



Partnering to deliver global interoperability

The need for global interoperability

Aviation is an international business. Consequently, global interoperability and harmonisation are prerequisites for the aviation community. The intention is for an aircraft to be able to fly anywhere in the world with just one set of equipment that will be interoperable with any ground-based aviation system, and with just one set of accompanying procedures. Standardisation ensures interoperability, lowers costs and enhances safety.

As different regions may need different ATM/CNS¹ solutions at different times, new technologies and procedures should also be adaptable, scalable and globally compatible. Cooperation on an international level is therefore needed to ensure seamless air traffic – for the benefit of both airlines and also passengers.

ICAO, the International Civil Aviation Organization, is instrumental in achieving a globally harmonised approach, as it will drive the implementation of the required standards and recommended practices by States and industry. It is equally important that ICAO's provisions are delivered in a prompt and timely manner to support regional implementation. ICAO's Aviation System Block Upgrade initiative, together with the revised Global Air Navigation Plan and Global Aviation Safety Plan, should together constitute the common agreed basis for modernising the worldwide air navigation system in a harmonised manner.

Europe actively contributes to the development of ICAO's provisions and international standardisation efforts in order to support global aviation interoperability.

The key institutional European actors present at the ICAO Twelfth Air Navigation Conference (AN-Conf/12) – the European Aviation Safety Agency (EASA), EUROCONTROL, the European Commission (EC), the SESAR Joint Undertaking (SJU) and the European Civil Aviation Conference (ECAC) – are fully committed to taking, together with ICAO and the other regions of the world, the next steps towards a seamless air navigation system, in line with the direction set at the Conference.

¹ Air Traffic Management/Communications Navigation Surveillance

What is interoperability?

In aviation, interoperability can be considered as the capability of two or more networks, systems, components or applications to exchange information and to be able to use this information for technical or operational purposes, so enabling them to operate effectively together.

Interoperability relies on the application of uniform principles and common reference standards. It is important to note that global interoperability does not mean that the same system must be implemented everywhere. Rather it should allow adaptable, scalable and regional solutions to be deployed in the framework of a globally interoperable ATM system.

Interoperability makes aviation systems, procedures, equipment and training compatible all over the world, facilitating the provision of seamless services to airspace users.

Interoperability: development of safety regulation and certification



Global interoperability is recognised as key in the transition to a harmonised and efficient aviation system. This cannot be achieved without having the necessary safety standards in place. Ensuring safety, performance and interoperability through the application of globally agreed standards is the goal of the European Aviation Safety Agency (EASA).

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The application of globally agreed standards that include the mandated safety requirements is fundamental in an effective, efficient and safe ATM system. To achieve this, EASA will continue to participate in the activities of standards organisations, such as EUROCAE, and will strengthen its participation in ICAO.

"A modernised aviation system requires a strong regulatory framework. EASA, in conjunction with its partners, has a crucial role to play in delivering increased performance and global interoperability, while also ensuring high safety levels," said **Patrick Goudou**, Executive Director of EASA.

Interoperability: an integrated ATM network



The biggest challenge facing global aviation today is the development of a smooth and seamless air traffic management (ATM) system. EUROCONTROL's technical expertise has contributed to the development of numerous standards for greater ATM interoperability. Its expertise has been wide-ranging: membership of ICAO panels; support of standard-making bodies; meeting engagements in terms of hardware and procedure design and communicating progress to the rest of the world.

Decades of working with both the civil and military air transport sectors have allowed EUROCONTROL to put in place the requisite interfaces for bringing about the agreement on future activity. The final goal remains a Single Global Sky. Much work has already been done on this, through cooperation with ICAO, but there is still much left to do.

The ICAO 12th Air Navigation Conference is a key stepping stone in the process. The objective is to generate the required consensus, obtain commitments and formulate recommendations on the way forward. *"This is a unique opportunity. As we plan changes, whether they be under NextGen, SESAR or any other programme, we must make sure that we do so in consultation with our colleagues around the world,"* stated **David McMillan**, Director General of EUROCONTROL.

Interoperability: a key component of the Single European Sky



An interoperable aviation network is a key component of the Single European Sky (SES), which aims both to improve overall performance and to harmonise ATM in the European Union's (EU) Member States, as well as in other States which cooperate with it. For this reason, one of the four SES regulations is focused on the interoperability of ATM systems. This Regulation enables the European Commission (EC) to adopt Implementing Rules and Community Specifications for ensuring the coordinated introduction of new technologies in ATM.

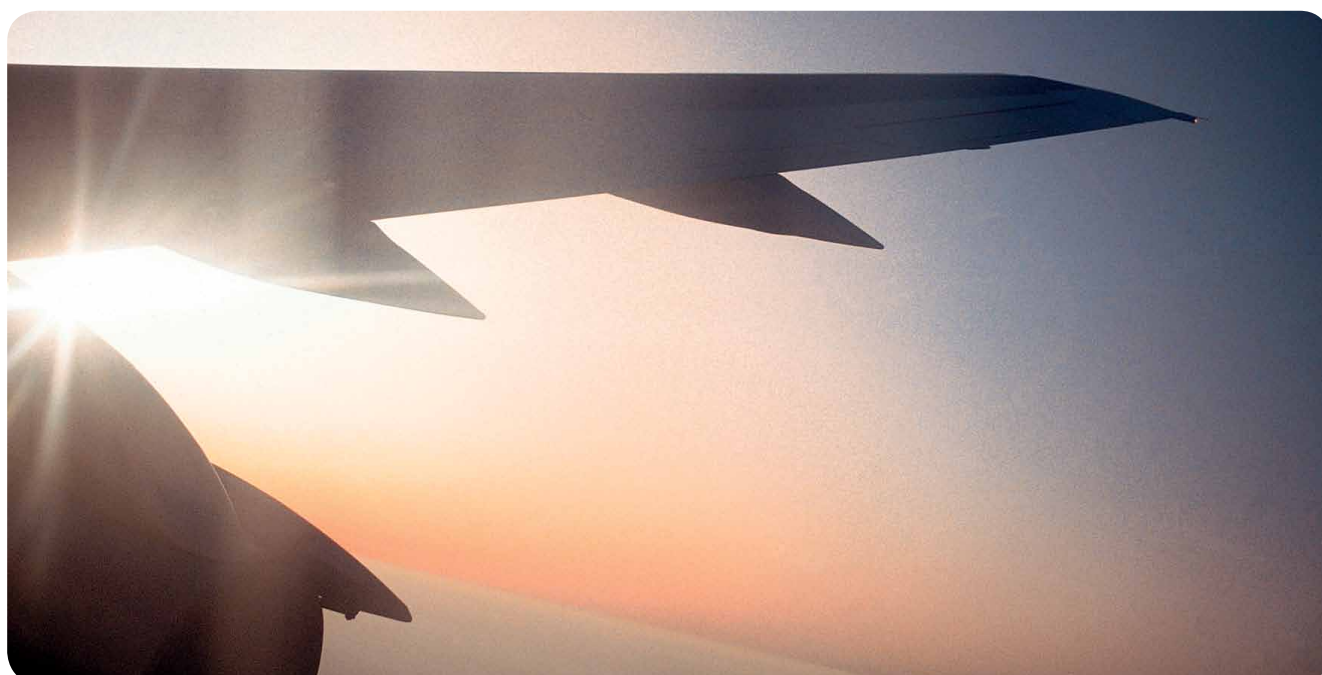
The EC is further developing these rules and specifications with the support of EUROCONTROL and EASA, but is looking for cooperation outside Europe as well, in particular for future ATM systems.

In order to help ensure global interoperability for future ATM systems, there is a specific Annex in the EU-US Memorandum of Cooperation for mutual cooperation in the promotion and development of civil aviation research and development, which covers SESAR-NextGen cooperation for global interoperability.

The provisions of this Annex are aimed at ensuring interoperability between the future US ATM system (developed under the NextGen programme) and the future European systems (developed under the SESAR programme), and will contribute to global interoperability through coordinated EU-US support for the development of ICAO's provisions and international standardisation.

Europe also cooperates with other regions of the world. An example of this is the Framework of Cooperation which has been established between the European Commission and the Ministry of Land, Infrastructure, Transport and Tourism of Japan to coordinate Japan's long-term vision of its own future air transportation system (CARATS), and the EU's SESAR programme.

*"The world is becoming increasingly global," noted **Siiim Kallas**, Vice-President of the Commission, responsible for Transport. "This is especially visible in the developments in air transport. We in the EU are convinced that working towards cross-border and global solutions is beneficial for everybody."*



Interoperability: at the heart of the SESAR Programme



The Single European ATM Research Programme, SESAR, is Europe's ambitious ATM modernisation programme. Interoperability is at the heart of SESAR. The European Transport Council's resolution adopting the first European ATM Master Plan in 2009 explicitly asks for the 'highest level of interoperability' between SESAR and NextGen, as well as with similar initiatives developed in other ICAO regions.

Global interoperability requires common standards with worldwide applicability. To this end, the SESAR Joint Undertaking cooperates closely with the FAA to formalise coordination plans for developments in these areas:

- information and trajectory management
- communications, navigation and surveillance
- airborne interoperability.

In addition, the SESAR JU and its members remain involved with ICAO and standardisation bodies – such as EUROCAE and RTCA – to advance common standards and procedures.

In the words of **Patrick Ky**, Executive Director of the SESAR Joint Undertaking: *"Global interoperability is vital for SESAR and its members. The SESAR Joint Undertaking is fully committed to ICAO's Aviation System Block Upgrades. I would like to highlight the importance of worldwide interoperability for the end-users of all the regional ATM modernisation programmes"*.

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Global interoperability: success stories

ICAO's efforts to strengthen interoperability have been supported over the years in various EUROCONTROL projects. This contribution is being taken further by the SESAR programme, a vehicle for Europe to support ICAO's developments which, in turn, provide important enablers for EASA. Many of these projects have found their way into operations. Implementation is strengthened by ongoing European Union regulation, for example in the case of data link techniques and services.

The European ATM Master Plan

The European ATM Master Plan (Master Plan) is the agreed performance-driven strategic roadmap for the modernisation of the European ATM system. Global interoperability is assured through maintaining consistency with the ICAO ASBUs (Aviation System Block Upgrades).

The Master Plan includes a strategic performance view; it identifies and prioritises the operational changes that are needed to meet the performance challenges in time. For each of these changes, the Master Plan identifies what needs to be done by each stakeholder in a coordinated and synchronised manner, so as to maximise the return on investment.

Global interoperability is further supported by the Master Plan through the Standardisation Roadmap, which includes the standardisation needs enabling technical and operational changes. This Roadmap has been included in the global standardisation coordination process.

ICAO's performance-based navigation (PBN) concept

ICAO's PBN concept has become the generally accepted way forward. Published in 2008 in the Performance-based Navigation Manual (Doc. 9613), the PBN Concept – replacing the former RNP concept – provides a framework for defining navigation performance requirements as well as international navigation specifications.

A navigation specification includes:

- requirements for navigation performance
- navigation functionalities
- crew procedures
- ATC training.

These specifications, together with a navigation infrastructure, support navigation applications.

PBN navigation specifications can be used as needed by regions and States, so ensuring global standardisation and avoiding the proliferation of different certification and operational approvals.

Driven by airspace or operational requirements rather than technology, PBN contributes to an ATM environment in which interoperability will not only be essential, but taken for granted.

The implementation of PBN requires a strong partnership between many actors, primarily ANSPs, airspace users and regulatory authorities. This has already begun at ICAO global and regional level but, as worldwide PBN deployment increases, it needs to be broadened to include operational personnel. These wider partnerships underpin improvements in safety, efficiency and capacity enabling better access to airspace and airports; they go a long way towards mitigating aviation's impact on the environment.

To support the implementation of the ICAO Assembly's resolution 37-11 on PBN, the European Commission has initiated an interoperability regulation, with the support of EUROCONTROL in close cooperation with EASA.

4D trajectory management

A globally interoperable trajectory based approach will be achieved through the definition of initial four dimension (4D) trajectory-based operations transitioning towards full 4D trajectory management, taking account of an agreed common time reference and technical definitions and standards for exchanging 4D trajectory data between air and ground platforms.

4D trajectory management will improve air traffic operations by increasing the overall predictability of traffic, so benefitting airspace users.

SESAR drives the European ATM system towards trajectory-based operations where airspace users are able to agree directly with air navigation service providers on the detailed trajectory for the flight in four dimensions (three spatial dimensions, plus time).

Future air-ground data communications systems and system-wide information management (SWIM) principles and technical infrastructure will facilitate service applications used for the timely and accurate sharing of information according to the needs of planning, management and execution of 4D trajectories.

The validated operational and technical requirements and associated standards work will be provided to ICAO as a key input into the future 4D trajectory-based flight plan, reflecting airspace users' business needs as well as air and ground system capabilities.



SESAR

The Single European Sky ATM Research programme is building the future European air traffic management (ATM) system. It is the technological and operational dimension of the Single European Sky (SES) initiative, launched by the **European Commission** (the executive body of the European Union that establishes the legal framework, which is binding for EU Member States in order to meet future capacity and air safety needs).

SESAR development and validation of the new concept which will underpin European ATM transformation is the responsibility of the **SESAR Joint Undertaking**, a public-private partnership jointly founded by the European Commission and EUROCONTROL, with 15 members.

EUROCONTROL, with 39 Member States covering almost all of Europe, is a key player in supporting and coordinating the development of ATM in Europe. Its role as Network Manager, its unique civil-military capability, its experience in supporting regulation and its position as founding member and major contributor to the SESAR Joint Undertaking all provide it with the technical expertise to work with the European Commission in striving to make the Single European Sky a reality.

EASA, the **European Aviation Safety Agency**, is an Agency of the European Union at the centre of a regulatory system providing for a single European market in the aviation industry. It promotes the highest common standards of safety and environmental protection in civil aviation in Europe and worldwide. EASA has specific regulatory and executive tasks in a variety of areas, including ATM.

The **European Civil Aviation Conference** (ECAC), as Europe's largest and longest-standing civil aviation organisation, is supporting the drive for global interoperability in air traffic management. It ensures that all of its forty-four Member States are able to participate in the preparation and delivery of a fully pan-European contribution to the global ATM debate, including at ICAO AN-Conf/12, and it takes opportunities as they arise to involve Europe's leading ATM bodies such as EUROCONTROL in ECAC's dialogues with State and regional partners outside Europe.

These actors (**EASA, EUROCONTROL, European Commission, SJU and ECAC**) work in very close cooperation and jointly contribute to ICAO's global effort towards the delivery of a worldwide interoperable ATM system.

The way ahead

The SESAR work programme defines the roadmap for the future ATM system in Europe. With the first two SESAR releases, the SESAR JU and its members are paving the way to make air traffic management in Europe more efficient, safer, cost effective and more environmentally friendly.

The aim of SESAR's release approach is to feed the aviation community with an incremental flow of new or improved ATM solutions at a pre-industrialisation stage, ready for deployment.

Release 1 featured 25 operational validation exercises which took place throughout Europe in 2011 and in the first months of 2012. The exercises focussed essentially on the development of efficient and green terminal airspace operations, the initial 4D trajectory, enhancing flight safety and collaborative network management.

SESAR is currently delivering the second SESAR release, which contains 18 validation exercises. Further releases will emphasise greater integration into the overall SESAR Programme, strengthening the flow of activity from long-term innovative research to operational deployment. SESAR has also finalised the second update of the European ATM Master Plan which lays out the essential operational changes required to reap the full benefits of ATM modernisation.

Implementing SESAR is closely linked with the process of establishing global interoperability, as demonstrated by ICAO's Aviation System Block Upgrades approach. The European partners seek continuation of the good cooperation, both with ICAO and at bilateral level, for the update and development of ICAO provisions and standards. Together with other regions, states and industry they will support ICAO in carrying out this major task.

The timely, effective and efficient implementation of the SESAR programme will make a sizeable contribution to the European economy, as air transport is a potent growth enabler. A recent study² calculated that the benefits of SESAR extend far beyond the air transport industry: the programme is expected to generate a combined positive impact on the European Union's GDP of € 419 billion over the 2013-2030 period and lead to the creation of a total of 328,000 direct and indirect jobs.

In the international efforts to achieve global aviation operability, the **European Aviation Safety Agency, EUROCONTROL, the European Commission, the SESAR Joint Undertaking and the European Civil Aviation Conference** will play a role at the ICAO Twelfth Air Navigation Conference (AN-Conf/12). The goal of this global event is to bring the entire aviation community together with a view to defining the next steps towards a seamless global navigation system.

² Assessing the Macroeconomic Impact of SESAR, Final Report June 2011, by SJU with the support of the European Commission, OECD and EUROCONTROL

Contact details

EASA

Jeremie Teahan

Communications Officer

Tel: + 49 (221) 89990 2077

E-mail: jeremie.teahan@easa.europa.eu

www.easa.europa.eu

EUROCONTROL

Kyla Evans

Head of Corporate Communications and Stakeholder Relations Management Unit

Tel: +32 (0)2 729 50 95

E-mail: kyla.evans@eurocontrol.int

www.eurocontrol.int

European Commission

Marinus de Jong

Policy advisor Single European Sky; ATM relations with ICAO

Tel: +32 (0)2 298 01 44

Email : marinus.de-jong@ec.europa.eu

Régine Eursels

Communications Officer

Tel: +32 (0)2 299 91 55

Email : regine.eursels@ec.europa.eu

www.ec.europa.eu/transport/air

SESAR Joint Undertaking

Michael Standar

Chief Strategies and International Relations

Tel: + 32 (0)2 507 80 68

E-mail: Michael.Standar@sesarju.eu

www.sesarju.eu

European Civil Aviation Conference

Peter Kirk

Deputy Executive Secretary

Tel: + 33 (0)1 46 41 85 11

E-mail: pkirk@ecac-ceac.org

www.ecac-ceac.org

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