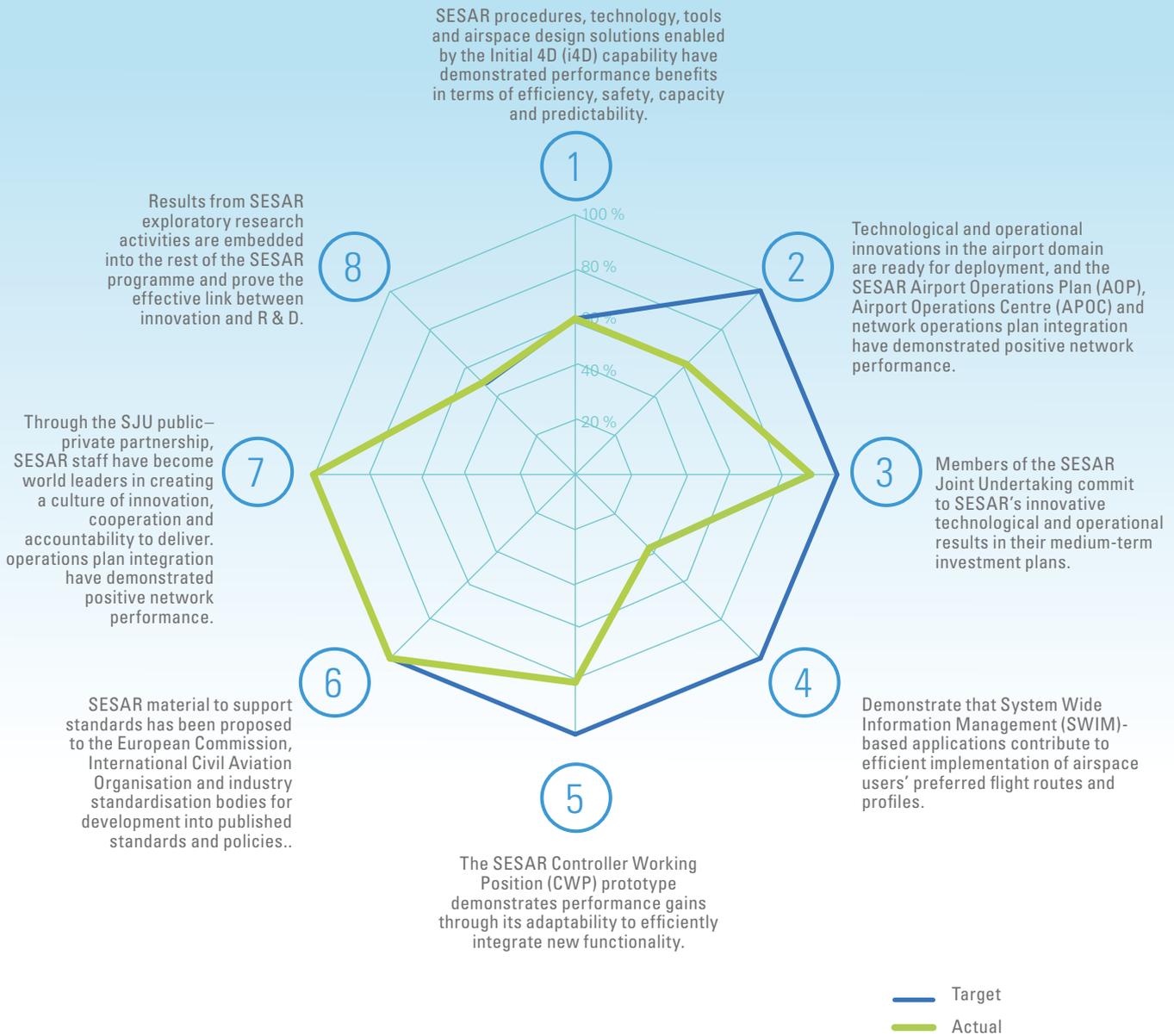
Of course, the SJU continued to foster strong ties with organisations and programmes within the



ATM world and sought opportunities to raise the profile of the work of the SJU and its members. In particular, the SJU worked closely with the European Commission, providing continued technical support for the finalisation and publication of the EU's Pilot Common Project Implementing Rules. We look forward to collaborating in the coming years with the SESAR Deployment Manager, which was established in December 2014, to ensure the smooth delivery of SESAR Solutions for synchronised and timely deployment across Europe.

Finally, 2014 marked a change of guard with the appointment of João Aguiar Machado Director-General of the European Commission's Directorate-General for Mobility and Transport, and Chairman of the SJU Administrative Board, and my own change of function. This provided the SJU with an opportunity to take stock of our work and operations, making changes where necessary in order to optimise the partnership's effectiveness and efficiency for the coming years.

Figure 1. SJU progress on achieving SESAR programme objectives





CHAPTER 1

Progressing towards our objectives

The SJU established several key SMART objectives to be reached in 2014 in line with its medium term vision (2012–14):

The SJU partnership has successfully introduced innovations, bringing measurable performance benefits to the worldwide aviation community

The accompanying Specific, Measurable, Achievable, Realistic and Timely (SMART) objectives allow the SJU to measure concretely the progress, including quick wins, towards achieving the vision as well as the overall mission of the SJU. The 2014 activities and objectives were also developed in alignment with the 2012 edition of the European ATM Master Plan, the EU's Pilot Common Project and the results of the programme review.

The objectives and activities set for the 2014 are detailed as follows.

OBJECTIVE ONE

SESAR procedures, technology, tools and airspace design solutions enabled by the Initial 4D (i4D) capability have demonstrated performance benefits in terms of efficiency, safety, capacity and predictability.

Validation exercises showed that i4D is a significant contributor to Key Performance Areas (KPAs), such as fuel efficiency, airport and airspace capacity, cost effectiveness and predictability. An analysis of performance results showed that a reduction of approximately 1.5 % in fuel could be obtained, which represents a 53 % achievement of the fuel efficiency target indicated for Step 1 of SESAR (?). However, validation exercises also showed that other SESAR Solutions, including Extended Arrival Manager (E-AMAN), Continuous Descent Approaches (CDA) in complex Terminal Manoeuvring Areas (TMA), enhanced decision-making tools, also contribute to these positive performance results. Further analysis of the individual contribution of each solution is underway. However, the results already indicate the need for trade-offs between the different KPAs and that all targets cannot be achieved simultaneously.

Taking into account the work undertaken in 2014, 60 % of this objective has been completed.

See Chapter 3 for more information about Release 4 validation activities.

OBJECTIVE TWO

Technological and operational innovations in the airport domain are ready for deployment, and the SESAR Airport Operations Plan (AOP), Airport Operations Centre (APOC) and network operations plan integration have demonstrated positive network performance.

Close to 40 % of the SESAR Solutions available at the end of 2014 are airport related. While several solutions are already embedded in the first deployment package, such as PCP ATM Functionality 4 (PCP — AF#4), a number are already being deployed locally. Notable examples include the Airport Operations Centre (APOC) at London Heathrow and Paris Charles de Gaulle airport and the implementation of Remote Tower Services at the Örnsköldsvik Airport in Sweden.

The progress made in 2014 means that 60 % of this objective has been completed. These examples of early local deployment as well as the inclusion of these solutions in the PCP suggest that this objective will be fully achieved by 2015/16.

See Chapter 3 for more information about the implementation of APOC and Remote Tower Services (RTS).

(?) The European ATM Master Plan: The roadmap for sustainable air traffic management (Edition 2, 2012).

OBJECTIVE THREE

Members of the SESAR Joint Undertaking commit to SESAR's innovative technological and operational results in their medium-term investment plans.

The deployment sequence of a number of SESAR Solutions, as indicated in the EU's PCP, indicate that this objective is being successfully met. These include E-AMAN and Performance-Based Navigation (PBN) in high density TMAs, which aim to facilitate traffic sequencing at an earlier stage as well as to improve the precision of approach trajectory, thus leading to fuel savings and an improved environmental footprint for the descent and arrival phases. The PCP medium-term timeline also includes solutions to improve runway safety and throughput, ensuring benefits in terms of fuel consumption and delay reduction, as well as airport and airspace capacity.

See Chapter 5 for more information about the PCP and preparations towards deployment.

Progress made to date means that this objective is 90 % complete.

OBJECTIVE FOUR

Demonstrate that System-Wide Information Management (SWIM)-based applications contribute to efficient implementation of airspace users' preferred flight routes and profiles.

Results from SESAR validation exercises on the SWIM-enabled exchange of trajectory information between airline operations and the Network Manager demonstrated how it is possible to optimise the usage of the route network. These results were fed into demonstration activities on free routing, notably through the Free Route Airspace Maastricht and Karlsruhe (FRAMaK) and Weekend Free Route for Environmental Efficiency (WE FREE) projects, which have shown some promising outcomes. The validation of the ground-ground trajectory exchange, however, showed that further work is required to ensure the delivery of this key SESAR enabler.

Considering the number of solutions and key enablers covered, this objective is considered to be 40 % complete.

See Chapters 3 and 4 for more information on SESAR validation and demonstration activities.

OBJECTIVE FIVE

The SESAR Controller Working Position (CWP) prototype demonstrates performance gains through its adaptability to efficiently integrate new functionality.

In 2014, activities focused on validating the integration of new functionalities and decision-making tools in the human machine interface of the controller working position. All the activities planned in 2014 in relation to the CWP have been completed and specific activities on the CWP interface were launched as well. It is confirmed that up to three out of five Air Navigation Service Providers (ANSP) covered by this objective are currently upgrading their CWP, while one additional ANSP is close to follow.

Mindful of these developments, this objective is 80 % complete.

OBJECTIVE SIX

SESAR material to support standards has been proposed to the European Commission, International Civil Aviation Organisation and industry standardisation bodies for development into published standards and policies.

In 2014, a number of important standards were published by the EUROCAE⁽³⁾ with contributions by the SJU and its members.

This objective is 100 % complete.

See Chapters 6 and 7 for more information on the SESAR contribution to European and global standardisation activities.

OBJECTIVE SEVEN

Through the SJU public-private partnership, SESAR staff have become world leaders in creating a culture of innovation, cooperation and accountability to deliver.

In 2014, the SJU and its members contributed to a number of key international events in order to promote SESAR and to increase global stakeholder engagement. Notable examples include the World ATM Congress in Madrid (March 2014) and ATC Global in Beijing (September 2014), at which a number of key SESAR Solutions were showcased.

⁽³⁾ ED-75d, ED-87c, ED-92b, ED-110b, ED-129b, ED-194a, ED-228, ED-229, ED-230, ED-231, ED-232, ED-233, ER-011.



The SJU organised its first SESAR Solution Workshop on Remote Tower Services (June 2014), which was hosted by the Dublin Airport Authority (DAA). Finally and very importantly, the successful cooperation with the United States' Federal Aviation Administration (FAA) and its NextGen programme led to the publication of a 'State of Harmonisation' document, highlighting the status and progress of the key areas related to harmonisation and global interoperability. Thanks to this cooperation, the notion of a shared global leadership has entered into the collaborative activities under the US–EU memorandum of understanding (MoC) on SESAR–NextGen interoperability. These activities have progressively consolidated the position of SESAR as a leading actor in ATM R & I and the SJU reputation is widely recognised.

See Chapter 7 for more information on SESAR's global outreach.

This objective is 100 % complete.

OBJECTIVE EIGHT

Results from SESAR exploratory research activities are embedded into the rest of the SESAR programme and prove an effective link between innovation and R & D.

While recognised as an important area of work, SESAR's exploratory research activities are not yet fully connected with the programme's applied and pre-industrial research. In 2014, with the support of its Scientific Committee, the SJU identified a number of lessons learnt from the current programme set-up which it used to design an approach to better connect these activities in the SESAR 2020 programme. In parallel, promising results from a number of exploratory research activities were transited into the definition of the applied and pre-industrial activities of SESAR 2020, demonstrating and proving the necessity of a progressive set-up of a well-connected R & I pipeline with feed-back loops and all the technology maturity phases represented.

Overall these results mean that this objective is 50 % complete.

See Chapter 2 for more information on SESAR's exploratory research activities.



TOWARDS 2015

At the end of 2014, the SJU adopted a new medium-term programme vision for the period 2015/16 which was endorsed by the SJU Administrative Board.

High-performing aviation in Europe

The SESAR Joint Undertaking is delivering solutions to modernise air traffic management, enabling high-performing aviation in Europe and worldwide

This programme vision has been structured into strategic objectives related to the closing of the SESAR 1 programme, but also constituting a solid basis for the launch of the SESAR 2020 programme.



2.2. Advisory Council for Aviation Research & Innovation in Europe (ACARE)



Beyond its own exploratory research activities, the SJU actively contributes to the Advisory Council for Aviation Research and Innovation in Europe (ACARE). In the framework of this contribution, the SJU co-leads and contributes to ACARE Working Group 1 'Meeting societal and market needs', which focuses on airports and ATM perspectives.

In addition and more generally, the SJU provides support, knowledge and guidance across all areas of the Strategic Research and Innovation Agenda (SRIA).

Increasingly, ACARE provides broad advice and information to the SJU, in particular in preparation for future innovation research programmes. Against this background, in 2014, priority research areas were identified for inclusion in the first SESAR 2020 exploratory research call for proposal under Horizon 2020, which was launched in March 2015.

2.3. SESAR Innovation Days puts scientific research on ATM under the spotlight

In November 2014, the SJU held its annual SESAR Innovation Days at the Universidad Politécnica de Madrid (UPM), Spain. The three-day event put scientific research under the spotlight through a series of presentations, workshops, research exhibitions and networking events.

Around 300 participants attended the event, which was kindly hosted by the Department of Aeronautical Engineering at the UPM with support from Eurocontrol — under WP-E and as part of an agreed contribution and commitment to the SJU.

A total of 30 papers were selected by the Programme Committee, which highlighted *'the growing number and high quality of paper submissions received'*. The selected papers were

clustered into nine main themes: complexity and data science; meteorology; RPAS and technical enablers; capacity and performance; risk and security assessment; human factors and decision support tools; modelling and optimisation; economics; and resilience engineering.



CHAPTER 3

Validating SESAR Solutions

Thanks to a strong collaboration between its members, the SJU is already delivering SESAR Solutions for industrialisation and subsequent deployment. In 2014, 17 solutions were made available on the SJU public website, while several underwent rigorous validation through the mechanism known as the SESAR Release process. 2014 also saw the SESAR Project Awards recognise three projects that exemplify innovative ideas and research excellence in ATM. Finally, SESAR achieved more milestones with the early implementation of several solutions by ATM actors.

3.1. SESAR Solutions at a click of a button

The SJU launched the SESAR Solutions Portal, an online tool offering access to extensive documentation on each solution delivered by SESAR, including validation reports, technical and interoperability specifications, and regulatory recommendations. The portal is proving to be a key tool for sharing SESAR results with a broader audience. The online portal was complemented by several other communication tools:

- a brochure explaining SESAR Solutions, published in time for the 2014 World ATM Congress;
- an animated video featuring four key solutions (Remote Towers, Time-based Separation, Automated Support for Dynamic Sectorisation and User-preferred Routing);
- a dedicated workshop on SESAR Remote Tower Services (June, Dublin Airport);
- a video interview with the SJU Executive Director explaining SESAR Solutions.

3.2. Release 4



Release 4 activities built on the knowledge and experience gained in previous releases (See Figure 3.1) to produce a comprehensive validation plan. This incremental approach to validating solutions allows SESAR to stay in tune with and responsive to the needs of the aviation industry, as they evolve. Exercises were

undertaken from which the following solutions are expected to emerge:

Air traffic flow management slot swapping

Aircraft operators' tactical priorities are introduced in a cooperative process with the Central Flow Management Unit (CFMU) through Air Traffic Flow Management (ATFM) slot exchanges made between flights within a single company). The

CFMU may propose slot exchanges between flights to minimise the inconvenience to the community as a whole with the objective of minimising the total ATFM delay.

Enhanced terminal operations with Low Visibility Procedures (LVP)

Using satellite-based augmentation systems, these procedures for vertical guidance will pave the way for flying Instrument Landing System (ILS) type approaches to airports independently of ground-based infrastructure. LVP enable landing operations in bad weather conditions or in airports that are not equipped with ILS.

Extended Arrival Management (E-AMAN)

E-AMAN refers to preparing further in advance the sequencing of air traffic destined for a particular airport. The solution extends the arrival management coordination beyond the airspace



surrounding the airport (Terminal Manoeuvring Area) to neighbouring en-route airspace. This allows controllers upstream to give early instructions to pilots to adjust their speed before initiating descent towards the destination airport (Top of Descent).

Flow-based integration of Arrival and Departure Management

Integrated Arrival and Departure Management (AMAN/DMAN) aims at increasing throughput and predictability at airports by improved coordination between en-route, approach and tower controllers. Arrival and departure flows to the same runway (or for dependent runways) are integrated by setting up a fixed arrival departure pattern for defined periods. The successive pattern might be chosen by the operators or provided by an optimisation algorithm considering arrival and departure demand. Departure flow to the runway is managed by pre-departure sequencing (integrating route planning), while arrival flow to the runway is managed by arrival metering.

Ground-Based Augmentation System procedures for CAT II/III precision approaches

The Ground-Based Augmentation System (GBAS) augments the Global Navigation Satellite System (GNSS) signals by sending the positioning corrections to aircraft for precision approach and landing. Unlike the ILS, the GBAS system is not reliant on one physical signal, but rather a digitally coded transmission which is loaded into

the aircraft's navigation and guidance capabilities — this allows greater flexibility in terms of the operations that it can perform. In particular, GBAS used for Category II/III approaches (1 000 feet or 300 metres) or less of runway visual range) offers a viable and cost-effective solution for low visibility operations, overcoming ILS operational limitations such as the critical and sensitive areas.

Pre-Departure Sequencing supported by Route Planning

This solution aims to deliver an optimal traffic flow to the runway by incorporating accurate taxi time forecasts into route planning so that Target Start-up Approval Times (TSAT) or off-block approved times can be calculated. Pre-departure sequences (TSAT sequence) is established by Tower Clearance Delivery Controllers who follow TSAT-windows when issuing start-up approval.

User-Driven Prioritisation Process (UDPP) departures

Taking place during pre-tactical operations, this solution provides airspace users with an easy and user-friendly way to identify their best swapping partners, as well as accrued flexibility in the slot-swapping rules such as multi-swap and substitution on cancellation. The slot-swapping tool allows airspace users to gain efficiency in the process of querying and identifying a partner for a slot-improvement, delay, or substitution on flight cancellation.

Figure 3.1. **Releases in a nutshell**



3.3. Release 4 highlights

Here are some notable highlights from the Release 4 validation activities.

Initial 4D flights to make air travel even more predictable



In March 2014, a flight trial from Toulouse to Copenhagen and then Stockholm, successfully validated the sharing of trajectory information between ground and airborne operations, and the capability of the aircraft to comply with time constraints in the en-route and approach phases of the flight.

The flight trial further confirmed that i4D offers important safety and environmental gains, as well as increased flight predictability and overall network efficiency. Controllers could clearly see on their screens expected ground and airborne trajectories, which allowed them to resolve discrepancies where necessary and predict the flight path with greater precision. On the airborne side, the aircraft was able to better manage their speed profile, resulting in fuel savings and an environmentally-optimised flight profile with greater predictability for the flight crew. The sharing of trajectory also meant that aircraft sequences could be better managed and delivered into TMAs with greater efficiency.

The i4D concept was the subject of a technical demonstration at the 2014 World ATM Congress, at which a broad range of ATM stakeholders had a chance to visit three operational platforms to experience for themselves the operational view of an i4D procedure. This gave a first-hand practical understanding of the progress achieved so far, in addition to the demonstrated benefits of i4D.

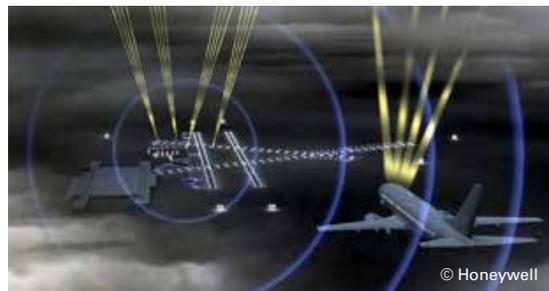
Crew and controllers give thumbs up to approach procedures using vertical guidance

In May, validation activities at Turin Airport showed how advanced Approach Procedures with Vertical Guidance (APV) can provide flight crew and air traffic controllers with good situational awareness

and have the potential to increase predictability of incoming flights to an airport. The procedures aim to enable vertically guided approaches to runways not equipped with standard instrument landing aids.

The exercise focused on the feasibility of operational implementation of such a solution, from both ground and air segments perspectives. The assessment looked at the life cycle of an approach operation, starting from procedure design and coding issues up to avionics behaviour and operational procedures (crew and controller workload, situational awareness, etc.). Initial feedback from crew members and controllers was very positive. Pilots were able to fly stabilised approaches, with both three and four degree glide path angles, in clean configuration (saving fuel and reducing the noise impact) keeping a good situational awareness with a manageable workload. Air traffic controllers were able to manage traffic with workload and situational awareness comparable to the current situation.

Progress made on GBAS Cat II/III precision landing



SESAR is exploring a range of new approach and landing operations made possible thanks to GBAS, such as curved approaches, displaced runway thresholds and variable glide slopes. While GBAS CAT 1 approaches have been in operation in Europe for several years, SESAR has taken the system a step further by conducting flight trials and research into GBAS CAT II/III approaches that enable the aircraft to land in even lower visibility.

In 2013, SESAR members reached a major milestone — a first CAT III approach enabled solely by GBAS. In June and July 2014, SESAR members embarked on a round of successful validation flights, testing a CAT II/III avionics receiver prototype with ground stations at Frankfurt, Toulouse and Bremen. Over 90 flights were completed using a mix of satellite guidance



and autopilot, focusing on further data collection with aircraft airborne receiver and ground stations in the final stages of prototype development for the validation of the International Civil Aviation Organisation (ICAO) Standards and Recommended Practices. So far the results are positive and assuming that standardisation and regulation progress as planned, the entry into service of GBAS Cat II/III can now be expected in the 2018–19 timeframe.

Trial confirms flexibility offered by short-term flow control management measures

In October, a live trial across a large part of Europe's core airspace validated the feasibility and benefits offered by a wider and more harmonised application of Short-term Air Traffic Flow and Capacity Management (ATFCM) Measures (STAMs). The management of air traffic flows in

Europe is centralised at Eurocontrol's Network Manager/Central Flow Management Unit (CFMU) in Brussels, in coordination with Flow Management Positions (FMPs) at all air traffic control centres in Europe. The trial brought together FMPs from Area Control Centres (ACCs), the Network Manager and airlines to validate a harmonised STAM process and FMP workflow. During the exercise, around 70 STAM measures were successfully initiated, coordinated and implemented, using a proposed workflow and a set of coordination tools.



SESAR BECOMING A REALITY: EARLY IMPLEMENTATIONS OF SESAR SOLUTIONS

A sign that SESAR is becoming a reality and a result of working together was news of the implementation of several SESAR Solutions over the course of 2014, such as Remote Tower Services at Örnköldsvik Airport and an Airport Operations Centre (APOC), which opened for business at Paris Charles de Gaulle and London Heathrow airports.

The most convincing proof of SESAR's readiness was the EU decision to deploy a first set of SESAR Solutions through the PCP. This will allow for the crucial synchronised deployment across Europe (2015–20).

See Chapter 5 for more details on the pathway to deployment

3.4. SESAR Project Awards: Recognising research excellence

Each year during the World ATM Congress, the SESAR Project Awards recognise projects for their excellence in ATM research. In 2014, a total of 21 projects, 7 'Best in Class' and 14 'Outstanding' projects were submitted for nomination.

In the 'Best in Class' category, Project 9.21 was recognised for the considerable work it undertook in defining options and developing a framework for airborne ADS-B performance evaluation, which is now accepted by the global SESAR community and is being used by other programme projects.

Two entries received the award for most 'Outstanding' project. The first went to the 'Passenger-Oriented Enhanced Metrics' (POEM) project (E.02.06), which developed a new network model to explicitly take into account passenger behaviours and propagation of passenger delay.



[LEFT TO RIGHT]: Christelle Pianetti (DSNA), Martina Stehlikova (Honeywell), Andrew Cook (University of Westminster)

The second award in this category went to Project 6.71, which was recognised for its pioneering role in developing Airport Safety Support Tools for pilots, vehicle drivers and controllers.

Discover more about SESAR Solutions:
YouTube: www.youtube.com/user/SESAREuropeanUnion
Website: <http://www.sesarju.eu/solutions>



CHAPTER 4

Demonstrating SESAR

Going upon their results, SESAR demonstrations activities are clearly bringing us closer to delivering a modernised ATM system and achieving a higher performing aviation sector for Europe. This is certainly good news for air traffic controllers, pilots and all those involved in aviation on a day-to-day basis. In the long run, it is equally good news for both European citizens and the economy, since the implementation of SESAR Solutions will help Europe's aviation industry to offer a better passenger experience and become even more sustainable and competitive. This chapter outlines the status of SESAR demonstration activities in 2014.

4.1. Seeing is believing

Between 2012 and 2014, the SJU co-financed a total of 18 demonstration activities, which amounted to over 30 000 flight trials and addressed all flight phases. Nine of these projects addressed the industrialisation and implementation readiness of SESAR Solutions, providing concrete and tangible evidence of the performance benefits that they can bring to the overall performance goals of aviation and air traffic management in Europe.

Given the importance of mitigating the environmental impact of aviation, a further nine projects were selected to specifically demonstrate how the programme's solutions can result in significant reductions in CO² emissions and noise. A number of these 'green' projects were run in collaboration with global partners, under the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) ⁽⁴⁾, representing the third edition of AIRE projects to be co-financed by the SESAR Joint Undertaking.

A report detailing the results of these 18 projects, as well as lessons learned and next steps was published in February 2015. This report highlighted that SESAR is already delivering quick wins with some solutions proving ready for implementation.



⁽⁴⁾ The Atlantic Interoperability Initiative (AIRE) was launched in 2007 by the European Commission and the United States (US) Federal Aviation Administration (FAA) with the goal of reducing emission. The SESAR Joint Undertaking has managed the programme from an European perspective since 2008. The initiative's aim is to improve aircrafts' energy efficiency and lower emissions and noise through ATM solutions. A total of 10 000 green flights were co-financed by the SJU between 2008 and 2011: www.sesarju.eu/innovation-solution/demonstrating-sesar/aire



Figure 4.1. Overview of 2012–14 SESAR demonstration projects

Domain	Demonstration activity/project	Location	Number of trials	
TMA	AMBER	Riga International Airport	124	
	CANARIAS	La Palma and Lanzarote airports	8	
	DFlex	Paris Charles de Gaulle (Paris CDG)	2 000	
	FAIR STREAM	Paris CDG, Flughafen Zürich and Munich Airport	825	
	OPTA-IN	Palma de Mallorca Airport	101	
	NEWBRIDGE (Ongoing)	Goteborg-Landvetter (ESGG)	3 000-4 000	
	NASCIO	Babice / Lodz Balikesir Koca Seyit Barcelona / La seu d'Urgell Bratislava Interlaken Sabadell / La seu d'Urgell Tetouan Burgas	67	
	REACT plus	Budapest Airport	4 113	
	Oceanic/ en-route	AFD	UK/Italian airspace	80
		ENGAGE Phase II	North Atlantic – between Canada & Europe	210
FRAMaK		Karlsruhe Upper Area Control (UAC) and Maastricht UAC	528	
ICATS		USA-Iberian Peninsula	240	
SATISFIED		EUR-SAM Oceanic corridor	165	
SMART (Ongoing)		Lisbon flight information region (FIR), New York Oceanic and Santa Maria FIR	250	
TOPMET		Continental Europe	1 000	
OPFLIGHTT		Transatlantic to London Heathrow	20 000	
WE-FREE		Paris CDG, Venice, Verona, Milano Linate, Pisa, Bologna, Torino, Genoa airports	128	
Gate-to-gate		MAGGO (Ongoing)	Santa Maria FIR	100

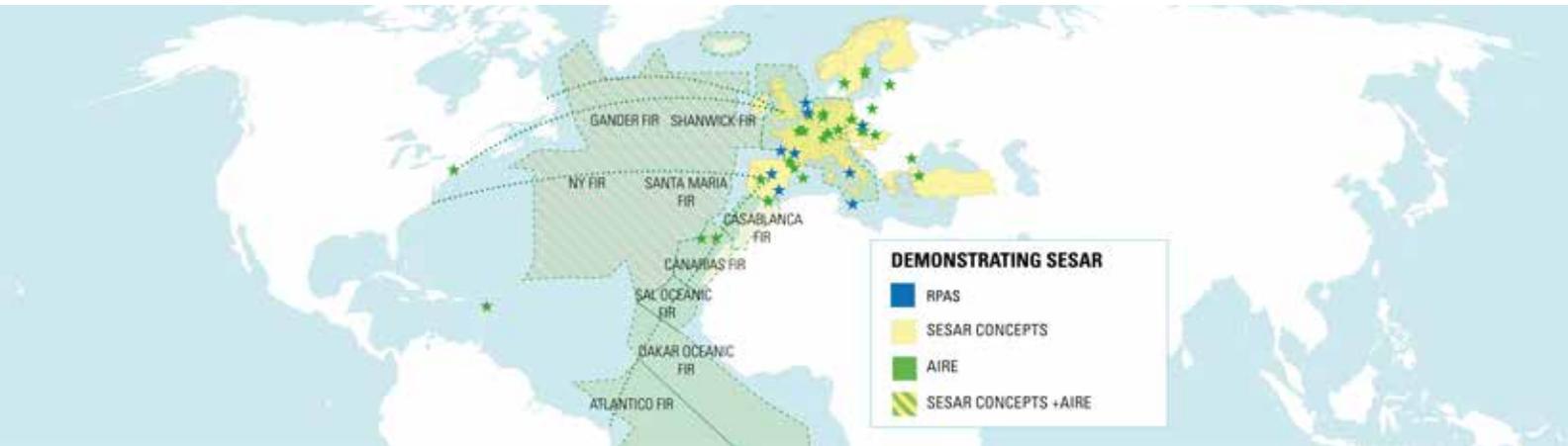


4.2. Integrating civil Remotely-Piloted Aircraft Systems (RPAS)

In addition to the aforementioned activities, work continued on 9 demonstration activities focusing on the integration of civil RPAS into the European ATM system. With 38 different partners from 8 different countries, these projects aim to demonstrate how to integrate RPAS into non-segregated airspace in a multi-aircraft flight environment, with a focus on identifying operational and technical gaps and demonstrating links with SESAR. Both optionally-piloted and fully remotely-piloted systems are participating in these projects, using various types and sizes of RPAS, such as rotary wings, motor gliders, and light observation aircraft, both civil and military.

The project results, which are expected by the end of 2015, will provide concrete evidence in the fields of safety, airport integration and airspace throughput, as well as security. Preliminary findings based on simulation and pre-operational flight trial activities performed throughout 2014 show that the nine projects are progressing well and that RPAS could be managed as a light aircraft within a certain density of commercial traffic. The findings so far also indicate the need for the definition of procedures to handle abnormal and emergency situations together with air traffic control.

Figure 4.2. **Geographical scope of SESAR Demonstration Activities**



4.3. Scaling up demonstrations

The results achieved so far provide the momentum for SESAR members and partners to perform larger and more complex projects together. In this respect, 15 large-scale projects were launched in 2014 to demonstrate that SESAR Solutions are relevant for uptake within a much wider operational environment across Europe.

Co-funded by the SJU, the projects are paving the way for the wider-scale deployment of the PCP and projects focused on small and medium-sized airports. Between now and 2016, the projects will unite the skills and innovative capabilities of a wide range of ATM stakeholders from across Europe in order to test SESAR Solutions in a variety of real operational environments.



SESAR Demonstration Activities workshop, Toulouse, October 2014

SHARING BEST PRACTICES TO MAKE CHANGE HAPPEN

In October 2014, at a dedicated workshop in Toulouse hosted by Airbus, some 50 participants came together to discuss the results of the completed demonstrations activities, as well as the plans of the newly-launched projects. Through their presentations, participants illustrated how SESAR demonstration activities are addressing all parts of the ATM value chain, from high-performing airport operations, optimised ATM network services and advanced air traffic services.



Discover more about SESAR demonstrations activities:
Website: <http://www.sesarju.eu/innovation-solution/demonstrating-sesar>
YouTube: www.youtube.com/user/SESAREuropeanUnion.



CHAPTER 5

Towards SESAR 2020

These are promising and yet challenging times for Europe's ATM sector. A lot has been achieved by SESAR, but a lot more work needs to be done to unlock the full potential of Europe's ATM. In 2014, important ground work was undertaken by the SJU to plan for the next phase of SESAR R&I activities, as well as to contribute to preparations for the large-scale deployment of the first set of SESAR Solutions across Europe. This chapter describes these activities, as well as how the SJU is responding to emerging challenges in the sector and planning for the future.

5.1. Extension of the SESAR Joint Undertaking

In June 2014, the Council of Ministers of the European Union adopted the extension of the SESAR Joint Undertaking (SJU) ⁽⁵⁾. This decision was taken in recognition of the need to foster R&I on ATM beyond the organisation's original mandate of 2016, as well as in appreciation of the ability of the SJU partnership to respond to evolving business needs and fast track technological and operational improvements in Europe's ATM system. The extension of the SJU was officially marked at an event organised by the European Commission's Directorate-General for Research & Innovation on 9 July 2014 by the then President of the European Commission, José Manuel Barroso. During the event, 500 participants were privy to the formal launch of seven public-private partnerships (PPPs) ⁽⁶⁾ that are set to deliver solutions to some of the biggest challenges affecting Europe in order to drive forward Europe's competitiveness.



[LEFT TO RIGHT]:
 Commission Vice-President Siim Kallas, Peter Hotham, Massimo Garbini, Commission President José Manuel Barroso, Florian Guillermet, Commissioner Máire Geoghegan-Quinn and Commission Vice-President Neelie Kroes

⁽⁵⁾ 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. Text with EEA relevance.

⁽⁶⁾ IMI (innovative medicines), Clean Sky (aeronautics and air transport), FCH (fuel cells and hydrogen), ECSEL (electronic components and systems), BBI (bio-based industries), SESAR (air traffic management) and SHIFT2RAIL (rail transport).



5.2. SESAR 2020: Call for membership

Against the backdrop of this event, a Call for Expression of Interest (CEI) was published on 9 July 2014 to officially launch the SESAR membership process.

The process involved an assessment of the proposed expressions of interest leading to the pre-selection of 24 applications, of which 12 were

from existing members, 3 from rearrangements in consortia composition and 9 new candidate members. A decision by the SJU Administrative Board in November enabled negotiations to get underway with 19 proposals (?). The process is expected to close by the end of 2015.

5.3. Performance-driven research and innovation

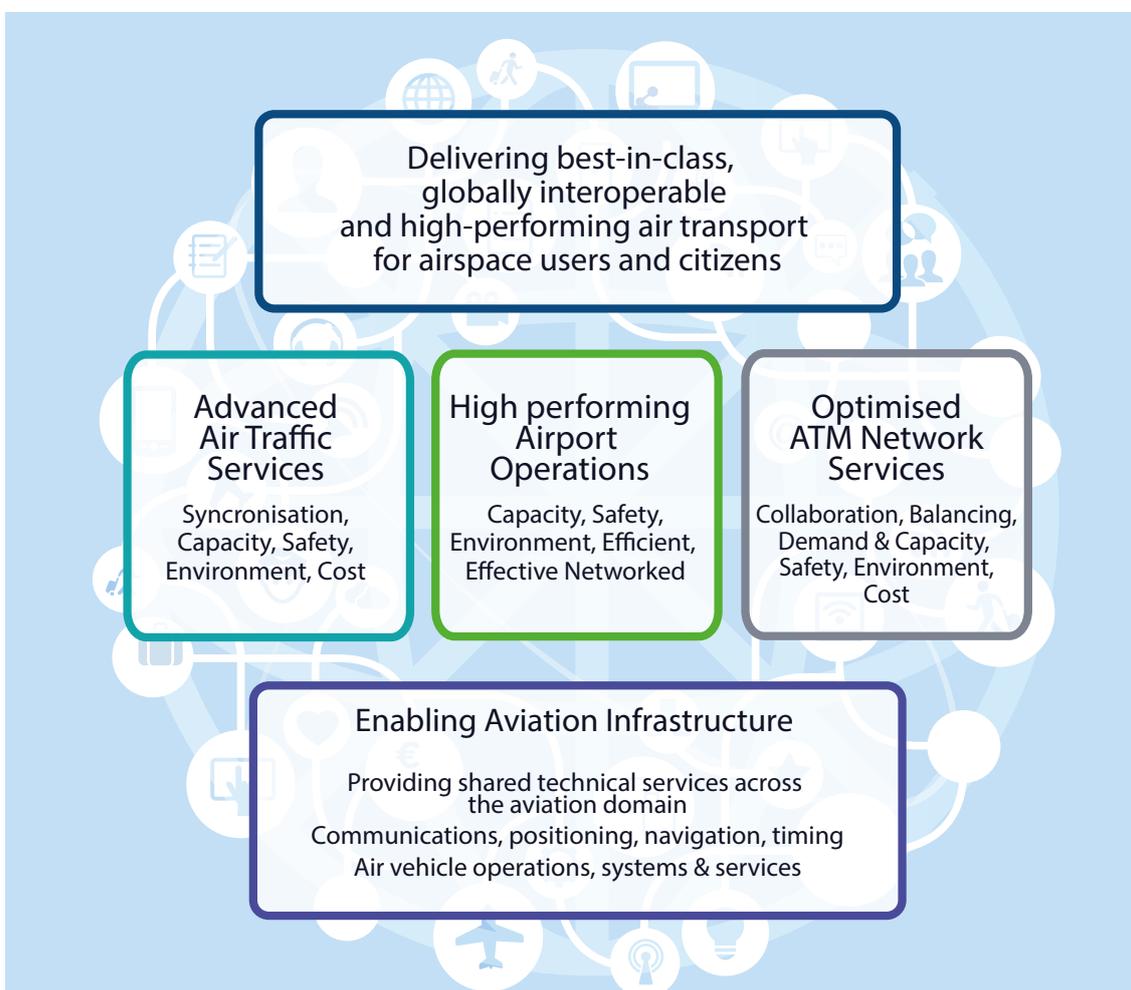
In addition to the opening of the membership process, the call for expression of interest also provided a draft work programme for SESAR 2020, which addresses several key areas of ATM, as well as new challenges, changing markets and the need for continuous and coordinated investment. Based on lessons learned from the current programme, SESAR 2020 is structured to

allow increased connectivity between exploratory research, industrial research and very large-scale demonstration activities to ensure a seamless ATM innovation pipeline.

In preparation for SESAR 2020, work got underway to address two specific areas of research.

(?) ADB (D)13-2014.

Figure 5.1. **SESAR 2020 Key Features**





5.3.1. Cybersecurity



The future ATM system in Europe will rely heavily on the virtual exchange of information between stakeholders. This shift in information exchange is facilitated by SESAR and in particular SWIM. However, greater interconnectivity and automation inevitably raises questions about how to guarantee that these platforms upon which this information exchange takes place are secure, resilient and trustworthy. Technical solutions to address cyber threats already exist and are implemented in the SESAR programme. Nevertheless, given the complex nature of the ATM system, there is a need for a systemic approach to cybersecurity for SESAR and in particular SWIM.

Taking a holistic look at cybersecurity, the study will provide the basis for a cybersecurity strategy for the development of new ATM systems, their interoperability and training needs, taking into account examples of best practices implemented in other sectors and standards agreed at an

international level. The final results — expected in the first quarter of 2015 — will be integrated into SESAR 2020, as well as the 2015 edition of the European ATM Master Plan.

5.3.2. Remotely-Piloted Aircraft Systems

The European RPAS Roadmap ⁽⁹⁾, handed over by RPAS stakeholders to the European Commission in 2013, paves the way for the safe integration of RPAS into the non-segregated ATM environments in Europe from 2016. As indicated in its annexes, the RPAS roadmap requires the development of a work breakdown structure, providing further details as to how to fully cover the R&I needs of RPAS ATM integration.

Against this background and upon a request from the European Commission, in early 2014, the SJU launched a call for tenders for the definition phase related to civil RPAS, which did not lead to a contract being awarded. Nevertheless, with the support of a significant number of stakeholders such as research centres, universities and associations, the SJU and its members were successful in detailing the structure and resources needed together with a breakdown of RPAS activities that are required from a R & D standpoint. Aligned with the EU RPAS roadmap, the aim of this phase was to also provide the basis for RPAS requirements within the next edition of the European ATM Master Plan, to be published at the end of 2015.

5.4. ATM Master Plan update

The European ATM Master Plan is the common roadmap for the development and deployment of SESAR Solutions linking them to the SES performance objectives. The plan defines the essential operational changes that need to occur in order to achieve the SES performance objectives, and identifies the related functionalities and actions that operational stakeholders should implement within a given timeframe and environment.

First drafted during the SESAR definition phase, the plan is updated every two to three years with the latest edition dating back to 2012. A campaign was therefore launched in 2014 to update the plan by June 2015. To mark its launch, the SJU organised a high-level conference to discuss the strategy behind the plan's update, taking into account views from various ATM stakeholder groups.



João Aguiar Machado, Director-General for Mobility and Transport, European Commission and Chairman of the SJU Administrative Board

Bringing together over 300 stakeholders and live-streaming to the entire ATM community, the event was also an opportunity to hear from global

⁽⁹⁾ Roadmap for the integration of civil Remotely-Piloted Aircraft Systems into the European aviation system.

partners on the value that the plan brings to efforts to harmonise and ensure global interoperability. Speakers included high-level representatives from

the European institutions, ICAO and the ATM and aviation community.

5.5. Supporting deployment preparations



Over the course of 2012 and 2013, the SJU supported the European Commission in drafting the PCP, which outlines the main changes

required to deploy the first wave of SESAR Solutions. The technical support provided by the SJU continued in 2014, as well as additional work on completing and base-lining the standardisation needs for PCP, and the identification of a final set of SESAR material required to support the PCP. The Implementing Regulation on the PCP was adopted on 27 June 2014.

A major step towards realising SESAR came with the launch of the aviation industry partnership, SESAR Deployment Manager (SDM), on 5 December 2014, to coordinate and synchronise the deployment of SESAR Solutions covered by the PCP. This new industry-wide consortium is in a framework partnership agreement with the European Commission, which brings together 11 ANSPs, 4 airline groups and 25 airports, representing cross-industry collaboration. Upon its launch, the SDM published a preliminary Deployment Programme in December, and is due to deliver its full Deployment Programme in June 2015. Over the course of 2015, the SJU will work closely with the SDM according to the established cooperation agreement to ensure that the activities of both organisations stay aligned and focused on the common SESAR vision.



CHAPTER 6

Partnering for smarter aviation

A fundamental principle of the SJU is to broaden and deepen collaboration with a range of different stakeholders in order to benefit from their expertise and gain their assurance that SESAR Solutions meet the needs of the entire European ATM and aviation community. Over the course of 2014, the SJU fostered strong ties with a number of key stakeholder groups with several important outcomes.

6.1. European Aviation Safety Agency



Strong cooperation continued between the SJU and EASA over the course of 2014, focusing on the next steps for effective PCP implementation preparations for SESAR 2020 and specific areas such as data communications, Remote Tower Services, GBAS CAT II/II, SWIM, RPAS and cybersecurity. The EASA also took an active part

in reviewing the final reports and first results of the SESAR demonstration projects. This ongoing collaboration resulted in several recommendations to be considered by the SJU in its work, in particular in the preparation of SESAR Solutions. For its part, the EASA Rulemaking Plan was adapted to include SESAR regulatory needs related to Remote Tower Services; SWIM; GBAS and PBN, while some of the work related to Notice of Proposed Amendments (NPA) is currently undergoing public consultation, taking into account SESAR results and the EU's PCP regulatory framework.



6.2. EUROCAE



The SJU contributed to ensuring ongoing alignment between SESAR standardisation needs and EUROCAE development and planning through its active participation in the EUROCAE

Technical Advisory Committee. In 2014, several standardisation needs originating from SESAR

were incorporated into the EUROCAE technical work programme. The two organisations also worked closely together to ensure standardisation needs were fully reflected in the PCP. As part of its delivery of SESAR Solutions, the SJU actively engaged with EUROCAE to systematise and streamline the processes for the delivery and production of standardisation material.

6.3. National authorities

The SJU continued to play an active role in fora at which national authorities coordinate and take decisions, such as the Single Sky Committee and EASA ATM Thematic Advisory Group. Close relations were also maintained through the National Supervisory Authorities (NSA) coordination platform, and, in particular, a working group addressing SESAR deployment issues. The working group enabled the SJU to raise awareness among the authorities of ongoing R&I, thus helping the authorities to better bridge development and deployment activities.

The SJU also continued to leverage the expertise of some 80 NSA experts through memoranda of understanding established with 17 national authorities ⁽⁹⁾ from 13 states ⁽¹⁰⁾. These experts provided input on a draft PCP document, as well as on a wide range of the topics, including RPAS, remote towers, GBAS CATII/III and SWIM, as well as the involvement of the authorities in SESAR demonstration activities. The results from assessments made by the authorities and their participation in validation exercises were integrated in 2014 SESAR deliverables. These have also been used for the elaboration of regulatory overviews of several SESAR Solutions.

6.4. Military and state aviation

In Europe, military aviation represents hundreds of military areas and dozens of military airfields. Only an estimated 30 % of military flights fly military General Aircraft Traffic (GAT), while the remainder operate according to Operational Air Traffic (OAT) rules. Sovereign military undertake a wide variety of missions for training purposes, homeland security, as well as cross-border crisis management operations. For such missions, access to airspace is vital, however, given that these missions are often launched at short notice, military use of airspace becomes more complex and varied than for civilian airspace users. For this reason, a wide military involvement is paramount to enable the SESAR programme to understand and take into account the various ways in which the military make use of airspace across Europe.

Since its establishment in 2011, the Military Engagement Plan for SESAR (MEPS) has enabled the structured participation of national military experts in all relevant aspects of the SESAR programme, such as through the creation of specific



panels to gather a large number of inputs from state aviation in specific technical and operational domains. In 2014, 69 military experts (5 % pilots, 35 % air defence experts, 20 % ATM experts, 40 % engineers) from 10 countries (Belgium, Finland, France, Germany, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom) took part in the MEPS in 51 projects.

⁽⁹⁾ Among the selected authorities are several national supervisory authorities, civil aviation authorities, two military authorities and one aviation security authority.

⁽¹⁰⁾ The states represented through these MoU are Belgium, France, Germany, Ireland, Italy, Malta, the Netherlands, Poland, Portugal, Romania, Spain, Turkey and the United Kingdom. Ukraine joined the group of national authorities cooperating with SESAR, through an expert working arrangement.



6.4.1. European Defence Agency



The SJU and European Defence Agency (EDA) have been engaged in close dialogue since 2011, and this

relationship continues to provide input on military matters and opinions into the programme. In 2014, the EDA established a 'SESAR cell' made up of four national experts to reinforce engagement, especially with regards to the European ATM Master Plan review and military costs.

In general, the collaboration between the EDA and SESAR focuses on:

- defense investment and procurement;
- planning for the evolution of relevant military technologies;

- risk mitigation actions related to military implementation of SESAR;
- provision of expertise or organisation of fora to gather the required results in key areas.

6.4.2. NATO



The SJU collaborates with NATO through a roadmap defining the need for technical interaction between the SJU, NATO and EDA. This roadmap aims to obtain a common understanding of how the SESAR affects NATO's interests and, through information sharing,

to identify possible matches between NATO expertise and SJU activities. Over the course of 2014, reports were issued and meetings took place whereby all parties were kept informed of ongoing activities, particularly in relation to the European ATM Master Plan review.

6.5. Professional staff associations

The SJU collaborates closely with the entire professional ATM community represented by the participation in the programme of the following five professional staff associations: International Federation of Air Traffic Controllers' Associations (IFATCA), European Cockpit Association (ECA), International Federation of Air Traffic Safety Electronics Associations (IFATSEA), European Transport Workers' Federation (ETF), and Air Traffic Controllers European Unions Coordination (ATCEUC).

The full integration of staff associations' representatives into the programme at different levels remains in place and a pool of 90 cross-nationality licensed and operational controllers, pilots and engineers continue to work on the International Validation Team (IVT). The IVT participated successfully in validation activities

during 2014 bringing vital operational input and value to the performance and exercise outcomes.

In terms of outreach, the SJU attended the annual meetings of IFATCA and IFATSEA, as well as SESAR or ATM coordination meetings organised by ETF, ATCEUC and ECA/IFALPA. Similarly, professional staff experts were invited to provide their views as panellists at various SJU-led events, such as the Remote Tower Services Solution Workshop (June 2014, Dublin) and the launch event of the European ATM Master Plan review. As well as their active participation in the SESAR Performance Partnership, experts were invited to participate in various working groups related to the RPAS definition work and the European ATM Master Plan.



6.6. SESAR Performance Partnership

The goal of the SESAR Performance Partnership (SPP) is to assist the SJU Executive Director in monitoring the objectives and results of the SESAR development phase work programme, ensuring transparency, common understanding, participation and consequent commitment of all stakeholders to changes to the European ATM Master Plan and transition from development to deployment.

During 2014, the focus of the SPP was concentrated on supporting the SJU Executive Director in the decision-making process related to the preparation for the update of the European ATM Master Plan. The SPP also focused on cross-checking R&I developments against the PCP ⁽¹⁾ objectives, as well as the level of ambition of the Step 2 Concept of Operations.

Figure 6.1.: Stakeholder interests represented in the SESAR Performance Partnership



6.7. Airports Council International Europe



Until recently, airports were largely disconnected from the rest of the ATM network, with very little real-time information exchange on flight arrivals and departures. Recognising the need for further airport integration, the SJU works closely with Airports Council International (ACI) to raise awareness about SESAR among airport partners — beyond the hub operators represented in the SESAR European Airports Consortium (SEAC).

In 2014, the ACI-SJU collaboration focused on spreading news about SESAR developments, carrying out joint communications activities and consulting on technical issues such as safety, environmental concerns and the European ATM Master Plan. Highlights included ACI-SESAR roadshows hosted in Manchester and Milan, as well as workshops and working sessions with the following ACI members: London Heathrow, Munich and Frankfurt (also SEAC members).

⁽¹⁾ See Chapter 5: Towards SESAR 2020.



6.8. Civil airspace users

Civil airspace users cover a wide spectrum of activities and undertakings, ranging from scheduled and charter airlines, cargo service providers to business and general aviation, including rotorcraft operations.

Civil airspace users are directly integrated within the programme and their expertise is recognised as key in ensuring the overall success of SESAR. During the course of 2014, airspace users' engagement was prioritised on the following areas: launch of SESAR 2020, PCP R & D delivery, demonstration activities and the refinement of

the level of ambition of the SESAR Concept of Operations to prepare for the ATM Master Plan update.

Thanks to their expertise, civil airspace users also made significant contributions to numerous SESAR activities such as Releases 4 and 5. In parallel, this group maintained its key role in SJU governance bodies with a particular focus on the Administrative Board, Programme Committee (opened to airspace users in 2014 with observer status) and the SPP group.

Figure 6.2. **List of airspace users involved in the SESAR Programme until 2014 (excluding demonstration activities)**



6.9. European Space Agency



The European ATM Master Plan clearly identifies the need for space-based positioning for

navigation and communication services in support of time-based and trajectory-based operations, as well as for improved operations into less well-equipped airports or with differently-equipped vehicles.

In 2014, the SJU and the ESA, through the Iris programme, continued to have a productive working arrangement whereby ESA staff participated in SESAR projects and the SJU contributed directly to the Joint Iris Advisory Committee (JIAC) and Iris Expert Group. This

allowed for technical coordination between the ESA, SJU and other stakeholders for example on the development of SESAR data link requirements using satellite communications in support of 4D trajectory operations.

With the establishment of the Iris Precursor or Iris 2017 by Inmarsat, the SJU launched a complementary project to fully explore its operational and technical viability, in particular in relation to supporting initial 4D operations in oceanic and remote areas, as well as providing backup to the existing continental VDL2 data link environment. The project also examines service continuity and airspace user cost implications of Iris 2017.

6.10. Clean Sky



The SJU continued to work in close coordination with Clean Sky, focusing on specific areas of common interest such as:

- gate-to-gate aircraft operational improvements (WP16) for fuel and environmental savings, environment metrics and modelling and the Clean Sky technology evaluator work;
- aircraft systems in support of SESAR Trajectory-Based Operations (WP9) and Clean Sky Systems for Green Operations <http://www.cleansky.eu/content/project/system-green-operations>.

In 2014, the two organisations exchanged operational information on a number of topics: PBN; Vertical Profile in the TMA; Ground and Airborne Capabilities to Implement Sequence; and Airborne Spacing (ASPA) Sequencing and Merging (S&M). These discussions confirmed that Clean Sky and SESAR activities are aligned. The SJU was proactive to foster enhanced cooperation in 2014 with the organisation of director-level meetings and exchanges of information on matters relating to the scope of SESAR 2020 and Clean Sky2, and the setup of the two organisations under Horizon 2020.



CHAPTER 7

Committed to global outreach

Recognising global interoperability as a prerequisite for a smooth and seamless transition towards a modernised global ATM system, the SJU actively engages with aviation partners worldwide. This chapter provides a summary of these global outreach activities and explores collaboration with two major aviation players — the United States' FAA through the NextGen ATM modernisation programme and ICAO. The SJU also raises the profile of the SESAR programme through a number of global outreach activities, in particular in relation to demonstrating SWIM.



7.1. Collaboration beyond Europe

The SJU pursues international relations in the context of the European Commission external relations framework. In this regard, the SJU actively liaises with Commission's DG Mobility and Transport to find the best means of technical cooperation in relation to ATM and SESAR.

In order to strengthen global cooperation, several bilateral Memoranda of Cooperation (MoC) have been drawn up between the European Commission and non-EU countries:

- EU-US MoC on civil aviation R & D, which entered into force in July 2010;
- MoC with the Japanese Civil Aviation Bureau (JCAB), signed in July 2011;
- MoC with Mexico, in order to explore cooperation in ATM R & D, signed in September 2011;
- MoC with the Civil Aviation Authority Singapore (CAAS), which entered into force in November 2012.



The New Zealand delegation visits the SJU

Over the course of 2014, these cooperation agreements made progress on aligning the European ATM Master Plan and SESAR programme with industry standardisation and ICAO's Global Air Navigation Plan/Aviation System Block Upgrades (GANP/ASBUs). The key areas addressed within this context continue to focus on:

- global coordination around SWIM and ATM information data definition and exchange;
- trajectory-based operations — including initial 4D operations and standards for data communication services.

In addition to the above, the SJU regularly meets with delegations from other world regions to share best practices. For example, in October 2014, representatives from New Zealand's New Southern Sky ⁽¹²⁾ ATM modernisation programme visited the SJU in order to learn from European experiences with SES/SESAR and in particular on the alignment between the European ATM Master Plan and the ICAO GANP.

Furthermore, external relations continued with the Australia, Brazil, China, Gulf States, Israel, Japan, Mexico, Turkey, Ukraine and the states in the African COMESA region.

7.2. FAA and NextGen



Within the framework of the MoC on civil aviation R & D between the USA and European Union, the Coordination Committee (CCOM) — which is co-chaired by the FAA and SJU — made significant progress

on a number of areas. In December 2014, the CCOM developed and delivered the NextGen and SESAR 'State of Harmonisation' document, which was subsequently approved by the High-Level Committee (HLC) and published in February 2015.

Over the course of 2014, the close coordination between SESAR and NextGen resulted in an alignment on a number of key interoperability matters:

- standardisation needs;
- alignment between the European ATM Master Plan and NextGen implementation plan;
- input to the next update of the ICAO GANP;
- cybersecurity, specifically in the area of SWIM;
- activity plans for the integration of RPAS into the ATM system;
- 4D trajectory management, in particular in forwarding the TBO concept document to

the work of the ICAO ATM Requirement and Performance Panel (ATMRPP);

- information management, in particular agreement on using the SWIM concept as a baseline for the new ICAO SWIM Panel (IMP);
- joint avionics roadmap;
- next steps for SWIM global demonstrations and i4D trials.

2014 also saw discussions focus on the necessary coordination efforts for addressing data communications and the future communications infrastructure in the two modernisation programmes.

In 2014, Florian Guillermet welcomed to the SJU premises in December 2014 Edward L. Bolton Jr., Assistant Administrator for NextGen to the SJU, who was accompanied by Steve Bradford, FAA Chief Scientist and Maria DiPasquantonio, FAA Brussels Senior International Programme Officer. Together, they discussed implications for the EU-US MoC of SESAR 2020 and key technical areas of cooperation. The recent NextGen Implementation Plan and organisational changes within the FAA were also discussed. As part of his trip, Mr Bolton visited the SESAR Remote Tower Services test site in Sweden, where SJU member, LFV, gave a guided tour of the facilities and presented the operational and technical infrastructure and systems

⁽¹²⁾ <http://www.nss.govt.nz/>



7.3. ICAO



Over the course of 2014, the SJU continued to play a key role in European coordination efforts (led by the European Commission and involving Eurocontrol, EASA, European Civil Aviation Conference (ECAC) and EUROCAE) towards the ICAO work programme priorities and the next update of the GANP/ASBUs. In this context, the SJU continued to invest in supporting European contributions towards the ICAO work programme groups, task forces, study groups and panels in order to secure both alignment and the available support from SESAR to ICAO.

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During 2014 the European Commission, Eurocontrol and the SJU contributed to the ICAO Multi-Disciplinary Working Group on incentives (MDWG) in describing the use of operational and economic/financial incentives as means to facilitate early implementations of the GANP/ASBU modules. The report was well received and will be referenced in the updated GANP for 2016.

While overall alignment between the European ATM Master Plan and ICAO ASBUs was achieved, work still needs to be performed to reach the necessary level of detail. The SJU has identified key areas where SESAR needs the support of standards and ICAO provisions. These areas have been coordinated and to a large extent agreed with the FAA under the EU-US MoC coordination plans, which will be further developed in 2015.

7.4. Showcasing SESAR at international events

The SJU participates in a number of high-level international events in order to raise awareness about SESAR, its latest results, and to increase global stakeholder engagement in the programme.

7.4.1. World ATM Congress, March 2014



In March 2014, the SJU participated in the World ATM Congress in Madrid, the largest ATM exhibition worldwide. The theme of the SJU's participation 'From innovation to solution' provided the backdrop for SESAR and its guests to present the progress achieved by the programme so far. During the course of the three-day congress, the SJU hosted an internal meeting, forum and three workshops, whereby attendees were privy to SESAR's concrete deliverables to date, as well as the future activities designed to reach the objective of developing a modernised ATM for Europe. The SJU also organised a technical demonstration of i4D trajectory management, offering participants hands-on, practical insight to the concept and its proven benefits.

7.4.2. ATC Global, September 2014

In September 2014, the SJU and its members organised a dedicated SESAR Solutions workshop and a stand at ATC Global in Beijing, China. The workshop featured three of SESAR's solutions: i4D trajectory management, SWIM and Remote Tower Services. The conference and exhibition was well attended by delegates from China and other non-EU countries (e.g. Australia, New Zealand, Singapore, Russia). The SJU took advantage of being in Beijing to hold meetings with various high-level stakeholders, including the Civil Aviation Administration of China (CAAC), Airbus China, Air Traffic Management Bureau of Civil Aviation Administration in China, Thales, Indra and Selex ES, and to present SESAR to students at the Civil Aviation University of China's Faculty of Sino-European Institute of Aviation Engineering (SIAE).



[LEFT TO RIGHT]:
Wolfgang Scheucher (SOLITEC), Dirk Schindler (Airbus Defence & Space), Dario Di Crescenzo (Selex ES), Frank Suykens (Luciad), Wim Post (SESAR Joint Undertaking)

7.4.3. Global SWIM outreach

The third edition of the SESAR SWIM Master Class took place between June and November 2014 and welcomed 81 international teams actively developing and demonstrating their SWIM-enabled applications, services and technical infrastructure. The SWIM Master Class culminated with a Best-in-Class Awards ceremony, where services and applications enabling distance calculations, aircraft tracking and optimised use of airspace received top prizes. The winners were among 39 SWIM-enabled ATM information solutions that were submitted to the Master Class jury for nomination in three categories: services, applications and technical infrastructure. The ceremony also demonstrated live some 20 services and applications, illustrating that SWIM is quickly becoming a reality within the global ATM system. Held annually, the Master Class is a chance for ATM stakeholders to share their experiences and best practices in

implementing the concept of SWIM. In doing so, the Master Class has become an important global platform through which to build a critical mass of knowledge and excellence about SWIM and to translate the concept into real solutions.

To further outreach and encourage the global take-up of SWIM, a global SWIM Demonstrations website was launched. The website provides the latest news on SWIM demonstrations and standards targeting global ATM interoperability, and aims to foster the deployment of SWIM solutions and strengthen international cooperation, based on consensus.

Recognition of these efforts to promote SWIM came in March when the SJU and its members won the prestigious IHS Jane's ATC Award for engaging an unprecedented number of ATM stakeholders in the goal of making SWIM a reality. The award was bestowed upon SESAR during a ceremony at the CANSO ATM dinner in Madrid, which brought together 400 delegates from the global ATM and air transport community.





CHAPTER 8

2014 Annual accounts

In 2014, the SJU made use of a total of EUR 275.2 million of member contributions (both in-cash and in-kind) for its activities, which represented an increase of 1.6 % compared to 2013. Of this amount, EUR 267.8 million (97.3 %) were incurred for operational expenses, as defined in the 2014 annual work programme, while EUR 7.4 million (2.7 %) were spent on running costs of the SJU.

With most programme activities at their peak in 2014, member-related operational expenses increased by EUR 2.0 (0.8 %) to EUR 249.2 compared to 2013, while non-member-related operational expenses increased by EUR 2.6 million (16.3 %) to EUR 18.6 million in the same period. Meanwhile, staff expenses decreased by EUR 0.2 million (-5.6 %) compared to 2013 due to vacancies and the need to fill fewer positions as originally foreseen for 2014 by the staff establishment plan.

In terms of contributions, by the end of 2014, the SJU received and validated EUR 1,009.8 million from its members, of which the EU provided EUR 439.6 million (43.5 %, cash only), Eurocontrol provided EUR 269.4 million (26.7 %, cash and in-kind) and EUR 300.9 million came from other members (29.8 %, cash and in-kind). Together with member contributions accumulated from previous years, the usage of contributions in 2014 resulted in EUR 234.5 million in negative net assets. This figure, however, does not take into account contributions from members amounting to EUR 245.5 million that are considered as liabilities, not as net assets, since they have yet to be validated. 2014 also saw an increase in accrued charges compared to 2013 in line with the abovementioned increase in non-member-related operational activities.

In terms of assets, both short-term and long-term pre-financing paid to SJU members was further cleared by EUR 8.4 million. The cash balance at the end of the year increased by EUR 15.9 million to EUR 21.2 million, out of which EUR 3.0 million were absorbed by administrative commitments not yet paid and EUR 8.4 million for members' cost claims received but not fully validated in late 2014. The SJU is required by the SJU financial rules to ensure the most adequate cash management and as such these remaining resources were necessary and sufficient to ensure the continuity of operations during the first quarter of 2015. Other assets have not undergone substantial or unexpected changes compared to the previous accounting year.

The resources made available by the SJU members, the budget provided by FP7⁽¹³⁾ and TEN-T⁽¹⁴⁾, and the cash contributions from Eurocontrol, were used in accordance with the SJU Financial Rules and, consequently, in line with the principles of the abovementioned EU programmes. With particular regard to the estimated eligible costs of the programme, the provisions of the SJU Financial Rules, derived from FP7 and TEN-T funding systems, were applied. Moreover, the acquisition of goods and services underwent a procurement process according to the SJU Financial Rules, ensuring fair competition among potential suppliers and efficient use of the SJU funds.

In conclusion, the programme is steady in terms of resources and efforts, and spending is expected to remain at comparable level at least in the coming year in anticipation of the closure of the programme at the end of 2016.

⁽¹³⁾ The European Union seventh framework programme.

⁽¹⁴⁾ Trans-European transport network.

BALANCE SHEET

<i>All figures in EUR</i>	31/12/2014	31/12/2013
I. NON-CURRENT ASSETS	75 379 787	63 669 050
Intangible fixed assets	288 122	571 332
Tangible fixed assets	264 204	360 786
Furniture and vehicles	85 294	99 690
Computer hardware	15 976	25 535
Other tangible assets	162 934	235 561
Long-term pre-financing	74 827 461	62 736 932
II. CURRENT ASSETS	27 047 761	31 567 774
Short-term pre-financing	5 008 559	25 533 298
Short-term receivables	882 200	818 215
Current receivables	9 761	78 293
Sundry receivables	9 437	273
Accrued income	4 245	29 380
Deferred charges	858 758	710 269
Cash & cash equivalents	21 157 002	5 216 262
TOTAL ASSETS	102 427 548	95 236 825
III. CURRENT LIABILITIES	336 941 304	319 096 672
Accounts payable	10 054 935	4 926 504
Current payables	776 785	356 228
Accrued charges	9 278 150	4 443 757
Other accounts payable	0	126 520
Co-Financing to be paid to the members	81 418 072	72 683 628
Contribution from members to be validated	245 468 297	241 486 539
TOTAL LIABILITIES	336 941 304	319 096 672
NET ASSETS (Total Assets less Total Liabilities)	(234 513 756)	(223 859 847)
IV. NET ASSETS	(234 513 756)	(223 859 847)
Contribution from members	1 009 783 843	745 291 300
European Union	439 553 899	344 800 515
Eurocontrol	269 374 415	185 286 408
Other members	300 855 529	215 204 377
Accumulated contribution from Members used previous years	(969 151 147)	(698 334 592)
Contribution from members used during the year (EOA)	(275 146 451)	(270 816 555)
TOTAL NET ASSETS	(234 513 756)	(223 859 847)



STATEMENT OF FINANCIAL PERFORMANCE

<i>All figures in EUR</i>	2014	2013
OPERATING REVENUE		
Contributions from members	0	0
Other revenues	0	0
TOTAL OPERATING REVENUE	0	0
OPERATING EXPENSES		
Administrative expenses	(7 394 626)	(7 692 834)
Staff expenses	(4 087 136)	(4 328 003)
Fixed assets related expenses	(448 460)	(539 706)
Other administrative expenses	(2 859 030)	(2 825 125)
Operational expenses	(267 793 373)	(263 162 801)
Other operational expenses	(267 793 373)	(263 162 801)
TOTAL OPERATING EXPENSES	(275 187 999)	(270 855 635)
DEFICIT FROM OPERATING ACTIVITIES	(275 187 999)	(270 855 635)
NON-OPERATING ACTIVITIES		
Financial operations revenues	53 120	33 495
Financial operations expenses	(11 660)	(3 282)
Other non operational income	88	8 868
Total non-operating activities	41 548	39 081
CONTRIBUTIONS FROM MEMBERS USED DURING THE YEAR	(275 146 451)	(270 816 554)

ANNEX 1

Composition of the SJU Administrative Board on 31 December 2014

SJU founding members	Member	Alternate member
EU represented by the European Commission	Mr João Aguiar Machado <i>(Chairman)</i>	Mr Margus Rahuoja
Eurocontrol	Mr Frank Brenner	Mr Philippe Merlo

SJU members	Member	Alternate member
Airbus	Mr Bernard Rontani	Mr Pierre Bachelier
Alenia Aermacchi	Mr Marco Protti	Mr Fabio Ruta
DFS	Mr Robert Schickling	Mr Ralf Bertsch
DSNA	Mr Maurice Georges	Mr Pierre-Yves Huerre
Enaire	Mr Ignacio González Sánchez	Ms Mariluz De Mateo
ENAV	Mr Iacopo Prissinotti	Mr Cristiano Baldoni
Frequentis	Mr Rolf Unterberger	Mr Christian Pegritz
Honeywell	Mr Jean-Luc Derouineau	Mr Sander Roosendaal
INDRA	Mr Rafael Gallego Carbonell	Mr Ramon Tarrech
NATMIG	Mr Aage Thunem	Mr Magnus Lindegren
NATS	Mr Simon Hocquard	Mr Peter Whysall
NORACON	vacant	Mr Niclas Gustavsson
SEAC	Mr Giovanni Russo	Mr Gérard Battistella
Selex ES	Mr Stefano Porfiri	Mr Giuliano d'Auria
Thales Group	Mr Jean-Marc Alias	Mr Luc Lallouette

Stakeholder representatives	Member	Alternate member
Military representative	vacant	Mr Per Coulet
European Defence Agency	Mrs Claude-France Arnould	Mr Denis Roger
Civil users of airspace	Mr Simon McNamara	Mr Giancarlo Buono
Air navigation service providers	Mr Guenter Martis	Mr Thomas Buchanan
Equipment manufacturers	Mr Vincent de Vroey	Mr Kyle Martin
Airports	Mr Olivier Jankovec	vacant
Staff in the ATM sector	Mr Michele Altieri	Mr Theodore Kiritsis
Scientific community	Mr Peter Hecker	Mr J.A. Mulder

ANNEX 2

The SJU team

In 2014, **Florian Guillemet** took over the position of Executive Director of the SESAR Joint Undertaking, following the guidelines established by the Administrative Board, to whom he reports. To achieve his mandate, he has the full commitment of the SJU team, which is currently composed of around 60 staff including seconded national experts and staff from SJU Members.



Find out more about the SJU team at:
Website: <http://www.sesarju.eu/about-us/our-staff>



ANNEX 3

Glossary

DMAN	Departure Manager
E-AMAN	Extended Arrival Manager
FMP	Flow Management Position
GAT	General Air Traffic
GNSS	Global Navigation Satellite System
ILS	Instrument Landing System
KPA	Key Performance Area
LPV	Localiser Performance with Vertical Guidance
NSA	National Supervisory Agencies
OAT	Operational Air Traffic
R & D	Research and Development
R4	Release 4
RPAS	Remotely-Piloted Aircraft System
RTS	Remote Tower Services
SARPS	Standards And Recommended Practices (ICAO)
SES	Single European Sky
SESAR	Single European Sky ATM Research
SJU	SESAR Joint Undertaking
SMAN	Surface Manager
SMART	Specific, measurable, agreed, relevant, timely
SMGCS	Surface Movement Guidance and Control System
STAM	Short-Term ATFM Measures
SWIM	System-Wide Information Management



For the latest information, please consult our website:

www.sesarju.eu

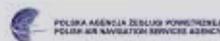
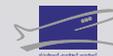
founding members



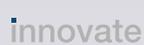
Members



Associate Partners



Associate Partners to the SESAR Joint Undertaking



Publications Office