



founding members



Today's partners
for Tomorrow's
aviation

Key figures



2.1 billion

euros invested in R&D
during the development phase

20.4 million

yearly flight movement by 2030 predicted
by Eurocontrol = twice the current figure

8-14 min

gain per flight on average

300-500kg

reduction in fuel per flight on average

945kg-1575kg

reduction of CO₂ emissions on average

2 founding members

European Community and Eurocontrol

15 members

from the aviation, aerospace, airports and air
navigation industries

Welcome word

“Aviation has made fantastic progress over the last 50 years and air traffic has more than doubled in the last two decades. To cope with the growing demand for air travel, air traffic management has also improved. But not sufficiently, as technologies are becoming old and saturated. Soon, the cost of technical shortcomings will become a real issue, and the technological gap between air traffic management and the other industrial fields (telecommunications, space, IT, etc.) may become impossible to bridge. As far as technologies are concerned, we are at a crossroads. The SESAR Programme is the only way forward and we are striving for rapid results.”

Patrick Ky, Director of the SESAR Joint Undertaking



The Single European Sky

The Single European Sky is an ambitious initiative launched by the European Commission in 2004 to reform the architecture of European air traffic management (ATM). It proposes a legislative approach to meet future capacity and safety needs at a European rather than a local level. The Single European Sky initiative is the only way to provide a uniform and high level of safety and efficiency over Europe's skies.

“SESAR is a truly new approach to ATM modernisation, providing guidance and leadership to all ATM-related activities in Europe.”

Daniel Calleja, Director Air Transport Directorate –
European Commission/Chairman of the SESAR JU Administrative Board

Key objectives are:

- to restructure European airspace as a function of air traffic flows;
- to create additional capacity; and
- to increase the overall efficiency of the air traffic management system.

SESAR (Single European Sky ATM Research) is the technological dimension of the Single European Sky. It will help create a 'paradigm shift', supported by state-of-the-art and innovative technology.



Programme & Goals

A programme for all and with all air transport actors

SESAR aims to eliminate the fragmented approach to European ATM, transform the ATM system, synchronise all stakeholders and federate resources.

For the first time, all aviation players are involved in the definition, development and deployment of a pan-European modernisation project.

SESAR, an ambitious phased programme

- The SESAR Definition Phase (2005-2008) delivered the SESAR ATM Master Plan. It was developed by a representative group of ATM stakeholders. The plan, based on future aviation requirements, identified the actions, from research to implementation, needed to achieve SESAR goals.
- The SESAR Development Phase (2008-2013) will produce the required new generation of technological systems, components and operational procedures as defined in the SESAR ATM Master Plan and Work Programme.
- The SESAR Deployment Phase (2014-2020) will see the large-scale production and implementation of the new air traffic management infrastructure, composed of fully harmonised and interoperable components guaranteeing high-performance air transport activities in Europe.

The SESAR Joint Undertaking (SJU) was created under European Community law on 27 February 2007, with Eurocontrol and the European Community as founding members, in order to manage the SESAR Development Phase.

The aim of the SESAR Joint Undertaking is to ensure the modernisation of the European air traffic management system by coordinating and concentrating all relevant research and development efforts in the Community. The Joint Undertaking also fosters cooperation with similar programmes around the world.

Fifteen members have now joined the SESAR Joint Undertaking:

AENA, Airbus, Alenia Aeronautica, the DFS, the DSNA, ENAV, Frequentis, Honeywell, INDRA, NATMIG, NATS (En Route) Limited, NORACON, SEAC, SELEX Consortium and Thales.

Several members are made up of consortiums, which brings the total number of organisations directly and indirectly bound to SESAR to up to 35. These 35 companies also have affiliates and sub-contractors. As a result, a total of 70 companies from 18 countries are participating in SESAR, demonstrating the impact of the programme on ATM R&D activities in Europe. The participating organisations are able to offer the specialist expertise of aircraft manufacturers, national air navigation services providers, airport operators and equipment manufacturers. This makes the SESAR Joint Undertaking a truly international public-private partnership.



The key performance targets for 2020 are:

- enable a threefold increase in capacity
- improve safety by a factor of 10
- reduce by 10% the environmental impact per flight
- cut ATM costs by 50%

Ambitious goals and benefits

SESAR aims to develop the new-generation air traffic management system capable of ensuring the safety and fluidity of air transport over the next 30 years. Through an open system design and dedicated international activities, SESAR will be compatible with similar global initiatives such as NextGen, the sister initiative from across the Atlantic.

What is in it for me?

In addition to the expected contribution to European Gross Domestic Product (GDP) growth (€ 470 billion p.a.)*, there are direct benefits for:

- **airlines:** meet demand with a better quality of service, better flight profiles and hence lower fuel consumption
- **air navigation service providers (ANSP):** provision of a better quality of service at a lower unit cost for airspace users
- **airports:** service provision in bad weather conditions, optimised operations, capacity increase
- **passengers:** provision of a better service at a lower cost with increased safety
- **general public:** a more environment friendly system (reduced contribution to global warming) with less noise
- **suppliers and manufacturers:** innovation and technological advancement leads to increased competitiveness for European industry, especially in aerospace. Today's R&D helps to produce tomorrow's technical standards, increasing the potential customer base worldwide.

Change is in the Air

Key to the SESAR Concept is the 'Business/Mission Trajectory' principle in which the airspace users, air navigation service providers and airport operators define together, through a collaborative process, **the optimal flight path from gate to gate.**

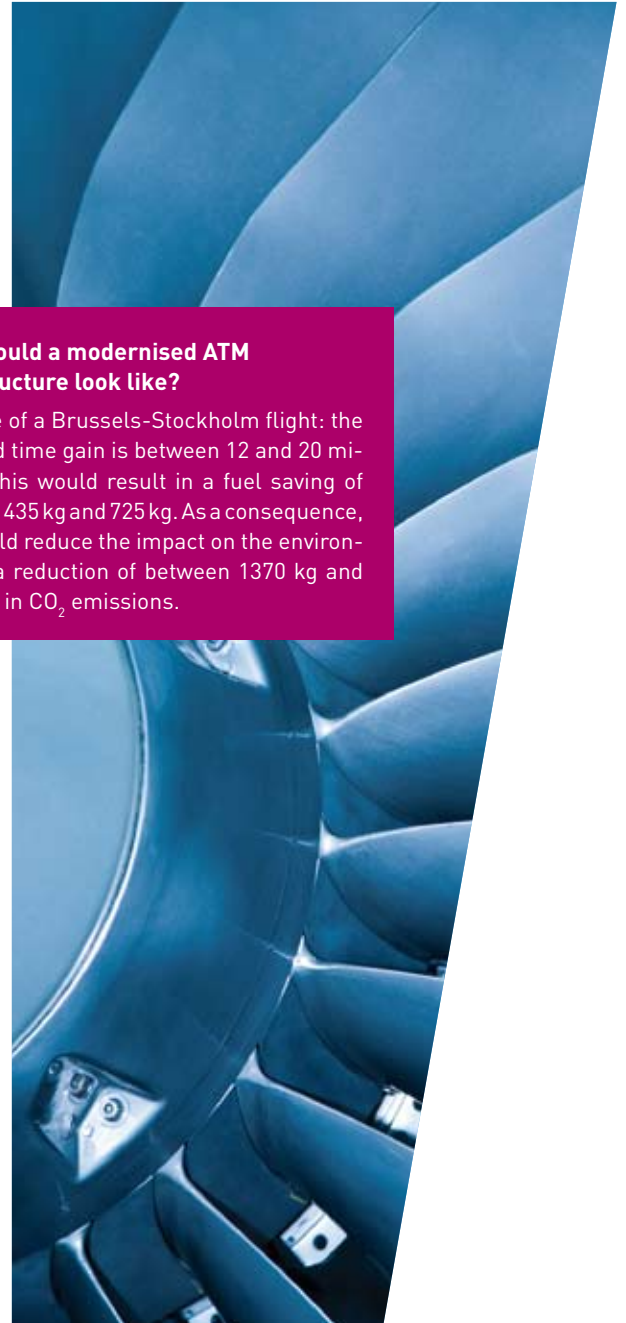
Taking full advantage of existing and newly developed technologies, SESAR's target concept relies on a number of key features applicable to all aircraft:

- The notion of 'trajectory-based operations' which will improve dramatically the predictability and precision of operations.
- A rolling network operation plan taking into account real time situations including weather and traffic evolution.
- The introduction of an air traffic management intranet, including aircraft, which will enable all actors to have full access to the right information at the right time.
- The full integration of ground activities into the air traffic management processes.
- Increased automation support to air traffic controllers and pilots, enabling them to concentrate on high added value activities.
- Increased environmentally-friendly operations at airports, enabling greener trajectories whilst maximising the use of existing runways.

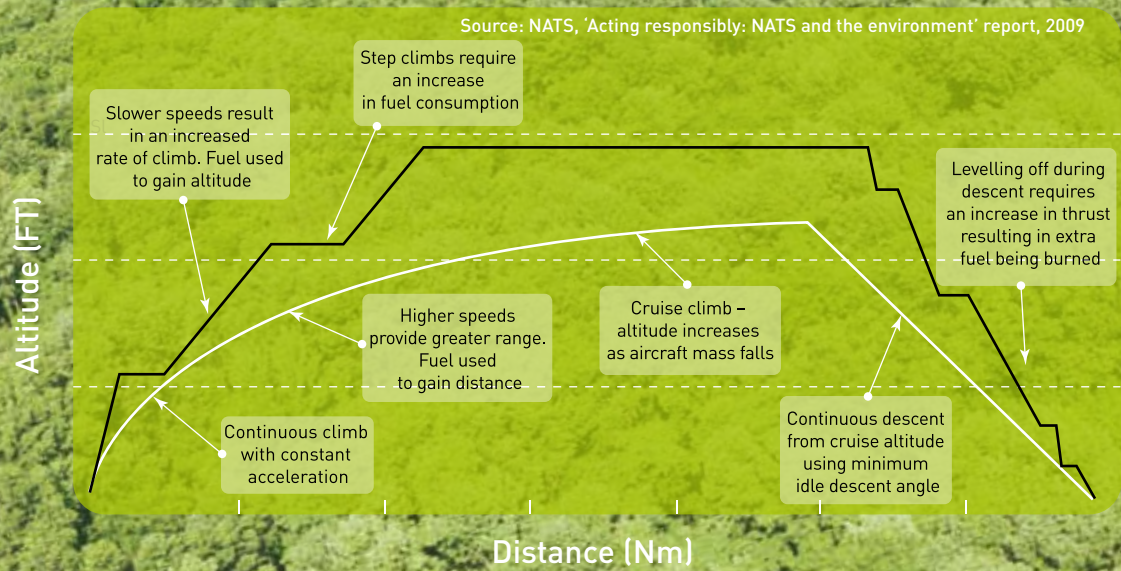
*The Economic Catalytic Effects of Air Transport in Europe – Eurocontrol – 2005

What would a modernised ATM infrastructure look like?

Example of a Brussels-Stockholm flight: the expected time gain is between 12 and 20 minutes. This would result in a fuel saving of between 435 kg and 725 kg. As a consequence, this would reduce the impact on the environment - a reduction of between 1370 kg and 2 283 kg in CO₂ emissions.



Fuel-efficient flight profile



Greener sky

Aircraft emissions by phase of ground operation



Source: NATS, 'Acting responsibly: NATS and the environment' report, 2009



One of the top priorities of the SESAR Programme is to **reduce by 10% the environmental impact per flight**. Air traffic growth must be sustainable. This is a major requirement of the air transport community and the general public at large.

Currently, flight paths often follow set air corridors that make the route longer than necessary. On arrival at the destination the aircraft may have to circle in a holding pattern or descend in stages while awaiting a landing slot. All of these factors increase fuel consumption, pollution and greenhouse gas emissions. SESAR technology will enable more direct flight paths and smoother climbing and descent that will eliminate some of the main causes of avoidable waste.

The Atlantic Interoperability Initiative to Reduce Emissions (AIRE) is a programme designed to improve energy efficiency and lower engine emissions and aircraft noise in cooperation with the FAA. The SESAR JU is responsible for its management from a European perspective.

Under this initiative ATM stakeholders work collaboratively to perform integrated flight trials and demonstrations validating solutions for the reduction of CO₂ emissions for ground movements, terminal and oceanic operations to substantially accelerate the pace of change.

The strategy is to produce constant step-wise improvements, to be implemented by each partner in order to contribute to reaching the common objective. The programme will be further expanded in 2010.

In 2009, the SESAR JU is supporting more than 100 trials in real conditions scheduled to take place with 17 partners: Air France, DSNA, Aéroports de Paris, ADACEL, AVTECH, Egis Avia, Nav Portugal, TAP Portugal, Isavia, Icelandair, AENA, INECO, Iberia, LFV, Novair, Airbus and Thales.



“Compared with today’s way of managing aircraft, SESAR represents a paradigm shift, achieved in clear steps. We will change the way we manage air traffic: no more skyways, just the most efficient trajectory – saving fuel and time.”

David McMillan , Director General of Eurocontrol

SESAR Stakeholders

Airspace users (both civilian and military)

Civilian airspace users include scheduled airlines, charter companies, cargo and air freight service providers, the business and leisure aviation sectors and all forms of non-military air travel, from hot air balloons through police helicopters to hobby pilots. The military, in the form of the air forces of the EU's Member States, are also users with an interest in SESAR technology developments.

SESAR technology will help them run more reliable and punctual services, even in the face of rising demands on air transport capacity, helping their businesses to be sustainable long into the future. Improved air traffic management will bring several tangible benefits:

- Lower environmental impact – SESAR aims to reduce aviation's environmental footprint by 10%
- Lower infrastructure costs – SESAR's goal is to halve total infrastructure costs
- Increased safety through better positioning and information sharing

Many of these companies and organisations are formally involved in the SESAR work programme, contributing experts and taking part in validation tests.

Airport operators

SESAR aims to triple the capacity of civilian airports in Europe. The ATM technology developed through the R&D programme will contribute to more direct flight paths and smoother, more rapid descents, reducing noise and other environmental impacts.

Several large consortia of airport operators, such as SEAC (including six large European airports: BAA Airports Ltd, Flughafen München GmbH, Fraport AG Frankfurt Airport Services Worldwide, Schiphol Nederland B.V., Aéroports de Paris S.A. and Unique Flughafen Zürich AG), AENA and NORACON, are already SESAR members.

Air navigation service providers (ANSP)

Europe will see a doubling in demand for air transport by 2020 according to projections. In order to manage this increased capacity, air traffic control or air navigation service providers will need improved technology to help communicate, coordinate and share information among themselves and with aircraft, as well as more accurate information on the position and trajectory of the aircraft.

SESAR's core objectives are to develop the air traffic management technology needed to manage this increasing demand with reduced costs and environmental impact.

The DSN (France), the DFS (Germany), ENAV (Italy), NORACON (covering northern Europe and Austria), AENA (Spain), and NATS (En Route) Ltd (United Kingdom) are already SESAR members.

Suppliers

The competitiveness of European industry depends on innovation and technological advancement. The European aerospace industry, whether manufacturing aircraft or equipment for the ground or the air, is committed to pursuing this through R&D. The SESAR programme is the best way to provide this for air traffic management.

By developing the technologies necessary to allow airports, airspace users and air navigation service providers to handle the sometimes conflicting factors of demand, costs and the environment, suppliers can ensure a sustainable market for their products. By participating in today's R&D to produce the advanced technical standards of tomorrow, European industry can also expand its customer base worldwide. At the same time, companies from outside Europe have also joined the programme, giving it an international dimension.

Several major companies from the following aviation supply industry sectors are already SESAR members, including:

- **ground and aerospace manufacturing** - Frequentis, Indra, Natmig and SELEX Sistemi Integrati;
- **aircraft manufacturers** - Airbus and Alenia Aeronautica;
- **airborne equipment manufacturers** - Honeywell and Thales.



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Airline, airport and air traffic navigation staff

The human factor is at the heart of air navigation systems. The technologies developed by SESAR will help people working in airports, aircraft or air traffic control to deal with increased capacity while improving their working environment.

Professionals from the air transport sector need to be involved at every stage, from the design phase through validation trials to implementation and roll-out, in order to ensure that future systems are built to their needs and specifications.

Regulators and administrations

Air travel is a highly regulated industry, whether its environmental, security, safety or competition aspects. European governments also have an interest in ensuring that the European air industry, both users and suppliers, remains competitive in future and continues to contribute to economic growth and jobs. The SESAR programme will result in new patents and products, as well as contributing to and taking account of new regulations and standards.

The European Commission, as the representative of the interests of European citizens as a whole, is a founder member of SESAR. The SESAR Joint Undertaking is, of course, open to regular contact with national regulators and standardisation bodies.

**Mobility is key to Europe's future:
SESAR is making it cleaner,
cheaper and safer.**

Individuals, as both passengers and citizens

Through improved air traffic navigation, information and positioning, passengers stand to benefit through shorter and more reliable journeys, lower costs and improved safety. As more people want or need to travel by air, it will take technological advancements to enable the infrastructure to handle higher demand while keeping air travel both comfortable and affordable.

Society at large, whether or not they use air transport, will also gain from a more competitive European air industry, less noise around airports, more efficient and convenient travel and a contribution to cutting greenhouse gases and reducing climate change impacts.

A results-focused work programme

Using the ATM Master Plan developed during the definition phase of the SESAR Programme, the work programme defines all projects and activities to be undertaken in the 2008-2014 timeframe under the supervision of the SESAR Joint Undertaking.

The work programme, implemented through cooperation by the 16 members, comprises 16 work packages designed to provide tangible results.

These packages will develop and deliver the necessary operational and technical materials (specifications, procedures, prototypes, validation reports, etc) for the progressive industrialisation, deployment and operation of the new ATM system.

The work programme is split into four different threads:

- Operational activities are addressed under work packages (WPs) 4, 5, 6 and 7;
- System development activities are addressed under WPs 9, 10, 11, 12, 13 and 15;
- System Wide Information Management is addressed under WPs 8 and 14;
- 'Transversal activities' – such as validation infrastructure, development of safety, security, environment and human performance cases, ATM Master Plan maintenance, target concept and architecture maintenance – are dealt with by additional WPs (i.e. B, C, 3, 16).



"SESAR needs to deliver results on the industry's top priorities—safety, environmental responsibility and financial sustainability. It must also be completed on time and in line with customer needs. The contractual cooperation between SESAR and major airlines is important because it accelerates validation of future technologies with flight trials in real conditions."

Giovanni Bisignani, Director General and CEO of the International Air Transport Association (IATA), which represents some 230 international airlines

Transversal activities



WP B / Target Concept and Architecture Maintenance

The scope of the Target Concept and Architecture Maintenance work package covers the maintenance and refinement of the high-level ATM Performance Target and Architecture, including the Concept of Operations (CONOPS). It defines and ensures the consistency of the ATM Service architecture for all SESAR WPs. WP B will also conduct a performance analysis of the ATM Target Concept throughout the SESAR development phase.



WP C / Master Plan Maintenance

The scope of the Master Plan Maintenance Work Package is to administer the up-to-date maintenance of the ATM Master Plan and to monitor the progress of development and implementation. It also maintains the standards and regulatory roadmaps as well as the SESAR business cases.



WP 3 / Validation Infrastructure Adaptation and Integration

The scope of the Validation Infrastructure Adaptation and Integration work package is to build a comprehensive and integrated validation infrastructure to fulfil the overall validation needs for the SESAR ATM system. It coordinates the development and deployment of the validation infrastructure needed for all SESAR validation activities including the system of systems aspects.



WP 16 / R&D Transversal Areas

The scope of the R&D Transversal Areas Work Package covers the improvements needed to adapt the Transversal Area (TA) management system practices – including safety, security, environment, contingency (service continuity) and human performance – to SESAR, as well as towards an integrated management system. WP 16 also provides support and coordination for the consistent and coherent application of the already existing as well as newly developed TA-related practices to SESAR operational and system work packages.



Operational activities



WP 4 / En-Route Operations

The scope of the En-Route Operations work package is to provide the operational concept description for en-route operations and perform its validation. The term ‘en-route’ includes both ‘continental’ and ‘oceanic’ applications (as appropriate). This covers all phases of planning and execution of flights/trajectories and the identification of supporting functions necessary for en-route operations.



WP 6 / Airport Operations

The scope of the Airport Operations work package is the refinement and validation of the concept definition, as well as the preparation and coordination of its operational validation process. The Airport Operations work package will address developments associated with the ‘airside’ elements of airport operations only. However, to ensure effective planning and management, landside elements (such as passenger and baggage handling) will be taken into consideration.



WP 5 / Terminal Operations

The scope of the TMA Operations Work Package is to manage and perform all activities required to define and validate the TMA ATM Target Concept (i.e. Concept of Operations, and System Architecture). This covers all phases of planning and execution of flights/trajectories and the identification of supporting functions necessary for TMA Operations, which include the management of traffic from the top of descent until landing and from take off until the top of climb.



WP 7 / Network Operations

The scope of the Network Operations work package covers the evolution of services taking place in the business development and planning phases to prepare and support trajectory-based operations, including airspace management, collaborative flight planning and the Network Operations Plan (NOP).



System development



WP 9 / Aircraft Systems

The scope of the Aircraft System work package covers the required evolutions of the aircraft platform, in particular to progressively introduce 4D Trajectory management functions in mainline, regional and business aircraft to provide very precise 4D trajectory management capabilities (three spatial dimensions, plus time). The work will also address the progressive development of Aircraft Separation Assurance and the aircraft components required for the improvement of surface movement operations.



WP 10 / En-Route & Approach ATC Systems

The scope of En-Route & Approach ATC Systems includes all R&D activities for the En-route & TMA ATC Systems evolutions. It will introduce and enhance:

- Trajectory Management functions;
- New Separation Modes;
- Controller Tools and Safety Nets;
- Airspace Management supporting functions;
- Management Complexity tools;
- Queue Management; and
- Route optimisation features.



WP 11 / Flight and Wing Operations Centres / Meteorological Services

The scope of the Flight and Wing Operations Centres / Meteorological Services work package is to define and validate the requirements for the Business/Mission trajectory planning and execution processes seen from a Flight and Wing Operation Centres perspective. It also addresses the meteorological service component in increasing ATM performance, seen from a transversal perspective throughout the SESAR work programme.



WP 12 / Airport Systems

The scope of the Airport Systems work package encompasses all R&D activities aimed at delivering the Airport Systems evolution needed to support the SESAR ATM target concept. It also addresses system/technical aspects such as functional and technical architecture, technical performance & safety requirements, technical interoperability requirements, associated specifications, models/simulation platforms and prototypes, technical validation and the development of inputs/proposals to technical standards groups.



WP 13 / Network Information Management System

The scope of this work package is to cover all systems R&D activities in support of three key aspects:

- ATM Network Design
- Airspace Management
- Aeronautical Information.

This work package will address the architectural (interoperability) and system/technical tasks required to deliver technology solutions to airspace capacity modelling, airspace design and organisation, scenario management, network demand and capacity balancing, flight planning management, demand data management, network performance management and aeronautical information distribution. Deliverables will include specifications, models and prototypes in support of technical validation, in addition to safety, environment and standardisation work, leading to operational validation/trials.



WP 15 / Non-Avionic CNS System

The Non-Avionic CNS System work package addresses the development and validation of Communication, Navigation and Surveillance (CNS) technologies, as well as considering their compatibility with the Military and General Aviation user needs. It identifies and defines the future mobile data-link systems to serve communication and surveillance services, the ground SWIM backbone system. It addresses the best combination of GNSS and non-GNSS navigation technologies to support Performance-Based Navigation and precision approach requirements. It contributes to the enhancement of ground surveillance systems and the introduction of new surveillance systems, as well as the use of future surveillance applications (including ADS-B applications) beyond initial operational capabilities.

System Wide Information Management (SWIM)



WP 8 / Information Management

The scope of the Information Management work package is to gather the information needs identified from the operations work packages into an implementation-independent data model suitable for establishing the 'Aviation Intranet' concept from work package 14. It also supports the Service Oriented Architecture development approach being delivered in work package B and bridges between the operations and the systems aspects using information models and service descriptions.



WP 14 / SWIM technical architecture

System Wide Information Management (SWIM) is the work package responsible for delivering the 'Aviation Intranet' concept; enabling the improved sharing of ATM information and eliminating the 'information silo with limited interoperability' approach used today. Benefits include access to information directly from the aircraft and being better able to respond to change (business agility) as well as supporting unexpected contingent operations and planned flexible methods of operation.

The scope of the SWIM work package is to cover all systems R&D activities that facilitate delivery of an 'information centric' ATM system where the right information is in the right place, with the right people and at the right time, to ensure that optimum decisions are taken and distributed across the network.



/ Staff SESAR Joint Undertaking

The Single European Sky initiative is the only way to provide a uniform and high level of safety and efficiency over Europe's skies.

The SESAR Scientific Committee

The SESAR Joint Undertaking has set up a new Scientific Committee to reinforce its innovative and scientific approach to building the air traffic management systems and procedures for the future. The 12-strong panel includes professors of computer, physical, aeronautic and meteorological sciences, as well as a European astronaut, and demonstrates the strong involvement of the scientific community in ensuring high levels of academic contribution to the SESAR programme.

The Committee will deal with all scientific aspects of the work programme, focusing on:

- scientific analysis of SESAR from different angles: economics, human factors, statistics, mathematics, computer science, physics, technology;
- liaison between SESAR and the academic and scientific communities across Europe, including future engineers & scientists in the fields relevant to SESAR;
- ensuring and validating the scientific value of the SESAR results.



Final word

“We cannot succeed without the collaboration of all. No solutions for the long term can be found by only one actor: the various air navigation service providers, airspace users, airports, the military, governments, etc. must all agree on the technological solutions and the way to implement them. SESAR is all about partnership.”

Patrick Ky, Director of the SESAR Joint Undertaking



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