State of Harmonisation Document

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CCOM Co-Chairs Report to the High Level Committee

NextGen – SESAR

State of Harmonisation Document

Prepared by
U.S.-EU MOC Annex 1 –
Coordination Committee

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Contents

Executive Summary 5
I. Introduction 8
II. The Need for Harmonisation 9
III. Harmonisation Status 10
A. Transversal Activities 10
B. Information Management 11
C. Trajectory Management 12
D. CNS 13
E. Collaboration projects 15
IV. New Areas for collaboration 17
V. Appendix 18

Executive Summary

The purpose of this document is to provide a high-level summary of the current state of progress toward achieving the necessary level of interoperability between the Next Generation Air Transportation System (NextGen) and the Single European Sky ATM Research Programme (SESAR), based on the cooperative activities between the United States and the European Union.

The U.S. and EU collaboration aims to harmonise and secure Air Traffic Management (ATM) modernisation efforts as drivers of and in support of the International Civil Aviation Organisation (ICAO) Global Air Navigation Plan (GANP) with the Aviation System Block Upgrade (ASBU) programme. Both NextGen and SESAR recognise the need to integrate the air and ground parts of their air traffic management systems by addressing efficiency needs of flight trajectories planning and execution and the seamless sharing of accurate information. The U.S./EU joint harmonisation work will assure that modernisation and advances in air navigation systems worldwide can be made in a way that supports cooperation, clear communication, seamless operations, and optimally safe practices.

The collaborative harmonisation work between the U.S. and the EU has taken place under the Memorandum of Cooperation (MOC) between the United States of America and the European Union on Civil Aviation Research and Development that was signed in March 2011, and specifically under Annex I, which covers "SESAR-NextGen Cooperation for Global Interoperability."

The two parties have concluded that it is more effective to plan for harmonisation activities with an implementation focus (ref. NextGen Implementation Plan and the European ATM Master Plan) and to initiate the activities early in the research and development phase. The MOC and its Annex I provide the functional framework for collaboration on such harmonisation activities.

This framework also provides a vehicle for the U.S. and Europe to work together towards interoperable standards and in support of efforts towards achievement of ICAO global harmonisation as articulated in the ICAO GANP/ASBU´s. Much of the collaboration work done under this framework directly supports global ICAO standardisation efforts. The U.S. and Europe are for the same reason also supporting and engaging in initiatives fostered by other international

bodies, such as the industry standardisation bodies of Radio Technical Commission for Aeronautics (RTCA) and European Organisation for Civil Aviation Equipment (EUROCAE).

There are five main areas of collaboration under Annex 1 to the MOC on NextGen and SESAR Harmonisation: Transversal Activities; Information Management; Trajectory Management; Communication, Navigation, and Surveillance (CNS) and Airborne Interoperability; and Collaboration Projects. This State of Harmonisation Document summarises the progress made in these five areas. A brief summary of accomplishments in each area is provided below.

Transversal Activities (ref. section III A)

Transversal activities are those strategic activities that cross all harmonisation work areas. They cover such areas as standardisation and joint work in support of ICAO initiatives, as well as operational concepts and architecture.

Both the U.S. and Europe were instrumental in supporting ICAO initiatives in the development of the Global Air Navigation Plan (GANP) and the Aviation System Block Upgrades (ASBU) programme. The MOC provided an invaluable framework for ensuring a close and effective coordination to that end.

In terms of separation provisions, the U.S. and Europe have been collaborating on an effort to re-categorise wake turbulence separation standards, providing input to the ICAO Wake Turbulence Study Group through a three-phase project called "RECAT." To date, the Phase 1 effort has identified many different methods for re-classifying aircraft into new

separation related categories, taking into account a thorough analysis of the effect of wake turbulence. The U.S. has completed an implementation plan for RECAT Phase I, and Europe is completing the European Aviation Safety Agency (EASA) safety assessment of a proposed RECAT-EU.

U.S. and Europe did not reach an agreement on a common set of separation minima to form the global proposal to ICAO for RECAT II. A working arrangement between the respective safety regulators (EASA and FAA Flight Standards) on determining wake turbulence separation minima for new heavy aircraft is being prepared. This would provide a stronger basis to re-start the work on the common RECAT II proposal to ICAO.

The FAA and SJU recently initiated collaboration work under this area of collaboration to include Remotely Piloted Aircraft Systems (RPAS) and Cyber Security. This collaborative work is further described in section IV of this document and is expected to mature in the coming months.

Information Management (ref. section III B)

Key to ATM modernisation in both the U.S. and Europe is the implementation of System Wide Information Management (SWIM). SWIM consists of standards, services, infrastructure and governance enabling the streamlined management of Air Traffic Management related information and its information exchange among multiple parties. Domains for information exchange standards include aeronautical information, meteorological information and flight information. Exchange models for each of these domains have been developed through collaboration between the U.S. and Europe.

The Aeronautical Information Exchange Model (AIXM) has become a de facto global standard for new digital AIM systems being deployed globally.

The Weather Information Exchange Model (WXXM) was developed as a joint effort of the EU, the U.S., and the World Meteorological Organisation (WMO). It supports the latest ICAO requirements and aligns with international standards for geospatial and temporal information.

The Flight Information Exchange Model (FIXM) has been established to define current operations and some elements of Flight and Flow Information for Collaborative Environment (FF-ICE). It has been developed through global coordination, reporting to the ICAO ATMRPP Panel for FF-ICE development, with major contributions from both the EU and the U.S.

Finally, a SWIM Concept of Operations (CONOPS) has been prepared in a joint effort, supporting the ICAO ATM Requirements and Performance Panel (ATMRPP) forming the baseline for the work of the recently established ICAO Information Management Panel (IMP).

Trajectory (4DT) Management (ref. section III C)

Trajectory management will improve air traffic operations and increase the overall predictability of the air traffic system. The 4D Trajectory (4DT) information set encompasses a large set of data, including latitude, longitude, altitude, and time.

The U.S and Europe are reaching agreement on exchange of ground to ground and air to ground trajectories, including the formats. However, work remains to be done on integrating the concept of dynamic interaction between ground ANSP systems and the airborne flight deck and avionics systems.

Communications, Navigation, and Surveillance (CNS) and Airborne Interoperability (ref. section III D)

A significant achievement in the NextGen and SESAR collaboration is the delivery of an agreed-upon baseline NextGen/SESAR Joint Avionics Roadmap. This roadmap identifies timelines for development of aircraft capabilities for navigation, surveillance, and data communications in the evolution of an airborne/ground integrated ATM concept and architecture. The baseline roadmap will be updated as necessary when there are agreed results of other areas of the cooperation.

Another successful area of collaboration is that of Data Communications Services (DataComm). The MOC proved an effective framework for resolving differences related to the scope of the DataComm services standards. As a result, there is an agreed-upon time lined path towards full convergence on the ATN Baseline 2 DataComm services standard (ATN B2).

Through the work under the MOC, affirmed commitment was made to the standards development in RTCA and EUROCAE industry standardisation bodies of the first standard to allow for the European implementation of initial 4 dimensional trajectory based operations (i4D) and subsequently to allow for the U.S. implementation with a second release of the standard for the full convergence on a common ATN B2 service standard.

Another achievement is the harmonisation of the technologies in relation to the Aeronautical Mobile Airport Communication System (AeroMACS), the airport surface wireless datalink. As a result the standards have been jointly developed and already published by EUROCAE and RTCA. In addition the draft ICAO AeroMACS standards are now undergoing validation with joint contributions, and the work for the avionics AeroMACS standard has started in AEEC.

Collaboration Projects (ref. section III E)

A key component of both NextGen and SESAR is the demonstration of new capabilities and technologies. In collaborative demonstrations, the NextGen/SESAR partnership aims to accelerate development and implementation of new technologies, operational capabilities and operational procedures.

The FAA and SJU have collaborated on a number of operational activities based on previous collaboration through the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) programme. This was a cooperative agreement between the FAA and the European Commission that promoted and harmonised environmental initiatives and procedures in European and North American oceanic airspace.

Recently the focus has been on operational activities intended to demonstrate early benefits of both NextGen and SESAR projects, with a focus on efficiency and capacity gains.

Under the heading of SWIM Global demonstrations, a number of demonstration activities are being set up by the SESAR Joint Undertaking (SJU), the FAA and various other organisations. Because each organisation is subject to different procurement procedures and is proceeding in accordance with its own priorities, these global demonstrations shall be seen as a federation of demonstration activities set up by various organisations with the aim of collaborative execution where possible. The collaboration between the FAA and SJU as part of these demonstration activities is covered under the collaboration projects.

The FAA and SJU are currently investigating the options for a stronger integration of the FAA's Mini Global II and SESAR's SWIM Global Demonstration activities.

The FAA and SJU recently also decided to initiate work to explore the possibility of performing collaborative demonstration activities in the field of initial 4D trajectory (i4D). This work is at the very initial stages and the content and timeframe have still to be defined.

Conclusion

As highlighted, the U.S. and Europe have established an effective framework for collaborating on Air Traffic Management harmonisation activities. While this document demonstrates that the collaboration has made progress, challenges lie ahead. However, the framework of the MOC will facilitate resolution of those challenges moving forward. The MOC proved an effective framework to facilitate the agreement between the U.S. and the EU on the path forward for convergence in several areas, notably on DataCommunications and SWIM. The MOC framework also facilitates the identification of potential divergence, and prompts action to mitigate associated risks. As potential issues or divergences in harmonisation arise, a mechanism--the MOC--is in place to resolve them in an effective manner, to help facilitate global harmonisation and interoperability.

I. Introduction

Both the United States and Europe are undertaking major modernisations of their respective Air Traffic Management (ATM) systems. The Next Generation Air Transportation System (NextGen) in the U.S. and the Single European Sky ATM Research Programme (SESAR) in Europe are developing new technologies, capabilities, and procedures. This modernisation will enable the transformation from a ground-based ATM system, using radar and voice communication between controller and pilot, to an air/ground integrated aviation system using satellite-based navigation and digital data communication. The goals on each side of the Atlantic are to improve overall aviation system performance, particularly in the areas of flight efficiency and environmental impact, while also meeting expected demands for increased capacity and continuing to maintain the highest levels of safety.

In order for airspace users to reap the full benefits of these modernisation programmes, it will be essential that the new systems established in the U.S. and Europe are harmonised and interoperable where necessary. Essentially this means that flights will be able to operate in both U.S. and European ATM environments with the same set of capabilities in the on-board equipment to navigate, communicate, and report their position. Failure to meet this global demand for harmonisation and interoperability runs the risk of burdening airspace users with the need to carry different types of capabilities, and causing them to bear the associated additional costs.

The purpose of this State of Harmonisation document is to provide a high-level summary of the current state of progress toward achieving interoperability between NextGen and SESAR, based on the collaborative activities that are being performed under Annex 1 of the EU/U.S. Memorandum of Cooperation (MOC) on Civil Aviation Research and Development. This document also serves as an outline for consideration of the current issues at stake and the challenges ahead. It demonstrates that differences are recognised and actions are taken to address them where necessary to ensure interoperability.

II. The Need for Harmonisation

As two of the major aviation modernisation programmes in the world, NextGen and SESAR have a shared interest in harmonisation as a means of ensuring interoperability. The two programmes have common challenges and a similar performance-driven approach. It is widely understood that the systems cannot be completely identical. But harmonisation is necessary to:

1. Ensure that the same flight/aircraft can operate in all systems;
2. Ensure that common standards are available when needed;
3. Minimise costs by sharing results and efforts.

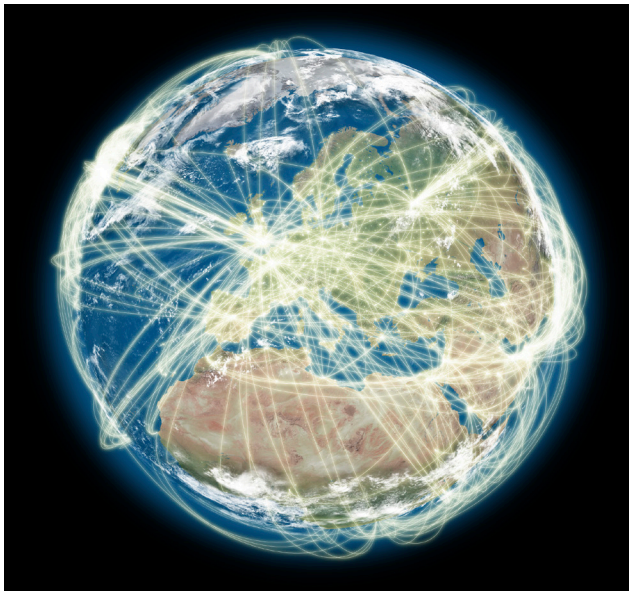
The scope of what should be harmonised is derived from the requirements expressed by the airspace users. In order to agree on harmonised solutions, a number of harmonised methods also are important, including concept validation. The U.S./EU collaborative framework is not the only vehicle for harmonisation activities. Both the U.S. and Europe contribute to develop global harmonisation initiatives under the umbrella of the International Civil Aviation Organisation (ICAO), the industry standardisation bodies of the Radio Technical Commission for Aeronautics (RTCA) and the European Organisation for Civil Aviation Equipment (EUROCAE), and in association with other international bodies.

Global Implications

ICAO estimates that 120 billion U.S. dollars will be spent on air transportation systems transformation in the next 10 years. While the NextGen and SESAR modernisation programmes account for a large share of this spending in the U.S. and Europe, there are parallel investment initiatives in other regions. ATM modernisation is a complex task, but aviation industry stakeholders seek to enlist the benefits of all of these initiatives, especially as traffic levels in civil aviation increase and new demands are placed on the system. To safely accommodate the increase in air traffic demand in the future, and respond to the diversified needs of operators, global environmental concerns, and other issues inherent in the current air navigation systems, modernisation of ATM systems is crucial. In order to provide the greatest operational and performance benefits, these programmes must harmonise to achieve seamless global air navigation going forward. ICAO is supporting the standardisation requirements of NextGen and SESAR as global leaders of ATM modernisation, while meeting its commitment to the global civil aviation community. These complex and comprehensive programmes are aligned with the Global Air Navigation Plan (GANP) with the supporting Aviation System Block Upgrade (ASBU) Programme.

III. Harmonisation Status

A substantial amount of collaborative work has taken place in numerous work areas under the existing collaboration between NextGen and SESAR. The five main work areas as defined in Annex 1 of the MOC are Transversal Activities; Information Management; Trajectory Management; Communication, Navigation, and Surveillance (CNS) and Airborne Interoperability; and Collaboration Projects. The areas of harmonisation outlined in this report will be discussed under their respective work areas as listed above.



A. Transversal Activities

III. A1 ICAO Global Air Navigation Plan (GANP) and Aviation System Block Upgrades (ASBU)

Description

The United States and Europe continue to collaborate to ensure harmonisation and demonstrate global leadership in support of ICAO initiatives. Both the U.S. and Europe were instrumental in supporting ICAO to develop the ASBU framework, which, while largely drawn from the programmatic plans for NextGen and SESAR, has global implications. The ASBUs provide a series of measurable, operational performance improvements, organised into flexible and scalable building blocks and modules. These building blocks and modules could be introduced as needed and implemented as each individual State and/or Region determines feasible based on its needs, capabilities and resources. The ASBUs provide the basis for ICAO's GANP 15-year outlook. The ASBUs are organised into five-year time increments starting in 2013 and continuing through 2028 and beyond. These dates indicate when the standards and regulations should be in place in order to support the system.

Status

The GANP was agreed upon and recommended for adoption by the Air Navigation Conference (2012) and endorsed by the 38th ICAO Assembly (2013).

In support of ICAO's 38th Assembly and the GANP, the U.S. and Europe provided ICAO with their inventories of the standards necessary to support implementation of the ASBUs. These inventories are used by ICAO to develop a prioritised list of required ICAO standards and to help prioritise workload.

Next Steps

The U.S. and Europe will support ICAO in developing the next edition of the GANP in 2014/2015, before the 39th ICAO Assembly in 2016. It is important for these developments to remain aligned with the NextGen Implementation Plan and the European ATM Master Plan to harmonise with the needs of the U.S. and European systems.

These major developments represent a leadership position for the U.S. and Europe within the international aviation scene, reflecting the collaborative effort to harmonise all plans and global approaches with other regions of the world to promote and support modernisation. The key aim for the U.S. and Europe will be to continue to ensure that language in the GANP is broad enough to encompass the needs of NextGen and SESAR, while allowing for regional and national implementation.

III. A2 Separation Provisions: Wake Vortex/ Re-categorisation (RECAT)

Description

Wake vortex separation provisions need to be modernised to yield improvements in efficiency and throughput at airports, especially those with capacity constraints. The U.S. and Europe have been collaborating on an effort to re-categorise

wake turbulence separation standards as a contribution to the ICAO Wake Turbulence Study Group. This initiative, called "RECAT," is split into three phases as follows:

a) Phase 1 (RECAT-1): Optimisation of the ICAO wake turbulence separation classes, with up to six categories;

b) Phase 2 (RECAT-2): Replacement of the separation classes with a static "pair-wise" regime, whereby each aircraft pair has its appropriate wake turbulence separation minima; and

c) Phase 3 (RECAT-3): Dynamic pair-wise separation, where actual conditions, such as aircraft mass and atmospheric/meteorological conditions, are considered when establishing the required wake turbulence separation minima.

To date, the Phase 1 effort has identified many different methods for re-classifying aircraft into new separation related categories, taking into account a thorough analysis of the effect of wake turbulence. A working arrangement between the respective safety regulators (EASA and FAA Flight Standards) on determining wake turbulence separation minima for new heavy aircraft is being prepared. The U.S. has completed an implementation plan for RECAT Phase I, and Europe is completing the European Aviation Safety Agency (EASA) safety assessment of a proposed RECAT-EU.

Coordination activities currently planned for the U.S. and Europe cover all aspects of separation provision; however, the short-term focus is on contributions to the international effort to revise the ICAO Wake Vortex Separation Standards. In particular, the joint contributions will include development and validation of the concept of Pair-wise Wake Vortex Separation (RECAT II), a necessary first step toward Dynamic Pair-wise Wake Vortex Separation (RECAT III).

Areas of Harmonisation

This work will involve coordination through ICAO of standards, regulatory roadmaps, and implementation planning of the related ASBU modules, and identification of the main challenges to deployment of related results.

Status

U.S. and Europe did not reach an agreement on a common set of separation minima to form the global proposal to ICAO for RECAT II. A working arrangement between the respective safety regulators (EASA and FAA Flight Standards) on determining wake turbulence separation minima for new heavy aircraft is being prepared. This would provide a stronger basis to re-start the work on the common RECAT II proposal to ICAO.

Next Steps

The next significant milestone will be agreement on common metrics of separation minima that can be used to prepare a RECAT II proposal to ICAO comprising a static pair-wise matrix (115 × 115 aircraft) of separation minima, together with guidance on grouping aircraft into six or more categories that take into account specific airport mix. Future work under a RECAT III effort will further develop the separation minima, introducing dynamic variables, such as wind speed, direction, actual take-off weight, etc.

B. Information Management

III. B1 System-Wide Information Management (SWIM)

Description

SWIM consists of standards, infrastructure and governance enabling the streamlined management of ATM related information and its information exchange among multiple parties. Domains for information exchange standards include aeronautical information, meteorological information and flight information.

The SWIM concept introduces a significant change in business practices regarding how information is managed during the life cycle of an ATM system. The SWIM environment will shift the ATM information architecture paradigm from point-to-point data exchanges to system-wide interoperability. It also addresses the need to provide better data distribution and accessibility in terms of quality and timeliness, and facilitates the provision of quality information to the right people at the right time.

Areas of Harmonisation

One of the main areas of harmonisation for SWIM involves standards. Examples of these standards include information models, information exchange service definitions, and technical interoperability standards. Infrastructure harmonisation does not necessarily imply that all information exchange standards need to be harmonised at a global level. The goal is interoperability; therefore global standardisation can remain limited to information exchanges between global participants both air and ground based. Services that are tailored for information exchange within one ICAO region need only be standardised within that region.

Harmonisation Status

Status

The Aeronautical Information Exchange Model (AIXM) has been developed jointly by the EU and U.S. It has become a de facto global standard for new digital AIM systems being deployed globally.

The Weather Information Exchange Model (WXXM) was developed as a joint effort of the EU, the U.S., and the World Meteorological Organisation (WMO). It supports the latest ICAO requirements and aligns with international standards for geospatial and temporal information.

The newest domain concerns flight information flow. A baseline information model has been established defining current operations and some elements of Flight and Flow Information for Collaborative Environment (FF-ICE). This model is referred to as the Flight Information Exchange Model (FIXM) and is developed though global coordination, reporting to the relevant ICAO panels for FF-ICE development, with major contributions from both the EU and the U.S.

During the ICAO 12th Air Navigation Conference (ANC/12) in November 2012, the decision was made to create an ICAO ATM information reference model (AIRM). The FAA and SJU currently are developing such reference models within their respective programmes. An initial service development framework has been defined and, when further validated, will supply information exchange service definitions. Significant progress has been made in aligning NextGen and SESAR registry requirements to administer information models, service definitions and service implementation. A prototype for a common repository is being developed.

A SWIM Concept of Operations (CONOPS) has been prepared in a joint effort supporting the ICAO panel, ATM Requirements and Performance Panel (ATMRPP) forming the baseline for the work of the recently established ICAO Information Management Panel (IMP).

Next Steps

One of the next steps is to develop an ICAO ATM information reference model (AIRM) and propose it to ICAO's Information Management Panel (IMP).

The governance of SWIM standards is an area for future coordination efforts. Common positions will be developed for presentation to the ICAO IMP.

Building on the already coordinated service development framework and registry definitions, services for global information exchange will be defined, aligned and validated through future demonstration activities. The common registry concept will require further work.

C. Trajectory Management

III. C1 4D Trajectory (4DT) Management

Description

Trajectory management provides additional fidelity regarding the aircraft path derived from the current flight plan, and also provides a time component. 4DT is a precise description of the aircraft path (latitude, longitude and altitude) and time. The Flight Information Exchange Model (FIXM) is the vehicle used to exchange 4DT information.

Trajectory Management will improve air traffic operations and increase the overall predictability of the aviation system. This will benefit all aviation partners and stakeholders alike. Under trajectory management, the airspace user plans and agrees to fly an intended route, allowing for target times within agreed and predictable time windows whilst catering for flexibility because of safety and weather. The 4D Trajectory (4DT) information set encompasses a large set of data, including latitude, longitude, altitude, and time.

A major component of the 4DT concept is FF-ICE, which supports trajectory-based operations through exchange and distribution of information. NextGen and SESAR are leading efforts with global partners to coordinate work in the area of 4D trajectory and FF-ICE.

Areas of Harmonisation

Global harmonisation is required for the trajectory management concept as well as for information and operation procedures.

Status

The Flight Information Exchange Model (FIXM) remains an integral component of the development of 4DT. Progress is being made on the inclusion of 4DT scenarios into FIXM. The U.S. and Europe have also made strong inroads in 4DT and FF-ICE development via ICAO panels, specifically the ATM Requirements and Performance Panel (ATMRPP), and through work with the ICAO Secretariat.

The U.S and Europe are reaching agreement on exchange of ground to ground and air to ground trajectories, including the formats. However, work remains to be done on future concepts for the dynamic interaction between ANSP sys-

tems and the airborne flight deck and avionics systems. In March 2014, the ICAO ATMRPP panel initiated development of a global Trajectory-Based Operations (TBO) concept.

Next Steps

The efforts of both the U.S. and Europe on ICAO panels in the areas of 4DT and FF-ICE are especially relevant and timely, given that ICAO panels covering 4DT and FF-ICE are being reorganised.

One of the major new ICAO panels will be the Information Management Panel (IMP). The agreement of both the U.S. and Europe to support 4DT and FF-ICE on this and other panels is fundamental for the development of several areas of the MOC. This work will require continued close transatlantic collaboration.

The next steps are for the FAA and SJU to agree on how to integrate and coordinate flight, aeronautical, and

MET information exchange models into the overarching architecture of information management as related to 4DT operations, and to continue the collaborative work with ICAO.

D. Communications, Navigation, and Surveillance (CNS) and Airborne Interoperability

III. D1 Avionics Roadmap

Description

This effort supports the avionics technology to be harmonised by delivering a joint U.S./EU Avionics Roadmap that, in collaboration with the aviation industry, identifies the U.S./EU avionics evolutions that are foreseen.

Areas of Harmonisation

Many future air navigation systems and procedures will affect avionics. This work identifies the necessary standard for users in both U.S. and European airspace.

Status

A recent significant achievement in the NextGen and SESAR collaboration is delivery of an agreed-upon baseline NextGen/SESAR Joint Avionics Roadmap. This baseline roadmap identifies and provides timelines for development of aircraft capabilities for navigation, surveillance, and data communications in the evolution of an airborne/ground integrated ATM concept and architecture.

The NextGen/SESAR Avionics Roadmap was recently modified to reflect the impact of regulatory guidance material scheduled for publication in 2016. Operational capabilities are being addressed through joint EUROCAE/RTCA standards development activities.

Next Steps

The roadmap will be updated to include new standards as necessary when there are agreed results of other areas of the cooperation and to incorporate input of industry standards.

III. D2 Data Communications (Data Comm)/ Datalink Applications

Description

The FAA and SJU have modernisation roadmaps that include operations requiring integration of added Data Communications (Data Comm) capability. DataComm is a cornerstone of modernisation efforts and introduces services that allow the evolution from the current workload-intensive, voice-based air traffic control to a data message environment. This will result in greater efficiency by reducing voice read-back, hear-back operations, and improved safety by reducing the possibility of error. It also allows more complex information to be communicated via data than can be provided by voice today.

Areas of Harmonisation

Although there are similarities within the modernisation strategies of DataComm for both NextGen and SESAR, they do not completely align. A main focus of harmonisation

activities is standards development. During 2013, while subject matter experts for both the U.S. and Europe were working to define a common Baseline 2 standard and deployment schedule, it became apparent that the two strategies did not completely align in scope and timing.

This resulted in a better understanding of standards requirements in scope and timing and a desire to converge/harmonise SESAR and NextGen guidance to the standards work in RTCA Special Committee 214 (SC-214) and EUROCAE Working Group 78 (WG-78) relating to the Baseline 2 standards publications. As a result, the framework of the MOC was employed to reach an agreed path forward between SESAR and NextGen; the U.S. and European leaders of the harmonisation activity developed a common understanding and time lined convergence path acceptable to all parties for moving forward to the ATN Baseline 2 standard.

Status

In August 2013, the FAA and SJU reached an agreement affirming their commitment to a time lined convergence path towards the ATN Baseline 2 (ATN B2) DataComm services standard. To accommodate both NextGen and SESAR modernisation roadmaps, a two-step approach was adopted.

This comprised first and initial release of the standard to allow for the European implementation of initial 4D trajectory (i4D) operations. This initial release of the ATN B2 DataComm services standard was subsequently finalised and published by RTCA and EUROCAE in the first half of 2014.

The second step will allow for the U.S. implementation with a second release of the standard for the full convergence on a common Baseline 2 Aeronautical Telecommunication Network (ATN B2) where the DataComm services standard.

Specifically, this final standard will:

- Allow for more advanced communications between the aircraft and ground ATM, making it possible to better plan and time slot arrivals;
- Allow for more advanced communication regarding the use of satellite-based procedures, such as Required Navigation Performance, thus providing increased flexibility to use more efficient routes;
- Allow controllers to convey detailed information to pilots about wind conditions along the path they are scheduled to fly;
- Address aircraft spacing.

Next Steps

The FAA and SJU have agreed on the second release of the standard for data communications services, and together are working to meet that mutual goal of harmonisation. Work is currently ongoing guiding the work of RTCA SC-214 and EUROCAE WG-78 on the additional services to be incorporated in the next release of the ATN B2 DataComm services standard.

III. D3 Data Communications (DataComm)/ Datalink Technology - AeroMACS

Description

Another significant achievement is the harmonisation on aeronautical Mobile Airport Communication System (AeroMACS) - the airport surface wireless data link system. AeroMACS is the first of the new communications enablers in the context of the Future Communications Infrastructure (FCI) required to support the NextGen and SESAR emerging operating concepts.

Areas of Harmonisation

There has been ongoing coordination and collaboration supporting the joint development of AeroMACS standards and consideration of the relevant spectrum aspects. The harmonisation covers the standards development activities in ICAO, EUROCAE/RTCA, AEEC and WiMAX Forum.

Status

Since the beginning of the AeroMACS activities in the U.S. and Europe, there has been very close coordination benefiting from synergies while avoiding unnecessary duplication.

Harmonisation Status

The AeroMACS profile (a selected subset of the capabilities offered of the WIMAX standard) has been jointly agreed following simulations and investigations. The AeroMACS profile identifies the required features in order to support global interoperability and has been published by both EUROCAE and RTCA.

In addition, EUROCAE (Working Group 82) and RTCA (Special Committee 223) have also jointly developed the AeroMACS Minimum Operational Performance Specification (MOPS) which has also been published.

In ICAO, the coordination has contributed to the establishment of the draft AeroMACS standard, which is now subject to validation. It is expected that the standard will be published in 2015 in Annex 10 in order to support an ICAO applicability date by November 2016. In addition the collaboration has contributed draft material for the AeroMACS Technical Manual currently under development.

Finally, the U.S. and Europe have jointly supported the initiation of AeroMACS avionics standardisation work in AEEC. This activity is now ongoing within the AEEC Systems, Architecture and Interfaces Committee (SAI).

Apart from standards, studies on spectrum have been undertaken investigating and addressing the potential interference aspects of AeroMACS with other systems.

Next Steps

The coordination will continue focusing on the completion of the ICAO standards and supporting as required the AEEC and WiMAX Forum work.

Coordination will also continue in the spectrum area and in the development of frequency planning criteria to support/facilitate the assignment of AeroMACS frequencies.

Finally, as AeroMACS is now starting to be considered for implementation, coordination will be established to share experience and knowledge in implementation planning and field trials.

III. D4 Automatic Dependent Surveillance (ADS) Services and Technology

Description

This area covers the harmonised development of ground surveillance applications based on Automatic Dependent Surveillance-Broadcast (ADS-B), and the evolution of Airborne Separation Assistance Systems (ASAS) and applications that use ADS-B in the cockpit to support situational awareness, support airborne “spacing” applications, and eventually the development of airborne “separation” applications.

It also covers the evolution of airborne ADS-B systems to meet the needs of both ground surveillance applications and ASAS applications through development of the ADS-B capability.

Areas of Harmonisation

Efforts in this area will support development of procedures and standards to meet U.S. and European needs for ADS-B applications and systems. The work in RTCA SC-186 and EUROCAE WG-51 provides the forum for harmonisation as these procedures and standards are developed.

Status

Harmonisation has been well managed in the area of ADS-B applications and technologies, with the publication of numerous RTCA and EUROCAE documents in the areas of Minimum Operation Performance (MOPs) and Safety, Performance and Interoperability Requirements. Developments continue in this joint forum supported by the FAA and SJU, including updates to the technical standards and development of further application standards.

Next Steps

The U.S. and Europe will continue efforts to define and coordinate research and development activities and share findings before reaching the standards development stage through RTCA and EUROCAE.

E. Collaboration Projects

Description

A key component of both NextGen and SESAR is the demonstration of new technologies and capabilities. The NextGen and SESAR partnership in collaborative demonstrations aims to accelerate development and implementation of new technologies, operational capabilities, and operational procedures. Demonstrations may include all phases of flight (planning, surface, departure, enroute and arrivals), and joint trials will focus primarily on flights between North America and Europe as well as supporting trials in both the U.S. and the EU with a harmonisation objective.

The work consists of discussing joint, shared or supporting projects with common goals, accelerating the developments and/or deployment of certain technologies and operational

procedures contributing to global interoperability in support of ICAO's GANP and implementation of the ASBUs.

Status

The FAA and SJU have collaborated on a number of operational activities through the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) programme, a cooperative agreement between the FAA and the European Commission that promoted and harmonised environmental initiatives and procedures in European and North American airspace. AIRE flight demonstrations produced significant potential fuel savings and emission reductions.

As a result of the maturing work under the MOC the focus is on operational activities intended to demonstrate early benefits of both NextGen and SESAR projects, with a focus on efficiency and capacity gains. Two particular domains have been identified for future collaboration activities – SWIM and Initial 4D Trajectory (i4D) trials.

III. E1 SWIM Demonstrations

Under the heading of SWIM Global demonstrations, a number of demonstration activities are being set up by the SJU, the FAA and various other organisations. Because each organisation is subject to different procurement procedures and is proceeding in accordance with its own priorities, these global demonstrations shall be seen as a federation of demonstration activities set up by various organisations with the aim of collaborative execution where possible. The collaboration between the FAA and the SJU as part of these demonstration activities is covered under the area of collaborative projects.

The FAA's MiniGlobal project is composed of two phases: MiniGlobal I and MiniGlobal II. MiniGlobal I successfully showcased global exchange of information during a demonstration activity at the FAA's NextGen Testbed in 2014. The next Phase of the FAA's demonstration is Mini-Global II. This will focus on the "Cloud" infrastructure, and the connectivity and data sharing between multiple Enterprise Messaging Services (EMS). It will continue to support the validation of flight, aeronautical and weather information standards by using additional datasets for complex use cases, and will address the backwards compatibility of these global exchange standards.

The SESAR activities will focus on the demonstration of the operational and safety benefits that can be derived from improvements in flight planning, flight briefing and flight following through global interoperability of specific SWIM services. A comprehensive initial set of the related ATM information services will be put into operation, for demonstration purposes only, from the end of 2014 with regular updates until the end of the second quarter of 2016. The "SESAR SWIM registry" will also be provided for the time of the demonstration to service consumers for registering and accessing services documentation. The SJU will provide SWIM foundation material and will organise support to the usage of this material.

The FAA and SJU are currently investigating the options for a stronger integration of the FAA's Mini Global II and SESAR's SWIM Global Demonstration activities.

These are all advanced concepts that are fully supported by ICAO. The ICAO Air Traffic Management Requirements & Performance Panel (ATMRPP) and other ICAO meetings continue to be a major venue for detailing the progress and work of such a joint demonstration project.

III. E2 Initial 4D Trajectory (i4D) Trials

The FAA and SJU recently decided to initiate work to explore the possibility of performing collaborative demonstration activities in the field of initial 4D trajectory (i4D). This work is at the very initial stages and the content and timeframe have still to be defined.

IV. New Areas for Collaboration

The FAA and SJU recently initiated collaboration work in additional areas to include Remotely Piloted Aircraft Systems (RPAS) and Cyber Security. This collaborative work is expected to mature in the coming months and will be found under collaboration area of transversal activities.

IV. 1 Remotely Piloted Aircraft Systems (RPAS)

Description

NextGen and SESAR recently initiated a new coordination activity for RPAS integration into the Aviation system and ATM that includes a growing and significant category of airspace users.

The purpose of the collaboration between NextGen and SESAR is to initiate, coordinate, and prioritise the activities necessary to support the evolution of RPAS as legitimate airspace users that are able to operate from an ATM perspective in a manner that is transparent to manned aircraft.

Areas of Harmonisation

To achieve ATM system transparency, it will be necessary to address issues relating to RPAS standards, certification and operational regulations from the perspective of equivalent and existing regulations for manned aircraft. The coordination will identify and authorise necessary actions and call for periodic status reports of the joint efforts to develop, harmonise and propose standards for the safe, efficient and transparent integration of RPAS operations in ATM. This work will involve coordination of content within relevant ICAO roadmaps, such as implementation planning of the ASBUs, and identification of the main challenges to deployment. The focus will be on developing strategies to support resolution of human factors issues, sense and avoid and collision-avoidance issues, and ATM integration compatibility issues.

IV. 2 Cyber Security

Description

Cyber security remains a major challenge for both the U.S. and Europe. The fundamental issues are to protect information and reduce the danger of disruption in the cyber environment and the critical infrastructures that depend upon it, without damage to the ATM system directly or in environments where ATM plays a key role in the prevention or response to threats aimed at high value assets and operations of the air transport system.

Areas of Harmonisation

The ATM community increasingly depends on the exchange of timely, relevant, accurate and quality-assured information in order to collaborate and make informed decisions. This will be supported step by step by SWIM, through an interconnected set of domain systems providing or consuming information, including human users and aircraft. To be able to implement SWIM reliably, the accessibility of information, the governance of the SWIM system, and the monitoring and oversight of security issues need to be addressed.

V. Appendix

Next Generation Air Transportation System (NextGen)

In the United States, NextGen is the ongoing transformation from a ground-based system of air traffic control to a satellite-based system of air traffic management. The FAA continues to validate future benefits through demonstrations, trials, and initial deployment of NextGen systems and procedures. National Airspace System (NAS) operators and users, particularly participants in demonstrations and trials, are already benefiting from NextGen. Information gained from the demonstrations provides direct measurements of the ways specific NextGen capabilities can benefit NAS stakeholders and the public. This enables stakeholders to improve their own estimates of the benefits and costs of buying equipment for NextGen, and to be more confident of their cost-benefit analyses (www.faa.gov/nextgen).

Single European Sky ATM Research (SESAR)

SESAR is being executed under the SJU, a public-private partnership (PPP) founded by the European Commission and EUROCONTROL and with strong participation of industry. The SJU is responsible for the development, operational validation, system verification and demonstrations, and trials of the new concept of operations that will underpin European ATM transformation. This concept, formulated during the SESAR Definition Phase, incorporates three steps: time-based operations, trajectory-based operations, and performance-based operations (www.sesarju.eu).

Background on Collaborative Agreements between US and Europe

There is a long tradition of cooperation between U.S. and European air traffic organisations. The MOC between EUROCONTROL and the FAA dates back to an agreement signed in 1964. The EU/U.S. MOC was signed in 2011.

The FAA/EUROCONTROL MOC on ATM covers five areas (or “Annexes”) and is represented by common action plans (AP)--statements of work revised periodically with associated deliverables--and Appendices (usually describing one-off collaborative actions).

Annex I of the U.S./EU MOC on SESAR/NextGen Cooperation for Global Interoperability consists of five specific areas and is based on current work programmes and coordination needs. These areas are broken down into coordination plans (CP) and are managed by appointed co-leaders, one each from the U.S. and Europe and each addressing a specific topic. The coordination plans are short documents that state the issues at stake and the actions to be taken to achieve interoperability or harmonisation at a satisfactory level in time for developments to be safeguarded and risks to be mitigated.

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