



# Partnering to deliver global interoperability

## The need for global interoperability

Global interoperability is a must for the aviation community.

Aircraft fly all over the world and cannot afford to have non-standardised certifications for ground and airborne systems, crews trained in non-standard ways or facing many different procedures. Standardisation allows interoperability and prevents aviation from becoming more expensive – or less safe.

Whilst different regions may need different ATM/CNS solutions at different times, designed solutions should be adaptable and globally compatible. That is why the different regions need to work together in order to provide airspace users with the seamless service they require.

ICAO, the International Civil Aviation Organization, is essential in this as it will play a key role in the delivery of the necessary standards and recommended practices to States and industry in a prompt and timely manner which will facilitate

regulation, technological improvement and ensure operational benefits worldwide. The Aviation System Global Block Upgrade initiative and a revised Global Air Navigation Plan should constitute the framework for a worldwide endorsement of the future aviation system.

Europe is contributing, and will continue to actively contribute to international standardisation efforts in order to support global aviation interoperability.

The four key institutional European actors present at the Global Air Navigation Industry Symposium – EUROCONTROL, the European Commission (EC), the European Aviation Safety Agency (EASA) and the SESAR Joint Undertaking, are fully committed to defining, together with ICAO and the other regions of the world, the next steps towards a seamless air navigation system, ahead of the 12th ICAO Air Navigation Conference, which will take place in 2012.

## What is interoperability?

In aviation, interoperability is considered as the capability of two or more networks, systems, components or applications working together through exchanges of information between them, without any restriction, and with the ability to use the exchanged information for technical or operational purposes without any restriction. It relies on uniform principles and global standards, and is achieved through procedures, hardware and software interfaces – points of interaction between those systems that ensure the necessary common understanding.

Interoperability is making aviation systems, procedures, equipment and training compatible around the world, and facilitates the provision of seamless services to airspace users.

# Interoperability: a key component of the Single European Sky



EUROPEAN COMMISSION

An interoperable aviation network is a key component of the Single European Sky (SES), which aims to standardise and harmonise ATM in the Member States of the European Union (EU) and other States cooperating with the EU. For this reason, one of the four SES regulations is focused on the interoperability of ATM systems. This Regulation entitles the European Commission 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 the future ATM systems.

In order to ensure global interoperability for future ATM systems, there is a specific Annex in the US-EU 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 will work to ensure 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 a coordinated EU-US support to the ICAO standardisation process.

Europe is also interested in cooperating with other regions of the world. An example of this is the Framework of Cooperation, which has recently been established between the European Commission and the Ministry of Land, Infrastructure, Transport and Tourism of Japan. It will establish a framework of cooperation between Japan's long-term vision of the future air transportation system, CARATS, and EU's SESAR programme.

*"The world is becoming increasingly global," said **Siim 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 an international European public-private partnership which is effectively putting interoperability at the forefront of its work. Private partners as well as public bodies are totally committed to "thinking interoperable".

Interoperability is at the heart of the SESAR Programme, as can be seen in the ATM Master Plan, which defines the content, development and deployment plans of the programme. In fact, the European Transport Council resolution adopting the first European ATM Master Plan explicitly states that the "highest level of interoperability" between SESAR and NextGen, as well as similar initiatives developed in other ICAO regions, needs to be achieved.

Global interoperability requires common standards with worldwide applicability. To this end, the SESAR Joint Undertaking

(SJU) is cooperating closely with the FAA to formalise coordination plans for developments in the following main areas: communications, navigation and surveillance, airborne interoperability, information management and trajectory management.

In addition, the SJU and its members remain in close contact with ICAO, and standardisation bodies such as EUROCAE and RTCA, to advance common standards and procedures.

The synchronised progress of SESAR and NextGen developments will ensure that a single global sky remains an achievable goal.

In the words of **Patrick Ky**, Executive Director of the SESAR Joint Undertaking: *"Global interoperability is at the heart of SESAR. The SESAR Joint Undertaking strongly welcomes the GANIS initiative and is fully committed to the ICAO approach. I would just like to reiterate the vital importance of worldwide interoperability for the end-users of all the regional ATM modernisation programmes"*.

## 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 put in place the requisite interfaces for

bringing about the agreement on future activity that is so necessary. The Single European Sky is just the beginning. The eventual 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.

A key stepping stone in the process will be the 12th ICAO Air Navigation Conference, in 2012. The objective will be to generate the required consensus, obtain commitments and formulate recommendations on the way forward. *"This is a unique opportunity. As we plan changes, whether it is 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: development of safety regulation and certification



A Global interoperability is recognised

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

The application of globally agreed standards that include the required safety requirements as a means to ensure an

effective, efficient and safe ATM system. To achieve this, EASA will continue to participate in standards organisations activities such as EURO CARE, and will strengthen its participation in ICAO.

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



# Global interoperability: success stories

ICAO efforts to strengthen interoperability have been supported over the years by EUROCONTROL projects. The further contribution to these efforts is through the SESAR programme, a vehicle for Europe to support the ICAO developments which in turn provide important enablers to 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 the use of data link techniques and services.



## Aeronautical information management standard: AIXM

Information management, including aeronautical information, is at the core of the Global ATM Operational Concept. It is essential for future ATM systems like SESAR and NextGen and therefore requires global standards.

In a move towards system-wide information management (SWIM), EUROCONTROL and the FAA cooperated to develop the Aeronautical Information Exchange Model (AIXM) standard. This standard facilitates the digital transfer of aeronautical information between ATM stakeholders over interoperable web-based services. AIXM is jointly maintained

by EUROCONTROL and the FAA, and is referenced in ICAO material to ensure global implementation.

The success of AIXM has led to complementary initiatives on ATM meteorology (weather exchange model – WXXM and Flight Exchange model – FIXM) and an overarching ATM Information Reference Model (AIRM) also fully coordinated between the FAA and Europe. These initiatives are progressed as part of the SESAR-programme.

## ICAO's performance-based navigation (PBN) concept

Within the scope of navigation, ICAO's PBN concept has become the generally accepted way forward. The concept was published in 2008 in the Performance-based Navigation Manual (Doc. 9613).

The PBN concept replaced the RNP concept following the realisation that non-standardised navigation solutions were being implemented in different ICAO regions. Unlike the RNP concept, the PBN concept not only spells out the required performance for navigation specification but also provides a global set of navigation specifications, each of which spells out the navigation functionalities, crew procedures, ATC training required for each navigation application.

A significant feature of PBN is that it is driven by airspace or operational requirements and not by technology. The use of area navigation systems (RNAV) lies at the core of PBN, which introduces approval requirements for use of area navigation systems in airspace implementations.

PBN provides a framework for defining navigation performance requirements, which can be used as needed by regions and States, thereby ensuring global standardisation. It will then contribute to an ATM environment in which interoperability will not only be essential, but will be taken for granted.

PBN requires a strong partnership between ANSPs, airspace users, regulators and others. This partnership has already started at ICAO level, and as more PBN implementations are sought, it will cascade to the operational level and improve safety, efficiency, capacity and access, and help mitigate the environmental impact. To support the implementation of the ICAO Assembly resolution 37-11 on PBN, the European Commission has initiated interoperability regulation, with the support of EUROCONTROL in close cooperation with EASA.

## SESAR 4D trajectories

4D trajectory management will improve air traffic operations, in particular increase the overall predictability of traffic, thereby benefitting airspace users.

SESAR drives the European ATM system towards trajectory-based operations where airspace users and aircraft are fully integrated as essential constituents and nodes of the ATM system and each aircraft achieves its agreed route and time of arrival.

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

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

The critical path is trajectory-based operations. Nevertheless SESAR will bring associated efficiencies in airspace design and planning, focusing on environmental benefits brought by performance-based navigation, continuous descent and climb profiles as well as increasing levels of automation and use of technology, such as remote towers.

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) establishing 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 air traffic management transformation is the responsibility of the **SESAR Joint Undertaking**, a public-private partnership jointly founded by the European Commission and EUROCONTROL, with strong industry participation.

**EUROCONTROL**, the intergovernmental organisation responsible for ATM in Europe, is a key player in the coordination of technical, political and legal developments and is supporting the required ATM developments at pan-European level, beyond EU membership.

**EASA**, the European Aviation Safety Agency, is an agency of the European Union which has been given specific regulatory and executive tasks in the field of aviation safety, including ATM.

These actors (EC, EASA, EUROCONTROL and the SESAR JU) 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 SESAR release, the SESAR Joint Undertaking (SJU) and its members are paving the way to make air traffic management (ATM) in Europe more efficient, safer, cheaper and more environmentally friendly. The aim of a SESAR release is to present to the aviation community new or improved ATM solutions at a pre-industrialisation stage ready for deployment. Through the incremental release of new procedures or products, the SESAR Joint Undertaking and its members will continuously provide results. By the end of 2011, the first SESAR release will be accomplished. It contains 29 validation exercises conducted by the SESAR members all over Europe. Those exercises will cover the areas of efficient and green terminal airspace operations, the initial 4D trajectory, end-to-end traffic synchronisation, integrated and collaborative network management and cooperative asset management.

SESAR is currently preparing for release two in 2012. SESAR is also preparing for the update of the Master Plan. The Master Plan outlines which technologies are needed, where they are needed with regard to deployment and also when they are needed. . In this context, it is clear that global agreement will be required on which technologies need to be implemented in order to avoid different deployments across the globe. One case in point is the data-link technology, a key enabler for future ATM concepts, which needs to be globally agreed in order to ensure worldwide interoperability.

The EC is developing a proposal for governance and incentive mechanisms in order to achieve the timely and synchronised deployment of SESAR as required to ensure SES performances and overall economic benefits expected from ATM modernisation.

Lastly, a brand-new Mc Kinsey study provides a quantification of the impact of SESAR on the EU economy, society and environment, on the basis of the European ATM Master Plan targets. It is based on a specific macroeconomic methodology reviewed by industry and economic experts from the European Commission, OECD and EUROCONTROL as well as from air transport actors such as Lufthansa, Air France, Airbus, etc. It is addressed to the air transport community and the representatives of the EU and Member States. The results of the macroeconomic methodology applied to SESAR implementation detailed in the report show that the timely, effective and efficient implementation of SESAR will have a significant positive impact. This study and more is available on [www.sesarju.eu](http://www.sesarju.eu)

A timely, effective and efficient implementation of SESAR requires global interoperability. GANIS is an important step towards the 12th Air Navigation Conference. The European partners are seeking continuation of the good cooperation with ICAO for an adequate and timely update and development of standards, which requires considerable planning effort on the part of ICAO. Together with other regions, States and industry, we will be able to support ICAO to fulfill this major task.

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