



# TECHNICAL WORK PROGRAMME

THE EUROPEAN ORGANISATION FOR CIVIL  
AVIATION EQUIPMENT

L'ORGANISATION EUROPEENNE POUR  
L'EQUIPEMENT DE L'AVIATION CIVILE

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**The European Organisation for Civil Aviation Equipment  
L'Organisation Européenne pour l'Équipement de l'Aviation Civile**

## **EUROCAE Technical Work Programme**

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**Prepared by the EUROCAE Technical Advisory Committee**

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## 1. Introduction

The purpose of this document is to provide an overview of the ongoing technical standardisation activities currently undertaken by EUROCAE together with the anticipated technical standardisation activities to be potentially undertaken by EUROCAE during the next five years, in order to illustrate the extent of the current and future EUROCAE work.

The foreseen future activities cover

- new or revised tasks to be allocated to existing WGs in the short term - a 2-year time frame
- the establishment of specific new working groups (WGs)

This document is intended to be used as an input to the EUROCAE Business Plan and TAC work for starting new and strategically relevant working groups in order to appropriately size the future EUROCAE activities.

In general, the strategic environment of EUROCAE, although wide, has been found to be stable.

Nevertheless, there was influence on the technical domains that can be summarised as follows:

- There is not much change in the Avionics Domain. Most aircraft manufacturers are upgrading their existing products through incremental innovation. Avionics equipment and systems are slowly continuing their evolution without experiencing significant breakthrough changes.
- In the CNS Domain and in the Surveillance subdomain the focus is on performance-based Surveillance and alternatives to conventional systems, with the opportunity to rationalise the ground surveillance infrastructure. In Navigation, the focus is also on performance-based Navigation, especially on GBAS CAT II/III multi-constellation/dual-frequency specification with enhanced DME-DME as a terrestrial backup network. The Communication subdomain will concentrate on work resulting from implementing the recommendations of the ELSA-study, as far as EUROCAE will be concerned, and on preparing the standardisation of a new terrestrial component (LDACS) and a SATCOM Datalink, both in the L-Band.
- Not much new work is expected for the ATM Domain. EUROCAE standards on digital Voice for ATM (VoIP) are expected to be globalised by ICAO.
- In the Airport Domain, work on Remote Tower is well under way. A-SMGCS is a dynamic field, driven by new sensor technologies emerging from SESAR (video and non-cooperative surveillance) and by SESAR deployment mandates.
- In order to reflect a more and more service-focus approach, the SWIM services as well as AIS/MET and datalink services have been grouped within one domain. The activities on SWIM in the near future have been outlined by the currently dormant WG-104. In the medium-term, a (to be created) European SWIM Governance function may influence EUROCAE's activities in the standardisation of SWIM services. Standardisation of MET information services is expected to happen in the SWIM Domain, also in support of MET Datalink services.
- In the Security Domain, a substantial work programme is foreseen for WG-72. Work will be conducted in close cooperation with RTCA as far as possible. Necessary input from certification authorities has to be awaited.
- UAS and General Aviation: with the creation of WG-105, a comprehensive work programme on UAS has been installed for at least the next three years within six Focus Areas. The UAS Domain has the potential to be a disruptive market segment with high growth rates and high number of aircraft especially in the domain of smaller aircraft flying at lower altitudes. This segment of the domain may not follow the approach established for transport category aircraft. European coordination of standardisation is foreseen among this differing stakeholder community via the EUSCG.
- In the Aircraft Energy Management Domain, all standardisation activities which are related to energy management of aviation needs are considered such as Hydrogen Fuel cells and the domain is expected to develop in the near future.

- In the Artificial Intelligence (AI) area identified as a new domain, technologies combine the raw computing power of machines with the cognitive power to reason, learn and make decisions. It is recognised as increasingly important in the aviation sector.

## 2. TWP development context

This Technical Work Programme (TWP) has been developed by the Technical Advisory Committee (TAC) with the support of the EUROCAE General Secretariat, in view of being presented to and approved by the EUROCAE Council.

### 2.1 TWP Contents

This document encompasses:

- Status of ongoing technical standardisation activities has been provided by the EUROCAE General Secretariat;
- Anticipated technical standardisation activities to be initiated in the future by EUROCAE are resulting from an analysis performed by the Technical Advisory Committee of the overall aviation environment based on inputs provided by the following bodies: ICB, SJU, EASCG, EUSCG, EC, EUROCONTROL, ICAO, EASA, RTCA, FAA and IATA;
- Description of Working Groups in the frame of their activities;
- Contribution from the General Secretariat through its participation to a number of various events (workshops, conferences, etc.) and working relations with partners;
- Views of the Technical Advisory Committee (TAC) members together with the support of their parent organisations.

This document is structured according to the following domains:

- Avionics (Non-CNS)
- CNS (Communication, Navigation, Surveillance)
- ATM
- Airports
- Services (SWIM, datalink and AIS/MET)
- Security
- UAS + General Aviation
- Aircraft energy management
- Artificial intelligence
- Miscellaneous

### 2.2 EUROCAE Strategy

This TWP has been developed according to the EUROCAE strategy, which delineates the scope of standardisation activities to be undertaken by EUROCAE.

EUROCAE's focus is the production of standards for aircraft equipment/system. This scope is not confined to electronic systems and may include any aviation related equipment or process aspects. The domain of applications covered is basically air transport aircraft, but standards may also be developed for an applicability to General Aviation and UAS as well.

EUROCAE also has activities that are producing standards for aviation-related ground systems and equipment for both ATM and airports.

Therefore, the scope of standardisation activities considered in this TWP relates to both airborne and ground systems, covering operational and functional considerations, systems architecture, hardware, software, databases and process aspects.

### 2.3 EUROCAE technical activities

The main EUROCAE technical activities consist in developing standards:

- in support of future regulatory requirements (e.g. ICAO)
- which could be recognised as Acceptable Means of Compliance AMC within the Aviation Safety Regulations
- which could be used as Acceptable Means of Compliance in support of SES Regulations

- in support of the ATM research, development and validation in Europe
- in support of the industrialisation and deployment of SESAR solutions
- in support of the European Aeronautical Industry

Activities captured in this TWP are addressing those needs.

The expected start time of the work has been classified as:

- Current (meaning that a Working Group is currently active)
- Short Term (meaning that a Working Group is expected to be formed within one year)
- Medium Term (meaning that a Working Group is anticipated to be formed within five years)

#### **2.4 EUROCAE document types**

The types of document produced by EUROCAE are defined in the latest edition of the EUROCAE Handbook.

Guidance documents have been developed for the drafting of the different document types.

### **3. Major changes and evolutions shaping the environment of EUROCAE technical activities**

#### **3.1 Sources for defining 2018 EUROCAE technical activities**

The technical standardisation activities to be initiated in the future by EUROCAE have been identified from inputs coming from a number of different sources, namely:

- ICAO
- European Commission
- EASA (and its international counterparts, e.g. the FAA)
- SESAR Joint Undertaking (SJU)
- SESAR Deployment Manager (SDM)
- EASCG/EUSCG
- EUROCONTROL
- RTCA and other standardisation organisations (e.g. SAE, ARINC, ...)
- Aeronautical Industry (aircraft manufacturers, airborne and ground system manufacturers and UAS stakeholders)
- Air Navigation Services Providers (ANSPs)
- Civil Aviation Authorities (CAAs)
- Airports
- Accident investigators (such as BEA, NTSB)
- JARUS
- Military organisations (e.g. EDA)
- Airspace users

More generally, all concerned aviation stakeholders, and in particular EUROCAE Members, are free at any time to propose initiatives for EUROCAE technical work. These may result in additional inputs from industry, airspace users, service providers and regulators. Those proposals for new EUROCAE activities are submitted as Discussions Papers (DP). These are reviewed by the TAC and may result in amending existing standards or activities of existing WGs or in recommendations to the EUROCAE Council to set up a new WG.

The following paragraphs give an overview on the major changes and evolutions affecting the environment of the EUROCAE technical activities, which may drive the needs for new or updated standards in the short-term or long-term.

#### **3.2 ICAO**

Since 2011, ICAO established a framework for global harmonisation and interoperability of air space named the Aviation System Block Upgrades (ASBUs). The principle of ASBU has been endorsed during the 12<sup>th</sup> ICAO Air Navigation Conference, in November 2012, and was approved during the 38<sup>th</sup> ICAO Assembly in October 2013, at which point the ASBUs have been included in the Global Air Navigation Plan (GANP).

The ICAO 12<sup>th</sup> Air Navigation Conference and several Assembly resolutions over the years urged ICAO to take a performance-based approach when developing Standards and Recommended Practices (SARPs). In such cases, the ICAO material would define the required performance, while referring to material providing information and methods how this performance can be achieved. Typically, such material could come from EUROCAE, RTCA and other standard-developing organisations (SDOs).

In order to plan standardisation activities at ICAO and other SDOs, the need for ICAO to develop a Standardization roadmap as basis for cooperation with SDOs has been identified. This will be done in the framework of the Standards Round Table and the activities for the development of this roadmap gathering all standard making organisations in support of the ICAO Standardization roadmap was restarted in late 2016.

It is expected that the Standardization roadmap will reflect ICAO's planning on the development of new and updating of existing Standards and Recommended Practices (SARPs) for the ICAO Annexes to the Chicago Conventions, Procedures for Air Navigation Services (PANS) and where needed guidance material in support of these SARPs and PANS. Whilst the focus is expected to be on the Global Air Navigation Plan (GANP) and Global Aviation Safety Plan (GASP), other activities may be taken into account and reflected in this roadmap.

EUROCAE will identify relevant activities in support of the GANP and GASP that will be provided to ICAO for inclusion in the ICAO Standardization roadmap as support to ICAO provisions. This work is ongoing in Standards Round Table.

This interaction will also require regular coordination with ICAO on relevant standardisation activities in order to understand the required scope of those activities and related timelines.

In February 2015, EUROCAE was recognised as an international organisation by ICAO. This enables EUROCAE to take more active part in ICAO activities, notably through the nomination of members to ICAO Panels as well as having access to ICAO consultation process. Currently EUROCAE is already represented in the RPAS Panel (RPASP).

Between 2013 and 2016, ICAO undertook a vast reorganisation of its Panels of experts as well as a common approach to develop standards at global level (i.e., "standards for standards") aiming at stable and high-level performance standards in line with ICAO GANP and GASP, for ICAO Annexes complemented as necessary by technical provisions developed by the Panels and/or industry organisations like EUROCAE.

The new relationship between EUROCAE and ICAO is reflected in an update to the Memorandum of Understanding, signed in December 2017.

In October 2018, the 13<sup>th</sup> Air Navigation Conference will be held, and EUROCAE together with RTCA, SAE and Arinc will present a working paper to underline the importance and advantages of using industry standards in support of ICAO provisions in particular performance-based SARPs. The WP will describe how ICAO may make better use of industry standards to complement ICAO provisions. This will allow ICAO to establish a coherent, effective and efficient system of standards, making best use of the available resources and expertise, thereby improving the overall quality and efficiency of the process and supporting the implementation of ICAO provisions.

During the ICAO 39<sup>th</sup> General Assembly, the following items were identified as eventually relevant for EUROCAE. This might be to support current activities but could also lead to future EUROCAE activities.

The main items were cybersecurity and UAS. While the Assembly discussed UAS in different areas, EUROCAE and RTCA were in particular mentioned to support and complement the ICAO global framework.

The two main strategic documents of ICAO are the GANP and the GASP while the 5<sup>th</sup> Edition of the GANP was endorsed as well as the 2017-2019 GASP.

Other items of interest which appear on the agenda of the 13<sup>th</sup> Air Navigation Conference (ANC-13, October 2018) are:

- Overview of the 6<sup>th</sup> edition of GANP
- Air Navigation roadmaps
- Aerodrome operations and capacity
- Integrated CNS and spectrum strategy
- Future provision of aeronautical meteorological service
- SWIM
- FF-ICE and TBO
- ATFM
- Civil/military cooperation
- Operations above Flight Level 600
- Operations below 1000 feet
- Remotely piloted aircraft system (RPAS)

- Cyber resilience

In the GASP, the following safety priorities are supported by EUROCAE:

- Runway safety
- Controlled Flight into Terrain (CFIT)
- Loss of Control In-Flight (LOC-I)
- Global flight tracking
- Unmanned aviation

### 3.3 European Commission

The EU Single European Sky (SES) Framework is another source of requirements for technical work within EUROCAE.

Under the SES framework, EUROCAE Documents could be referenced as core material of Community Specifications (SES CS)<sup>1</sup>. These standards, when cited in the Official Journal of the European Union (OJEU) as SES CSs, are recognised as a MOC with the Essential Requirements (ER) of the Interoperability Regulation as well as to IRs stemming from the Interoperability Regulation.

The European Commission, following the proposals of the Industry Consultation Body (ICB), has issued a set of mandates since 2006 to the ESOs (M/390<sup>2</sup>, M/408<sup>3</sup> and M/438<sup>4</sup>, M/510<sup>5</sup>, M/524<sup>6</sup>) to develop SES CSs in cooperation with EUROCAE. Following the amendment of the EASA Basic Regulation, regulation EU 2018/1139 of 4 July 2018, the EC proceeded with changing several implementing rules, which are supported by EUROCAE documents.

As EUROCAE is already developing a number of standards in support of regulations, it is considered whether and how these EDs could be recognised at the same level as harmonised European Standards (EN status) to enable their use as a basis for all kinds of certification processes. EASA, ICAO and FAA often make direct reference to EDs and the EC has recognised the role and quality of EDs in the past in the SES Interoperability Regulation (552/2004). Today, e.g. in the UAS area, a requirement for CE marking is emerging. As per the existing regulations on European Standardisation (Regulation (EU) No 1025/2012) harmonised standards are providing the basis for this process and can only be published by the current ESOs: CEN, CENELEC and ETSI. Industry is increasingly sceptical about duplication of activities and structures and EUROCAE is seen to be the primary standardisation body in Europe for aviation.

### 3.4 EASA

#### Rulemaking and Safety Promotion Programme including the European Plan for Aviation Safety (EPAS) 2018–2022

The Strategy and Safety Management Directorate is responsible to develop and maintain the Rulemaking and Safety Promotion Programme including the European Plan for Aviation Safety (EPAS). These documents identify areas in which standards are needed to address safety related issues or improve safety through the safety promotion items. This five-year, annually-updated programme identifies the rulemaking

<sup>1</sup> To distinguish between Community Specifications developed under mandates from the European Commission under the Interoperability Regulation (EC) 552/2004 and Certification Specifications issued by EASA, the first ones are referred to as SES CS and the latter ones as EASA CS in this document.

<sup>2</sup> M/390 (12 July 2006): Mandate to CEN/CENELEC/ETSI for the development of European standards (first set of Community Specifications) for interoperability of the European Air Traffic Management Network (EATMN)

<sup>3</sup> M/408 (14 May 2007): Mandate to CEN/CENELEC/ETSI for the development of European standards (first part of second set of Community Specifications) for interoperability of the European Air Traffic Management Network (EATMN)

<sup>4</sup> M/438 (13th January 2009): Mandate to CEN/CENELEC/ETSI for the development of European standards for interoperability of the European Air Traffic Management Network (EATMN) for datalink services

<sup>5</sup> M/510 (10 October 2012): Mandate to CEN/CENELEC/ETSI for the Development of a European Standard for Aerodrome Mapping Data

<sup>6</sup> M/524 (8 March 2013): Standardization Mandate to European Standardization Organizations (ESO) on Air Traffic Management (ATM) Interoperability for the ATM Master Plan

activities. The general principle is to use industry standards as means of compliance to high-level performance-oriented regulations.

EASA's role in providing technical advice to the European Commission (EC) in the domain of aviation has been strengthened over time. EASA is tasked by the EC to develop regulations in the domain of navigation, surveillance and datalink for the Single European Sky. Here as well as in other areas standards are envisaged to be used to define detailed objectives. It is envisioned to not call standards directly by regulations but to use them as acceptable means of compliance. This eases the introduction of alternative ways to show compliance to the high-level objectives without being blocked by regulations.

EASA has now a more active role within some research programmes like SESAR, Clean Sky and Horizon 2020.

Particularly, since the last EASA BR quoted above, EASA has become responsible for the development of the Interoperability regulations, currently IR 552/2004. A transition period is accounted for in the BR.

As part of the General Aviation roadmap a simplification of the regulations has started. Industry Standards are playing an important role in this concept. CS-23, the applicable certification specification has been condensed to high level requirements, which are supplemented by industry standards. ASTM has been identified by the FAA, as the standardisation body best fitted for this exercise. The work on this activity is still ongoing but the extension of this concept to other categories of aircraft is discussed. The rotorcraft domain (CS 27) may be the next one to follow.

The integration of UAS, referred to as Unmanned Aircraft Systems (UAS), into the ATM system is under development and EASA is playing an active role. In 2017, a Notice for Proposed Amendment (NPA) has been published to collect stakeholder feedback.

Through the bilateral recognition of ETSO authorisations by Brazil, Canada and the US EUROCAE standards are recognised within their system to a certain extent. Now negotiations with China have started which may also lead to further recognition and to interest of China in EUROCAE standards. Negotiations aiming for a bilateral arrangement with China have started.

Currently a modernisation of regulation (EC) No 216/2008 defining the role and competencies of EASA has been completed, see BR 2018/1139 quoted above. Within this amendment, there are options to move away from equipment certification in certain domains and to rely on conformance declarations to standards instead. Aim is to reduce burden to industry on articles required for aircraft operation. EASA responsibilities have been extended to cover e.g. the development of regulations for UAS, to address cybersecurity in aviation etc. Those fields will require standards as well.

### **3.5 FAA and other Airworthiness Authorities**

In general, the FAA is working with RTCA and SAE to develop standards but has no objection to use EUROCAE standards as well in their systems. It is therefore important for European stakeholders to participate to such development and to secure long-term influence by performing joint developments of standards. It should be recognised that the relationship between RTCA or SAE and the FAA is different from the European model as the FAA is also providing research development activities to support the standards development.

The development of new functionalities and standards for the ATM system is performed in the US within the NEXTGEN programme. Most of the developments are leading to RTCA standards and it is open to EUROCAE to join those activities.

The automatic recognition of ETSO/TSO approvals by FAA and EASA is putting more emphasis on the need to have harmonised EUROCAE/RTCA/SAE standards and to avoid having diverse requirements in both systems.

### **3.6 SESAR Joint Undertaking**

In the context of the SESAR programme, it is recognised that the European ATM Master Plan constitutes the driver for identifying potential ATM Technology changes. The current edition of the Master Plan dates from 2015. An update is taking place that should be completed by early 2019.

The general themes of the campaign include digitalisation, connectivity and safe integration of UAS, as well as the publication of a CNS Roadmap. Wide stakeholder consultation forms part of this update campaign, and this stakeholder group includes EUROCAE and its members.

In addition to the ATM Master Plan Executive View, published in 2015 (ATM MP Level 1), the SJU also produces updates to the data set (ATM MP Level 2) at least once per year, and this contains details of Operational Improvements and/or System Enablers, modified in the light of ongoing validation exercises. The data set is an essential input into the development of the standardisation roadmap.

The SESAR 2020 programme comprises three types of research: Exploratory Research (ER), Industrial Research (IR) and Very Large-scale Demonstrations (VLD). IR constitutes the largest part of the SESAR research programme and leads to the development of 'SESAR Solutions', which provide operational and technical requirements that have been validated on industrial prototypes. These Solutions, which are sometimes demonstrated on a larger scale during VLDs, form the basis for standardisation and regulatory activity.

During the development and validation of SESAR Solutions, research teams consider requirements for standardisation. In many cases, work begins within EUROCAE WGs in parallel with the finalisation of research activities, allowing a coordinated approach to the development of appropriate standards. On publication, the SESAR Solution Pack will contain recommendations for necessary standardisation activities and finalisation of the relevant EUROCAE standards will normally take place after the SESAR Solutions have been fully validated and published.

### 3.7 **SESAR Deployment Manager**

On the basis of EC Regulation 409/2013, an ATM solution deployment governance process has been set up in Europe. Management of this deployment is done by the SESAR Deployment Manager (SDM).

EUROCAE is involved within this new framework as a specific actor.

A working arrangement / MoU with the SESAR Deployment Manager was concluded in 2016 in order to provide a framework for this cooperation.

A Deployment Programme (DP) is available – as Edition 2017 in its most recent version – from the SESAR Deployment Manager to follow up on the deployment of elements of the current Commission Implementing Regulation (EU) No. 716/2014, the PCP.

DP 2017 includes an Annex B containing Standardisation and Regulation Roadmaps. They have been developed with the primary objective of providing an accurate snapshot of the availability of Standards and Regulation mapped with 46 ATM Families of the Deployment Programme.

Those roadmaps have been developed taking into account the following main sources of information:

- the PCP itself (especially the related indicative Roadmap with respect to standardisation and regulation needs);
- an Integrated Roadmap Dataset #16, as provided by SJU;
- SESAR Solutions, i.e. deliverables from SESAR R&D mapped to Operational Improvements (OIs);
- the ATM Standardisation Rolling Development Plan (RDP), as developed by EASCG, chaired by EUROCAE.

The work performed by the SDM in developing a view on the potential needs was supported by operational stakeholders, while recognising that the SDM view is not binding for standardisation/regulatory bodies.

The operational stakeholders' specific priorities have been aligned with the SDM view of ATM Functionalities (AF) as defined within the PCP and are listed below.

AF1 Extended Arrival Management and Performance Based Navigation in the High-Density Terminal Manoeuvring Areas

The family focuses on vertically guided RNP approaches and RNP1 operations in TMA, in conjunction with the extension of the AMAN horizon at selected European airports with high traffic loads

EUROCAE contributes heavily to this family with the extended AMAN Upstream service specification delivered by WG-104 and various standards concerning GPS/GALILEO configurations (WG-62)

**AF2 Airport Integration and Throughput**

The family has a wide scope around the Airport Operation Plan, Surface Management (A-SMGCS) and Departure Management.

EUROCAE contributes to A-SMGCS via WG-41.

**AF3 Flexible Airspace Management and Free Route**

EUROCAE is not involved in supporting the deployment of this family.

**AF4 Network Collaborative Management**

EUROCAE is not involved in supporting the deployment of this family.

**AF5 Initial System Wide Information Management**

The whole family was restructured in 2017 around three focal areas: Common SWIM infrastructure components, stakeholder SWIM infrastructure components and SWIM Public Key Infrastructure and Cybersecurity, to emphasise the security aspects.

EUROCAE is directly involved through WG-104 in terms of SWIM services, and WG-59 in terms of future revisions of ED-133.

**AF6 Initial Trajectory Information Sharing**

Two dedicated projects have started both to immediately implement ELSA findings (Path I project) and to prepare the transition to a pan-European data link model (Path II project).

With respect to non-PCP activities, the SDM has been tasked to conduct the Data link recovery plan and is being tasked to oversee the implementation of the SPI-IR in support of the EC and all stakeholders by 2020.

**3.8 EASCG and EUSCG**

**3.8.1 EASCG**

In early 2015, on the initiative of the European Commission, the European ATM Standardisation Coordination Group (EASCG) was established. The EASCG is an advisory group established to coordinate the ATM-related standardisation activities, essentially stemming from the European ATM Master Plan, in support of Single European Sky implementation.

The membership is composed of EUROCAE, EUROCONTROL, European Commission (DG MOVE), EASA, SJU, CANSO, ESOs. The SESAR Deployment Manager, EDA and ASD are invited as observers.

The EASCG develops and maintains a European ATM Standardisation Rolling Development Plan (RDP), which summarises all relevant standardisation activities of the EASCG member organisations in the area of ATM.

In addition, the EASCG has submitted a position paper on the question of validation of standards as part of its advisory role to the EC on standardisation matters. The position paper provides several conclusions as well as a number of recommendations, and the EASCG will continue to work on these recommendations at future meetings. At the European level, coordination between the Standardization Organizations (SDOs) is conducted through the EASCG.

EUROCAE is chairing the group.

In supporting the EASCG, the objectives of EUROCAE are to:

- ensure that activities between other SDOs are complementary and avoid overlap and duplication,
- align the roadmaps with EUROCAE work programme,
- enrich the EUROCAE TWP based on the EASCG discussions,

- be aware of context and adapt to timeframes to accommodate the timely production of standards,
- develop standards aligned with members needs and specifically the standardisation roadmap (in particular the PCP indicative roadmap)

The activities identified in this TWP are in line with the current issue of the RDP.

### 3.8.2

#### **EUSCG**

Based on the successful example of the EASCG and considering the significant number of actors in the area of Unmanned Aircraft Systems (UAS), the European Commission and EASA initiated the establishment of the EUSCG (European UAS Standards Coordination Group). The Kick-Off meeting took place at the EUROCAE premises on 01 June 2017.

During the Kick-Off meeting it was agreed that EUROCAE will chair the EUSCG and will also provide the secretarial support.

Members of the EUSCG are EUROCAE, EUROCONTROL, European Commission (DG MOVE and DG GROW), EASA, EDA, ISO, JARUS, SAE, SJU, ESOs, ASD, ASD-STAN, ASTM, GUTMA (Global UTM Association), DMAE (Drone Manufacturers Alliance Europe), and UVS International.

The EUSCG develops and maintains a Rolling Development Plan (RDP), which summarises all relevant standardisation activities of the EUSCG member organisations in the area of UAS.

The activities identified in this TWP will be in line with the current issue of the UAS RDP.

### 3.9

#### **EUROCONTROL**

EUROCONTROL continues its involvement in the area of standardisation.

Active engagement in EASCG and EUSCG is maintained, notably with respect to ATM domain related activities, in order to ensure effective coordination and synergies with other standards developing organisations. Relevant EUROCONTROL standardisation activities are reflected in the EASCG RDP and EUSCG RDP.

EUROCONTROL develops standards (Specifications and Guidelines) exclusively in the domain of ATM/ANS, enabling European ATM Network improvements, and in support of interoperability harmonisation projects that address global, Pan-European and State needs. A number of EUROCONTROL specifications and guidelines are foreseen to be published in support of the implementation of the PCP regulation. The beneficiaries of the EUROCONTROL standards are primarily the ANSPs and the National Authorities (CAA, NSA). EUROCONTROL supports the work of EUROCAE by active participation in the WGs.

When deemed appropriate, standardisation work conducted by EUROCONTROL is being used as basis for further standards development activities within the EUROCAE framework.

### 3.10

#### **Standardisation organisations (RTCA, SAE, ARINC, ESOs ...)**

In an increasingly interdependent environment, in which stakeholders require global interoperability and harmonised requirements, it is of prime importance to ensure coordination and cooperation with other standardisation bodies. To achieve this, EUROCAE has concluded over the past years a number of cooperation agreements, Memoranda of Cooperation or Understanding and similar agreements, and established efficient cooperation mechanisms, notably with RTCA Inc. and SAE Aerospace.

Co-operation arrangements vary from exchange of ideas and information to complete partnerships between working groups and committees that result in technically identical documents.

More than half of the active EUROCAE WGs have established some form of cooperation with RTCA Special Committees or SAE Committees. A significant number of documents is being developed in a synchronised manner.

### 3.10.1 RTCA

According to the existing Memorandum of Cooperation, cooperation between EUROCAE and RTCA is of prime importance for EUROCAE. Specific yearly coordination meetings are held between both organisations.

About 50% of the EUROCAE work programme is carried out jointly or in coordination with RTCA.

Current topics under consideration are the following:

- Cooperation in the area of information security following the completion of the joint revision of ED-203A/DO-356A
- UAS standardisation strategy to be clarified

In May 2018, it was announced that after 42 years of being chartered by the Federal Government as a utilised federal advisory committee, RTCA has been informed by the US Department of Transportation and the Federal Aviation Administration (FAA) that it will no longer engage RTCA for this purpose. The umbrella agreement (Charter) under which RTCA provides Federal Advisory Committees (FAC) expired May 29, 2018.

The DoT has indicated they plan to issue charters to the FAA to operate the NextGen Advisory Committee (NAC) and the Drone Advisory Committee (DAC) as separate, stand-alone federal advisory committees.

RTCA therefore launched the RTCA Standards Development Organization to continue its track record of producing timely and robust standards and guidance documents to serve as the basis for FAA regulations. The RTCA and EUROCAE Secretariats are working together to continue the work without any gaps and working closely with the joint committees for a smooth transition.

Currently, no major impact is expected on the ongoing SC/WG joint activities. For new activities, coordination between the organisations will be ensured as previously, and the PMC will be the decision-making body on the RTCA side.

### 3.10.2 SAE

In 2015, EUROCAE and SAE have signed an updated Memorandum of Cooperation that strengthens the cooperation between the two organisations and clarifies the collaboration mechanisms.

Currently, 4 WGs are working jointly or coordinating with SAE committees.

In 2014, SAE took over the standardisation section of ARINC, strengthening SAE's presence within the technical standards arena, helping to further support the entire aerospace industry.

### 3.10.3 Other SDOs

EUROCAE maintains relationship with the European Standardization Organisations (ESO) in line with the EC mandates under the Interoperability Regulation – see section 3.3. Coordination with the ESOs, notably CEN and ETSI, is mainly achieved through the EASCG/EUSCG. More direct collaboration with ETSI is ongoing in the area of A-SMGCS and datalink, in support of the ETSI work to maintain the SES Community Specifications.

A Memorandum of Understanding (MoU) with ASD-STAN has been signed in 2015, in order to promote harmonised standards development throughout the Aerospace & Defence Industry of Europe, and to make optimal use of the resources. The MoU provides a basis for information exchange and further cooperation and coordination on subjects of common interest, such as external relations, standards development, studies, events and training, as far as both organisations are concerned and expect complementary activities and potential harmonisation and avoid duplications and overlaps between our activities. Coordination with ASD-STAN is focussing on the UAS domain and discussions take place both bilaterally and through the EUSCG.

Activities in other standardisation organisations, such as ISO, might be of interest in the future, but no formal coordination has been established at this stage. ISO is, however, attending the EUSCG meetings.

### 3.11 Aeronautical Industry (Aircraft manufacturers)

All aviation stakeholders including the industry recognise that the increasing complexity of the European aviation system and the development of new technologies require an evolution of the regulatory process. A regulatory approach based to a greater extent (though not solely) on the use of performance objectives focusing on the risks to be mitigated should be encouraged, rather than relying increasingly on overly prescriptive - and ever-more detailed - technical specifications. Such regulation can also be overly restrictive, particularly when it comes to new technologies or modern multi-national organisations with multi-tiered supply chains and new business models. This approach should continuously generate some technical standardisation tasks for European standardisation bodies such as EUROCAE.

Most aircraft manufacturers are upgrading their existing products through incremental changes. (Major changes and derivatives).

No application for a new TC implementing significant technological breakthrough changes is expected in the near future. (A 5-7-year time frame is foreseen for those new technologies). The product competitiveness is then driven by added-value and innovative solutions to be developed with more and more challenging lead-time and cost objectives.

In that context, aircraft system evolution is mainly linked to functional needs to cope with

- Safety considerations addressing particularly loss of control, CFIT and Runway excursions
- ATM environment evolutions in line with implementation of SESAR and Next Gen capabilities
- New regulations such as global flight tracking, recorders
- Innovating technologies allowing to define more integrated technical solutions
- Faster development processes based for example, on the use of automated tools for analysis and design, automatic requirements checks, data exchange and simulation
- Increased data exchange capabilities between avionics systems and open-world systems such as Electronic Flight Bags for Flight Operations efficiency

Examples of new foreseen operational and systems needs are:

- Additional safety nets
- Gaining benefits from EVS, SVS and CVS
- New ATM trajectories (free route, RNP, LPV)
- Increased usage of ADS-B
- New datalinks (ATN vs IPS)
- Dual Frequency and Multiple Constellations (DFMC) GNSS
- Enhanced consideration for Cybersecurity
- Increased use of wireless communication
- UAS integration
- Connectivity and capacity to perform system health monitoring and predictive maintenance
- Optimised trajectories for fuel consumption

In the mid/long term, introduction in operations/systems of

- Single Pilot Operations
- Use of Artificial Intelligence
- Electrical and Hybrid systems
- Integrated C.N.S architecture with increased use of smart antennas, software defined radios and shared resources

### 3.12 Other UAS Stakeholders

It is foreseen that EUROCAE WG-105 and ASD-STAN will cooperate in relevant and overlapping areas under the umbrella of the MoU.

The UAS standards development working group (D5WG8) is planning to work in the UTM domain; in particular on the topics of geofencing and E-ident for the Open category.

Further information is needed on their workplan and the interface with UTM FT to formalise coordination with WG-105.

### **3.13 Aeronautical Industry (Airborne equipment and system manufacturers)**

Avionics equipment and systems are slowly continuing their evolution without experiencing significant breakthrough changes. Current evolution is pursuing cost reduction, increased integration, more open solutions and additional performance and capabilities.

Most of the current changes are driven by the implementation of the new SESAR and NextGen capabilities that are now expected on-board, resulting in some cases in some architectural and design changes with regard to current avionics systems and equipment.

One recent evolution is the increasing need for information security that now needs to be taken into account within all new designs.

Another notable evolution is the need for clear interfaces between the different development assurance processes across the different domains, i.e. (here) hardware, software, and aircraft system. The aircraft system development assurance standard has been developed late in this context but is at the top of the pyramid.

### **3.14 Aeronautical Industry (Ground equipment and system manufacturers)**

The high-level goals of the Single European Sky and its SESAR programme in Europe, of the NextGen programme in the US have expressed the need for much more coordination and synchronisation between the ATM stakeholders through organised, reliable and efficient information sharing.

This has a direct impact on ATM Ground Systems, requiring their evolution for information sharing with better performance and efficiency, leading to new operational concepts such as Trajectory Management, Cross Border Free Route operations in all types of environment, including high density and high complexity airspace. Initial SWIM, Flight Object Interoperability, Trajectory Information Sharing are the main initial technology changes to implement in ATM Ground Systems in the medium term.

As a consequence, new or evolved concept of operations, better airborne and ground system performance imply also the need to upgrade ATC tools such as Conflict Detection and Resolution or Monitoring Aids.

In the medium / long term, a new approach for the provision of air traffic service is likely to be adopted by air navigation service providers, requiring architectural and technological evolution such as Service Oriented Architecture, Cloud, and Virtualisation. This new approach for the provision of air traffic service will also impact airport operations, e.g., remote tower concept.

Digital technologies such as Big Data Analytics and Artificial Intelligence will gradually be implemented in the ATM community, allowing the development of new or extended services and capabilities.

The very rapid growth of the UAS market will oblige to develop specific tools to handle fleets of thousands of UAS, requiring a high level of automation, which will ultimately impact the current ATM landscape (evolution of the systems towards more automated ATC, newcomers in the service providers and suppliers environment, ...).

Generalisations of information exchanges will increase the threat of malevolent intrusions, requiring that cybersecurity aspects are handled both at operations and systems levels.

All these changes need to be performed with the overarching goal of maintaining or even strengthening the target level of safety.

With this respect, the mandate given to EASA in 2009 as part of the SES-2 regulation by update of the Basic Regulation to address the safety of the ATM Ground Systems in addition to their initial mandate for airborne systems, is a major change for the ground ATM environment (for both service providers and suppliers). EASA is progressing in the

implementation of this mandate and the resulting rules might impact industry manufacturing practices (design, development, testing).

### **3.15 Air Navigation Services Providers (ANSPs)**

For Air Navigation Service Providers (ANSP) following main external drivers for short-to medium-term standardisation activities are:

- Safety
- Interoperability (generating a need for information security)
- Compliance with regulation, in particular PCP for SESAR Deployment

In civil aviation, Safety always has the prime attention. The host of improvements to be introduced in the SESAR framework need not only to assure current safety levels, but have to improve the Key Performance Area (KPA) Safety in terms of ambitious quantitative goals. Within EUROCAE almost each Working Group addresses safety aspects and will continue to do so in future.

One of the major objectives of the Single European Sky regulation, and the SESAR programme technological pillar, is to increase interoperability of European ANSPs to support seamless cross-border operation.

The basis for interoperability is sharing of operational information, and again various EUROCAE Working Groups are already involved in this (e.g. WG-59).

For the future, two more related aspects have to be addressed: information security and risk sharing for entities that share critical information, as well as the introduction of SWIM services to disseminate such information.

Driven by the SES Regulatory environment and customer demand European ANSPs strive to improve efficiency in providing their services. This can be seen in developments to virtualise the Controller working position, rationalise system infrastructure and introduce service-oriented architecture, and finally envisage common provision of services.

As part of the SES package the SESAR Deployment has started with the regulation of the "Pilot Common Project – PCP".

EUROCAE will need to develop the guidance material and AMC associated with the regulations (e.g., DLS, PBN and SPI) to facilitate ANSP implementation in compliance with NSA/EASA working arrangements.

A new and significant driving force is the integration of UAS into non-segregated airspace. In particular, for the new EASA Certified Class of UAS it is very important to provide appropriate standards early in order to enable a controlled and safe For EUROCAE WG-105 will be a cornerstone to support standardisation in this area.

### **3.16 Civil Aviation Authorities**

Civil Aviation Authorities have the role to implement ICAO SARPS and EU regulations into the national legislation of the States. The compliance to these requirements is enforced through certification and oversight functions. Although at the EU level the initial airworthiness and continued airworthiness function are EASA's responsibility exercised on behalf of the EU Member States, the CAAs still conduct certification and oversight activities including but not limited to aircraft operations, aerodromes and ANSPs.

While the working arrangements with ANSPs (Annexes 2, 10, 11, PANS-ATM) are usually sufficient to obtain conformity demonstrated by the ANSP which is staffed accordingly, the situation is much more variable for airport authorities and airspace users.

In particular, the need for standards and associated means of compliance may not be easily expressed by the end users due to lack of resources or access to standardisation forums. In this context, it is expected that the CAA would be in the best position to identify specific issues which could deserve some standardisation work.

The involvement of several CAAs in EUROCAE activities is useful to support the appropriate consideration of those specific issues.

**3.17****Airports**

A variety of airport matters have recently been taken into consideration by EUROCAE. There are three main streams of concerns:

1. Airports are now considered by the European Commission (Single European Sky) as an integral part of the ATM system. Their optimised processes and interoperability are one essential support to the seamless operations of air traffic from gate to gate within Europe. This is particularly true for 25 airports listed in the Pilot Common Project. For those airports the PCP requires a number of new ATM functionalities e.g. in the domains of A-SMGCS, airport collaborative decision making (ACDM) or SWIM. It is anticipated that part of these ATM functionalities would also bring benefits to airports not listed in the Pilot Common Project. EUROCAE will have to support the specification and standardisation of the required services and technologies in accordance with objectives set by the EASCG.
2. Airports are important industry stakeholders which expect evolution of their infrastructure supported by innovation and technological changes. This is visible through the emergence of remote and virtual towers, the use of digital data exchange between stakeholders and new IT systems supporting ground processes. Airport authorities are in charge of the safe and efficient coexistence on the platform of a number of stakeholders (e.g., catering, refuelling, airlines ground personnel). This all may raise new needs for EUROCAE deliverables (e.g. airport vehicles equipment).
3. The global growth of air traffic is leading to the fact that big airports are more and more becoming bottlenecks to the ATC system and that currently smaller airports become new important stakeholders that need to be considered at network level. The current trend is to progress in the airport integration in the network, enabling the elaboration of a detailed and accurate situation of ATC capacity and delays. That trend is visible in the revision of the EATM Masterplan. It is likely, that the increase in the number and diversity in configurations of airports will generate new issues to consider for standardisation.

**3.18****Accident investigation**

Beside the occurrence reporting Accident investigations are part of the aviation feedback loop aiming to increase the overall safety. Accident investigators are doing a root cause analysis of accidents and serious incidents. As an outcome of their activities they are recommending changes to requirements or make other proposals how to improve the aviation safety system. Those recommendations are in general addressed to manufacturers and operators but also to other agencies like EASA, SJU and EUROCAE, who are due to analyse and provide answers to those recommendations.

As outcome, after the EASA assessment of the recommendations and EASA's decision on the measures to take, the most important elements, which deserve regulatory activities are translated into the European Aviation Safety Plan (EASp). They might lead to initiation of research, standards development or revision and potentially later on to changes in certification requirements and regulations.

Several accidents or severe incidents have been caused by weather phenomena. Consequently, the better availability of tactical and strategic weather information in the cockpit has been recommended. Several research projects have been launched, aiming for standards development, respectively standards update. It is of special importance to have a standardised graphical weather information interface to pilots and not one, which is changing from one supplier to the next one to avoid in the end misinterpretation and confusion.

A long-standing set of recommendations aim to have better weight and balance information. In several cases, incorrect information was used in determining the needed runway length leading at least to incidents. It is true that the recent attempt failed to deliver a MOPS, but this does not prevent to look again into this subject.

On that aspect, it should be noted that several AAI agencies have recurrently recommended to EASA to develop specifications for systems aimed to mitigate human errors, beyond the reliance on operational procedures only. For example,

recommendations have been made to improve the helicopter offshore operation and especially the Helicopter TAWS function.

### 3.19 JARUS

JARUS (Joint Authority on Rulemaking for Unmanned Systems) plays an ever-increasing role in the development of guidelines for the integration of UAS into the airspace.

Representatives of JARUS are members of the respective EUROCAE Working Group (WG-105). At the level of the Secretariats, there is no formal cooperation so far.

JARUS Stakeholder Consultation Board (SCB) is composed of industry representatives in different categories. It allows industry expertise to be fed into the document development process in the JARUS Working Groups (WGs). EUROCAE is a member of the SCB category of Standards Making Organisations.

The SCB is the Focal Point for the execution of the “Calls for Expertise” launched by the JARUS WGs. This allows EUROCAE to make sure that its members are aware of these Calls and can submit their application to the JARUS Secretariat. This resulted already in EUROCAE participation in the work of JARUS Working Groups.

In addition, this direct link to the JARUS working arrangements will allow EUROCAE to get early information on and access to JARUS documents that are released for Open Consultation. This way it can be ensured that the expertise of the EUROCAE membership can be utilised.

During last JARUS plenary meeting in April 2018, a future work survey task has been initialised, which could lead to creation of new JARUS Focus Groups in the next months.

### 3.20 Military organisations (e.g. EDA)

Military Organisations will make greater consideration of Civil Standards and Civil Standard Organisations (such as EUROCAE) in the future. For many countries, the philosophy is “as Civil as possible and as Military as necessary”. This approach results in an increasing need for both Civil and Military standards and this trend is expected to continue in the future, with greater emphasis on the use of Civil Standards where possible. Military Aviation Authorities are particularly interested in performance-based certification so that existing equipment can be certified as being equivalent to civil systems, thereby reducing the need for expensive re-equipage or retro-fitting of new systems to often quite old airframes. This places greater emphasis on the suitability of standards for both civil and military use.

The European Defence Agency (EDA) is a full EUROCAE member so that military input into the activities of the EUROCAE Working Groups has been facilitated. It can be expected that this will result in increased direct participation of military experts in the work of EUROCAE.

Areas where Civil Standards are already currently employed are in the areas of software development (ED-12C/DO-178C) and complex hardware development (ED-80/DO-254). Other existing standards that could be used include ED-79A/ARP4754A for system development and ED-135/ARP4761 for system safety analysis. Standards, such as ED-14G/DO-160G for environmental qualification, could also be considered for military use, but would have to be updated to include the appropriate Military environments first.

Unmanned Aircraft Systems (UAS) is a new area of technology where standards to support both civil and military needs are required. The Enhanced RPAS Automation (ERA) project, which is managed by the European Defence Agency (EDA), has asked EUROCAE to develop new standards to support three RPAS functions:

- Emergency Recovery
- Automatic Take-off and Landing
- Automatic Taxiing

Another activity just launched within the activities of WG-105 is the RPS Standardisation – the development of standards for the Remote Pilot Station (RPS) for Air Traffic Integration (ATI). EDA is also making an important contribution to the definition of

standards for Detect and Avoid by coordinating the use of results from the MIDCAS project through participation in WG-105.

### **3.21 Airspace Users**

#### **3.21.1 IATA**

Airspace user's and Airline interests will be reflected appropriately through increased involvement of IATA in all EUROCAE activities. An example of their concern on complexity is the approach to the full digitalisation (of the EFB or NOTAMS via SWIM) and CNS rationalisation. There is no doubt that it is important for airlines and the entire ATM world to be synchronised at the air- and ground side. It is important that it be integrated into existing Standardisation projects and activities.

The signature of a Memorandum of Understanding between IATA and EUROCAE will greatly facilitate this objective. IATA is a JARUS Member, working in diverse Boards or bodies (EUROCONTROL, EASA) at all national and European Levels (EC, SJU). The airspace users need to stay focused on several important goals: increasing capacity, ensuring (Cyber) security, enabling greater predictability, keeping costs affordable, addressing UAS integration and better predictability in order to plan and execute flights efficiently.

Airlines Top Targets and Topics are between others:

1. Cybersecurity is a new challenge and priority for ATM and CNS Aircraft Airborne Equipment (Datalink, via IP, OIS):
2. Safe, secure and fair integration of UAS/RPAS
3. Datalink and replacement of "best in class" by a real modern European Standard of DL and ADS-B/C Airborne Equipment.

#### **3.21.2 General Aviation**

Realising that there has long been a need for the interests of general aviation users to be represented in the EUROCAE standards process EUROCAE and the International Council of Aircraft Owner and Pilot Associations (IAOPA) formalised the inclusions of General Aviation in the development of standards with the signature of a new Memorandum of Understanding on March 26, 2018. IAOPA Europe represents over 45,000 members belonging to 35 autonomous, nongovernmental, national general aviation organisations in almost every nation in Europe.

The cooperation between the EUROCAE and IAOPA Europe will take various forms, including but not limited to exchange of general and technical information; sharing of expertise and best practices; participation in each other's working groups; coordinated communication activities.

The MoU paved the way for the next steps, welcoming IAOPA as a member and IAOPA experts joining EUROCAE working group activities and the development of standards. The GA will need specific adopted standards for their domain handled by existing working groups; in parallel, IAOPA might propose specific standardisation activities in support of the GA community.

Similarly, contacts with the business jet operators have been initiated, which might result in contributions to existing or proposals for new standardisation activities.

In this GA domain, several activities could be carried out soon, provided EUROCAE is able to gather the main participants around the table. As a matter of fact, the "performance based" concept could be further expanded to reflect more specifically the needs of the GA community. This could take the form of specifications tailored to GA operations, such as for example the use of COTS in domains like VHF 8.33 channel spacing. Other examples include voluntary equipage of electronic conspicuity devices based on different technologies (such as ADS-B, Mode S transponders, FLARM, PilotAware, etc.). The proper level of interoperability would have to be defined according to the intended usage. Participation of Air Navigation Service Providers or Air Traffic Controllers' associations would be a major asset to define the concept of operations and services expected from such electronic conspicuity devices.

In that respect, EASA (GA Department) will discuss those tasks with EUROCAE.

## **4. Ongoing and foreseen EUROCAE technical activities**

### **4.1 Avionics (non-CNS)**

#### **4.1.1 Purpose & Scope of activities of this Domain**

This Domain encompasses all standardisation activities, which are related to on-board equipment and systems without those in interaction with the external world (which are part of the CNS Domain). In addition, this Domain also encompasses standardisation activities related to the various system development activities.

Scope of activities therefore includes:

- Architecture and networks
- Sensors and displays
- Safety Systems
- System Engineering
- System Safety Assessment
- Environment

#### **4.1.2 Avionics Architecture and Network**

##### **4.1.2.1 Current activities of this Sub-Domain**

EUROCAE WG-96 Wireless On-Board Avionics network is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

##### **4.1.2.2 Anticipated evolution affecting this Sub-Domain**

Two components of avionics networks have emerged during the last years and may evolve due to new technologies and to support the increasing need of communication and processing power.

The two components are the following:

- The network: Instead of conventional cabling, the network transmits digital data between aircraft systems thanks to several transit points, referred to as switches.
- The avionic resources: Conventional avionics are designed with computers that are assigned to specific systems whereas Modular avionics are designed with computers that are assigned to several systems.

For the network part, main trends in a short term are driven by

- Higher bandwidth for avionic communication buses (ARINC825 standardising so-called CAN FD to upgrade CAN bus bandwidth, ARINC846 standardising optical multi-fibre interconnection, updates to ARINC664 and ARINC800 to standardise Gigabit Ethernet communications)
- Wireless Aircraft intra-communication for which EUROCAE Working Group 96 is working with RTCA to develop a MOPS.

For allowing ICAO to proceed in its timely development of SARPs for WAIC, SC-236/WG-96 has decided to issue a MASPS in early 2019 with a first set of requirements and rules mainly focusing on ensuring coexistence between WAIC systems on board one aircraft and radio altimeters/WAIC systems on board other aircraft. This will enable the early issue of SARPS opening the way to the certification of WAIC systems. SC-236/WG-96 will then issue full MOPS in October 2021, providing a complete set of specifications.

For the avionic part, main trends in a short term are driven by the new multi-core processor technology for which basic services and OS shall be adapted (ARINC 653 standardisation is ongoing).

In the long-term view, Network Communication may evolve based on new technologies such as Optical Fibre to increase the bandwidth.

##### **4.1.2.3 Vision of future EUROCAE activities in this Sub-Domain**

As EASA and FAA are updating their IMA guidance, it may be appropriate to review the IMA standard ED-124/DO-297 in the medium term.

### **4.1.3 Sensors & Indications**

#### **4.1.3.1 Current activities of this Sub-Domain**

EUROCAE WG-68 Altimetry is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

#### **4.1.3.2 Anticipated evolutions affecting this Sub-Domain**

Developments in this domain are often triggered by standardisation activities by other standardisation bodies, like RTCA or SAE, on short notice. EUROCAE needs to identify if there is an interest for European industry for a joint activity.

One potential field is the development of a specific standard for air data sensors using LIDAR technology. Several initiatives perform R&D, looking at industrialisation of this technology at an attractive cost while demonstrating equivalent or better performance than current air data probes technology. A specific standard will be needed for such equipment, probably in coordination with SAE.

#### **4.1.3.3 Vision of future EUROCAE activities in this Sub-Domain**

TAC has decided to keep WG-89 and WG-95 dormant for the next three years.

The future activities will be determined in coordination with other standardisation organisations in particular in domains where EUROCAE has competencies.

This activity supports strategic development in EASA in response to recommendations from accident investigations.

### **4.1.4 Safety systems**

#### **4.1.4.1 Current activities of this Sub-Domain**

EUROCAE WG-88 On Board Weight and Balance Systems and WG-98 Aircraft Emergency Locator Transmitters are already active in this Sub-Domain.

The WG-98 is currently developing the ED-62B MOPS for Aircraft Emergency Locator Transmitters (expected to be published before end 2018). The WG has already published ED-237 MASPS for Criteria to Detect In-Flight Aircraft Distress Events to Trigger Transmission of Flight Information. The WG will continue its work to develop a MASPS for Return Link Service. This task was kicked off in April 2018, with the deliverable expected by end 2019.

The SAR/Galileo Service, with its Forward Link Service (FLS) is an integral part of the future MEOSAR system and ensures the detection and localisation of the beacon distress signals through the relay of these signals by the Search and Rescue repeaters on board the Galileo satellites, their reception by the ground stations called MEOLUTs and alerts transmission to the Mission Control Centers. In addition, the SAR/Galileo Service will also introduce a new Search and Rescue function, called the Return Link Service (RLS), which provides acknowledgment messages to distress beacons equipped with a Galileo receiver, through the Galileo L1 signal).

For details on the deliverables please consult the table in annex.

#### **4.1.4.2 Anticipated evolutions affecting this Sub-Domain**

A Take Off Performance Monitoring System (TOPMS) is a system to alert the pilot that the aircraft's performance is significantly lower than the expected performance, at a point in time where the take-off can be safely aborted.

In Q1/2015, WG-94 (TOPMS) interim report concluded that this activity would not be pursued at this time, but that capabilities could be monitored and investigated again in a longer term, once the adequate level of maturity has been reached.

However, accident investigators think some functionality exist already today to improve the situation. Their expectation is to have a less complex function but already a good improvement of the situation leading to the use of wrong performance parameter. This may trigger a similar activity with modified scope in the mid-term. The On-Board Weight and Balance System activity may bring this expected result, but it could be that another activity may need to be launched to answer to the need.

The European Commission has published mandatory actions in the domain of flight tracking to improve the accuracy of the available impact point and to ease recovery of recorded data. One means to achieve the objective could be the use of deployable flight data recorders which are accomplished by an Emergency Locator Transmitter (ELT). No MOPS exists today which accounts for the needs of this specific combination. Consequently, the requirements for deployable recorders and for deployable ELTs may need to be developed on the basis of similar already existing MOPS requirements. In addition to ongoing work within WG-98, activities to address a combined deployable recording and ELT device could be envisaged.

Landing overrun accidents in slippery conditions continue to occur. A significant contributing factor is the lack of timely, accurate information on runway friction conditions in adverse weather conditions. WG-76 is currently working on the specification of a datalink service providing such information to the flight deck. FAA is sponsoring research to develop feasible methods of using data from landing airplanes and report real-time runway friction conditions to air traffic controllers, airport personnel and flight crews of subsequent arriving airplanes.

Following several offshore helicopter accidents, CAA UK started research to improve the Helicopter Terrain Awareness (HTAWS) function. Now first results are available and are planned to be published as a CAA UK CAP (Civil Aviation Publication). This has resulted in the proposal of developing a standard for a Class A HTAWS "Classic modes".

Other safety recommendations resulting from accident or incident investigation may trigger the development of further standards.

#### 4.1.4.3

#### Vision of future EUROCAE activities in this Sub-Domain

Depending on technologies maturity, there could be a need for the following EUROCAE standardisation activities.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
TOPMS	MASPS	Medium term	Industry Airworthiness Authority	RTCA
Deployable ELT linked to FDR	MOPS	Short Term	Industry Airworthiness Authority Accident Investigator	RTCA
Deployable FDR	MOPS update	Short Term	Industry Airworthiness Authority Accident Investigator	

All activities respond to safety recommendations received from accident investigators.

The ELT and FDR related activity is linked to ICAO recommendations and corresponding equipage mandates in Europe.

TOPMS contributes to runway safety as reflected in the European Plan for Aviation Safety during departure while the Wrong Glide Slope Warning addresses the landing case.

HTAWS improvement for offshore operation contributes as well to the helicopter operation improvements as laid down in the EASp.

## **4.1.5 System Engineering**

### **4.1.5.1 Current activities of this Sub-Domain**

EUROCAE working group WG-97 Interoperability of Virtual Avionics Components is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

Consequently, the new ToR would provide for a Technical Specification that would be named VISTAS – WG-97 Standard of Virtual Interoperable Simulation for Tests of Avionics Systems in virtual or hybrid. The first release of the standard will cover main avionics interfaces. Further releases (i.e. Revision A) will be due in a second step, as the group will expand the scope to cover additional avionics interfaces and functionalities.

With the aim to identify how ED-12 could apply to the small UAS community, a joint EUROCAE/RTCA working group has been set up. It looks at ensuring how ED-12/DO-178 can continue to meet the needs of software development for the Aviation community when including UAS, by proposing recommendations on possible amendments and applicability, without impeding the UAS fast deployment. The group, which include members of the Forum on Aeronautical Software, traditional avionics manufacturers, and members of the UAS software industry, UAS OEM manufacturers, representatives from regulators, ANSPs, and users/owners of UAS, will provide its recommendations by the end of 2018.

### **4.1.5.2 Anticipated evolutions affecting this Sub-Domain**

No activities foreseen in the medium term.

### **4.1.5.3 Vision of future EUROCAE activities in this Sub-Domain**

As far as software and hardware assurance processes are concerned, work is performed on high-level objectives allowing the justification and use of alternate standards to ED-12 or ED-80. In parallel some research activities are performed, looking into alternate approaches for development assurance demonstration. This may lead to an update of the corresponding standards to benefit from those developments.

In parallel, some activities are performed at ASTM to develop specific versions of similar standards in the software and hardware development assurance domain specifically tailored for the General Aviation /UAS community and there may be benefit for some joint activities to maintain consistency.

As far as “Interoperability of Virtual Avionics Components” WG-97 is concerned, no standardisation activity is foreseen to date beyond the current plan.

This activity supports efficiency gains for industry and authorities.

## **4.1.6 System Safety Assessment**

### **4.1.6.1 Current activities of this Sub-Domain**

EUROCAE working group WG-63 is already active in this Sub-Domain For details on the deliverables please consult the table in annex.

### **4.1.6.2 Anticipated evolutions affecting this Sub-Domain**

Model-based activities, as upcoming processes involving safety, are not yet addressed. MBSA (Model Based Safety Assessment) is planned to be addressed in ED-135.

No frame has been defined so far to address MBSE (Model Based System Engineering).

### **4.1.6.3 Vision of future new EUROCAE activities in this Sub-Domain**

Industry has requested to EASA and FAA to extract the objectives from ED-79/ARP-4754. ED-79/ARP-4754 is accused to be too prescriptive and to contains best practice instead of defining objectives. This may lead to the development of a new standard extracting the objectives from the document.

There is probably a need to monitor MBSE processes so as to be ready for standardisation activities when mature enough.

## **4.1.7 Environment**

### **4.1.7.1 Current activities of this Sub-Domain**

EUROCAE working groups WG-14 Environment and WG-31 Lightning are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### **4.1.7.2 Anticipated evolutions affecting this Sub-Domain**

This Domain currently covers a large set of environmental categories. It is not envisaged to enlarge this set, that, so far, addresses all the domains that seem necessary to handle.

Though, there is an evolution that needs to be taken into account, regarding the increasing possibilities of simulation, as a support to demonstrate system capabilities and performances.

RTCA has launched an activity on UAS ground equipment. WG-14 also entered into the work. The goal is to get relevant standards for ground equipment, such as UAS ground stations, adapted to ground environment conditions, quite different from what is requested for air vehicles. WG-105 will cooperate with WG-14 on this topic.

### **4.1.7.3 Vision of future new EUROCAE activities in this Sub-Domain**

Climate changes may lead to update the weather standards to be taken into account, as for hail for instance. WG-14 will probably need to consider these new elements.

It is expected that WG-31 will initiate activities on the use of simulation in support of compliance demonstrations.

## **4.2 CNS**

### **4.2.1 Purpose & Scope of activities of this Domain**

This Domain encompasses all standardisation activities which are related to on-board and ground equipment and systems which are in interaction with the external world for Communications, Navigation and Surveillance (CNS). Activities related to Datalink are also considered as part of this Domain.

Scope of activities therefore includes:

- Navigation including ground and space navigation infrastructure
- Surveillance including ACAS
- Communications means
- Datalink applications

### **4.2.2 Integrated CNS evolution**

Until recently, it was possible to develop implementation roadmaps for COM, NAV and SUR systems which could be aggregated to capture key technological improvements as well as potential impact on avionics architecture and spectrum (i.e., aeronautical frequencies used for COM, NAV and SUR).

These distinct roadmaps could not describe the technological and/or functional synergies across the COM, NAV and SUR domains enabled from common system/infrastructure capabilities. In addition, the identification of common modes of failure was only achieved at the safety assessment for each system.

European strategy is to evolve towards performance-based approach supported by a backbone composed of GNSS, ADS-B, Data Link/PENS and the common services associated to NAV, SUR, COM.

The evolution to common support services modifies the system approach to functional approach and enables to reconsider the supporting infrastructure at a regional level rather than at a national level.

The performance-based approach is rendered possible because of the introduction of satellite technologies (e.g. GNSS) and is resulting in a shift from physical assets ("systems") to data provision to functional requirements ("ATM operations"). The performance-based approach is also necessary in the SES context where ATM

performance must be enhanced and measured, introducing new actors in the business models (data service providers, communication service providers, satellite service providers).

In parallel, the need to improve the overall performance is also visible in the activity promoting rationalisation of the infrastructure at the European level. It may impact the work programme for several working groups.

Last but not least, it is anticipated that a specific CNS-strategy for a large number of UAS would be needed.

### **CNS services**

A modernised ATM system enabling SESAR cannot exist without efficient and cost-effective CNS services. The service-oriented architecture concept helps generating new business models with a positive impact on the Air Navigation Service Providers costs. Thanks to the service-oriented approach applied to CNS provision it is possible to support several ATM changes, like data link services in support of trajectory-based operations or data sharing enabled by SWIM in support of ATFM delay sharing.

These various technological solutions will have to be packaged or merged in a way which guarantees to end users the availability, integrity, safety, security and other performance requirements that could be mandated by the relevant authority.

The latest developments within ATM are marked by the virtualisation, which first appeared in support of ATS for remote towers and will be further developed to En-route and TMA sectors by decoupling the controller working positions (CWPs) from the ATM data service provision.

Another key element is the implementation of virtual centres supported by data centre services in the 2025 timeframe. In parallel, it is anticipated that the development of virtual reality for tower supported as appropriate by video cameras, augmented by synthetic vision for tower will open new business opportunities.

## **4.2.3 Navigation**

### **4.2.3.1 Current activities of this Sub-Domain**

The following EUROCAE working groups are already active in this Sub-Domain: WG-28 Global Navigation Satellite Systems, WG-62 GALILEO, WG-107 RNP Reversion based on DME / DME and WG-85, 4D Navigation. For details on the deliverables please consult the table in annex.

### **4.2.3.2 Anticipated evolutions affecting this Sub-Domain**

#### **4.2.3.2.1 Context**

Developments of Performance-Based Navigation (PBN) introduce a move from conventional navigation to area navigation. Additionally, the new operational concepts developed by SESAR, e.g. initial four-dimensional (i4D) and full 4D trajectory management, are driving performance requirements placed on navigation systems to become more complex and demanding.

With the introduction of PBN operations, the need for more complex on-board and ground functions increases, with data exchanges (e.g. trajectory exchanges) between ATM and aircraft. The navigation databases play also a crucial role. However, conventional navigation operations will continue to exist, therefore the coexistence of the two types of operations, conventional navigation and PBN, will raise issues related to operational procedures and enabling infrastructure, which will have to be effectively managed.

The evolution of the ATM infrastructure to meet the performance requirements and needs of the European ATM Network is driven to a large extent by the need for integration between the COM, NAV, SUR, ATM systems and ATM network components, therefore, integrated CNS solutions are expected to emerge.

#### 4.2.3.2.2 Navigation specific evolutions

The main trend is associated with the move towards a total (RNAV) RNP environment based on PBN enabling time-based operations and 4D trajectory-based operations (Trajectory management), and gradual increase in reliance on satellite-based navigation infrastructure GNSS for positioning and timing. The following elements should be noted in particular:

- Multi-constellation/dual-frequency GNSS to support PBN, i4D and SUR applications/requirements: a multi-constellation and dual-frequency GNSS environment will address the majority of the concerns associated with common mode failure and will enable increased accuracy, continuity and integrity.
- Ground-Based Augmentation System (GBAS) supporting CAT II/III operations for advanced procedures in a multi-constellation and dual-frequency GNSS environment. It is recognised that there will not be a rapid replacement of ILS by GBAS but GBAS can be economically viable on a local basis. GBAS CAT I stations are considered to be an interim step towards the development of GBAS CAT II/III stations.
- Alternative Position, Navigation and Timing (A-PNT) – Research is ongoing on new terrestrial technologies as a back-up to GNSS, e.g. Enhanced DME Network (DME-DME), wide area multi-lateration, aircraft-based systems. A-PNT is a means to continue PBN operations during periods when GNSS services are unavailable, due to interference or outage. As a short-term solution to the need for GNSS back up, WG-107 is working on a revision to ED-57 Minimum Performance Specification for Distance Measuring Equipment (DME/N and DME/P) - Ground Equipment, and on a new ED - MASP for RNP reversion using DME/DME Positioning.
- Advanced Receiver Autonomous Integrity Monitoring (A-RAIM) – studies are ongoing in a joint activity between EU and US on the possibility to introduce A-RAIM in aircraft navigation. In a future multi-constellation and dual-frequency GNSS environment, the use of A-RAIM can be an alternative for vertical guidance (Localizer Performance with Vertical guidance (LPV-200)) with worldwide coverage when SBAS is not available. Studies are covering the concept, assumptions, algorithms, implementation architecture options. The outcome of the studies may provide a basis for potential standardisation activities.

With the aim to develop common, or as a minimum, harmonised standards between RTCA and EUROCAE, in particular when the technology is deployed and utilised at a global scale, a joint activity between RTCA and EUROCAE is being worked to develop a joint GPS/Galileo dual-frequency SBAS MOPS. However, there remains to agree on common dates, short term and achievable, for the initial and final MOPS versions, in order to support the delivery of ground and space infrastructure as well as to ensure a reasonable time to market of certified airborne receivers. Airborne industry can develop, certify and deploy, airborne receivers at a reasonable cost with an expected short-term return on investment thanks to market readiness and sufficient operational benefits.

#### 4.2.3.3 **Vision of future new EUROCAE activities in this Sub-Domain**

There is a need for EUROCAE to conduct activities in response to the following drivers:

- Standardisation activities for Satellite positioning
- Multi-constellation/dual-frequency GNSS GBAS CAT II/III multi-constellation/dual-frequency, addressing Ground station and Airborne equipment.
- MOPS on GPS/GALILEO dual-frequency SBAS

Standardisation for more advanced applications, such as A-PNT as GNSS backup and Advanced RAIM may be necessary in the medium-term, but the need will have to be assessed at a later stage. This activity supports strategic development towards PBN operations in the ICAO context.

Whilst GNSS interference, in the form of jamming, may cause the loss of GNSS data, GNSS spoofing may cause the output by GNSS avionics of erroneous data, by using counterfeit signals. There is a growing demand from Regulators to address this threat in future multi-constellation dual-frequency standards. It can be expected that future standards will provide recommendations and/or requirements against these threats,

including threat characterisation and scenarios, test procedures and mitigations techniques, not necessarily limited to the GNSS receiver.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
GBAS Cat II/III multi-constellation/ dual-frequency <i>System level</i>	MASPS	Medium Term	Industry	RTCA SC-159
GBAS Cat II/III multi-constellation/ dual-frequency <i>Ground Station</i>	MOPS for the GBAS ground subsystem to support precision approach and landing in the context of GBAS CATII/III L1	Medium Term	Industry	RTCA SC-159
Alternative Position, Navigation and Time solution (A-PNT) as GNSS backup	TBD	Medium Term	Industry	RTCA SC-159
Advanced Receiver Autonomous Integrity Monitoring (ARAIM)	TBD	Medium Term	Industry	RTCA SC-159

#### 4.2.3.3.1 Additional comments

Standardisation activities in the area of navigation need to be based on international ICAO requirements and guidelines and support European ATM Network developments as well as global interoperability needs.

Coordination between different EUROCAE WGs will become even more important as the European ATM network moves towards more advanced and integrated applications, functions and enabling technologies, to ensure that navigation capabilities remain well coordinated and consistent with the other ATM domains.

EUROCAE TAC needs to monitor the progress of the work in SESAR Programme 2020, as it unfolds, as well as any need for standards in support of implementation activities, that could arise from possible future common projects, in order to maintain the content of this section up-to-date.

This activity supports strategic development in the domain of cooperation with other SDOs and RTCA and SESAR Deployment.

## 4.2.4 **Approach and Landing Systems**

### 4.2.4.1 **Current activities of this Sub-Domain**

EUROCAE working group WG-79 EVS & SVS is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### 4.2.4.2 **Anticipated evolutions affecting this Sub-Domain**

Enhanced and Synthetic Vision Systems are technologies which are progressively introduced on various types of civil aircraft (Business jets, helicopters, Air transport, ...). An Enhanced Vision System (EVS) is an Electronic means which provides the flight crew with an image of the external scene through the use of imaging sensors such as forward-looking infrared cameras, millimetre wave radar, and / or low-level image intensifying.

A Synthetic Vision System (SVS) is an Electronic means which provides the flight crew with a computer-generated image of the external scene topography. This image is derived from aircraft attitude, aircraft navigation solution, database of terrain, obstacles and other relevant features.

A Combined Vision System (CVS) is a combination of Synthetic and Enhanced Vision systems.

EFVS (Enhanced Flight Vision System) is an Enhanced Vision System (EVS) coupled with Head-Up Displays (HUD).

Except for EFVS, there are no established standards for the approval of these type of systems which justify the current activities of the Working Group 79.

In a short timeframe and beyond the MASPS under study by WG-79, main trends affecting this sub-domain are driven by:

- a desire to obtain some operational credit at reaching minima reduction with SVS and/or EVS. Then, an updated operational concept should be established.

In a medium/long term, the main trend is associated with additional operational credit and flight crew awareness for airport operations:

The following elements should be noted as enablers:

- EVS Sensors technology such as millimetre wave radar, multi-band infra-red sensors, LIDAR
- SVS Database with regards to accuracy & integrity dealing potentially with obstacles, terrain, runways and navigation.
- SVS concept extension to Airport operations

#### 4.2.4.3 Vision of future EUROCAE activities in this Sub-Domain

There is a need for EUROCAE to conduct activities in response to the following drivers:

There is an EASA Rulemaking Activity and an FAA activity.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
SVS/EVS/CVS operational credit	MASPS	Short-term	Industry	RTCA SC-213
EVS sensors	MOPS	Short-term	Industry	

#### 4.2.5 Surveillance

##### 4.2.5.1 Current activities of this Sub-Domain

In the Surveillance Subdomain six EUROCAE WGs are active:

- WG-41 A-SMGCS
- WG-49 Mode-S Transponder, which was reactivated in January 2016
- WG-51 Automatic Dependent Surveillance-Broadcast (ADS-B)
- WG-75 Traffic Alert and Collision Avoidance System (TCAS)
- WG-102 GEN-SUR SPR
- WG-103 Independent Non-Cooperative Surveillance Systems

For details on the deliverables please consult the table in annex.

##### 4.2.5.2 Anticipated evolutions affecting this Sub-Domain

In the surveillance domain, the main evolutions in the short / medium term are:

The harmonised implementation of an optimized performance-based, safe and cost-efficient surveillance system will remain a challenge due to the very different characteristics of sensor technologies. The availability of Generic Surveillance Requirements and their extension to support applications beyond En-route and TMA separation for IFR traffic will support this task. An activity to provide guidance on the efficient use of spectrum may complement the existing documentation.

The whole topic of collision avoidance systems is getting more complex and has to be kept interoperable while maintaining the independence as last resort safety net. The surveillance function of the airborne collision avoidance system will be enhanced by

ADS-B and Extended Hybrid Surveillance. It will be extended to UAS, hence distinct collision avoidance systems (TCAS II, ACAS Xa, ACAS Xu: Collision Avoidance for UAS) are emerging and have to be kept interoperable. ACAS Xu will be addressed in coordination with EUROCAE WG-105 on UAS. Finally, collision avoidance resolution advisories have been and will be coupled to Flight Guidance systems.

Surveillance based on video tracking will be progressively integrated as one potential surveillance data source on airports, for final approach and surface movements. Such function will support gap filling for surface movement and detection of airborne very small targets as well (such as micro and mini UAS). An activity regarding combined surveillance on airport surface could be envisaged.

#### 4.2.5.3 Vision of future EUROCAE activities in this Sub-Domain

As ground ATC surveillance is being composed of conventional radar and Mode S multi-lateration technology and supported by ADS-B as well as Mode S enhanced surveillance information, there is the need to ensure that future needs (e.g. airport ground traffic safety nets, new tactical controller tools etc.) are equally supported by airborne data. Therefore, coordination with WG-41 and close coordination between WG-49- and WG-51 is necessary to e.g. develop new versions of transponders as the concept of operations is evolving.

Concerning the UAS Collision Avoidance capability, WG-75 TCAS has taken that task into its remit, working together with WG-105, coordinating with RTCA SC-147. WG-75 has also to ensure that with the emergence of a number of distinct collision avoidance systems (TCAS II, ACAS Xa, Collision Avoidance for UAS) any two collision avoidance systems interoperate effectively.

A European led initiative (Airbus, Honeywell Europe) is ongoing towards the development of a function called RITAAS (Runway Incursion Traffic Alert Airborne System) which use the processing of ADS-B message from surrounding transponders to alert the flight crew of an intruder on Runway. Whilst it is desired that this is ultimately run as a Joint activity, decision on a revision of the SPR and development of a MOPS cannot be expected before end 2018, after consultation of relevant expertise in RTCA SC-186 / EUROCAE WG-51.

Satellite-based ADS-B is currently being deployed. This may demand to clarify expected performances of such a system in relation to the expected separation services.

This activity supports strategic development in the domains of stakeholders, in particular ANSPs and Military organisations.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
SURF IA	SPR for SURF-IA	medium term	Industry	RTCA (?)
	MOPS for SURF-IA	medium term	Industry	RTCA (?)

## 4.2.6 Communication means

### 4.2.6.1 Current activities of this Sub-Domain

EUROCAE Working Groups WG-82 New Air/Ground Technologies, WG-92 VDL Mode 2 and WG-108 ATN/IPS are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### 4.2.6.2 Anticipated evolutions affecting this Sub-Domain

Three components of the radio communication system have emerged during the last years and are in need of new technologies, identified at ICAO level and confirmed in the context of SESAR and NextGen.

The three components are the following:

- one component to cover the airport surface, that will be derived from the existing set of standards known as IEEE 802.16 (one profile currently in deployment being the WIMAX system): it will be a specific dedicated system (and associated standards) operating in the safety of flight C band frequency allocation,
- one terrestrial component (LDACS) to cover the TMA and En-route areas, that will operate in the L band (sharing the band with DME and Mode S),
- one satellite component to cover also the TMA and en-route areas but also the oceanic areas. A possible system solution is under investigation by ESA with a strong cooperation of the SESAR programme, this system will operate in the current AMS(R)S spectrum allocation.

Regarding VDL Mode 2, the European Commission has issued the mandate EC 29/2009 for ATC communications. As the mandate relies on VDL Mode 2, and the dual-frequency mechanisms, the WG-92 updated ED-92 to support dual-frequency mechanisms. ED-92B has been issued.

In order to investigate evident Controller/Pilot Data Link Communications (CPDLC) performance issues, the Enhanced Large Scale ATN deployment (ELSA). In its final report, the project released its recommendations, some of which address the need for standardisation activities.

Through an exchange of letters, the European Commission and EUROCAE agreed on covering this need through WG-92 activities (ED-92C and companion document, ED-92D).

### 4.2.6.3 Vision of future EUROCAE activities in this Sub-Domain

In the medium-term timeframe, the terrestrial component of Air-Ground communication in L-Band needs standards.

1. For VDL2 ELSA recommendations need to be implemented (ongoing in WG-92).
2. For LDACS, the capacity study has demonstrated that the European ATM will require a new high bandwidth media around 2030. The solution will be developed under SESAR 2020 and will require EUROCAE support.

A second area of activities in mid-term timeframe would be standardisation of an RPAS Command and Control Datalink.

The satellite component is foreseen long-term, depending on the ESA Iris programme.

This activity supports strategic development in SESAR Deployment and cooperation with RTCA.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
L Band Air Ground Communication <i>System</i>	MASPS	Medium Term	Industry	SESAR RTCA
System level L Band Air Ground Communication System <i>Ground System</i>	Ground MOPS	Medium Term	Industry	SESAR RTCA

L Band Air Ground Communication System <i>Airborne Equipment</i>	MOPS	Medium Term	Industry	SESAR RTCA
UAS New command and control datalink <i>System level</i>	System level TS	Medium Term	Industry	
UAS New command and control datalink <i>Ground System</i>	Ground MOPS	Medium Term	Industry	
UAS New command and control datalink Airborne Equipment	MOPS	Medium Term	Industry	
VDL Mode 2 Avionics Equipment	MOPS	Medium Term	Industry	SESAR RTCA

In the long-term, “Beyond Line of sight” communication means in the C Band may also be considered for use.

“The Future Aviation Spectrum Strategy and Vision” could also result in some new standards or updates.

### 4.3 ATM

#### 4.3.1 Purpose & Scope of activities of this Domain

In the ATM-Domain following EUROCAE WGs are concerned:

- WG-59 Flight Data Processing (FDP) Interoperability
- WG-67 Voice on Internet Protocol (VoIP) for ATM
- WG-81 Interoperability of ATM Validation Platforms

WG-59 is concentrating on a new release of ED-133 (Flight Object Interoperability Specification) to include outcomes/findings from SESAR and other implementation/validation projects. This new release constitutes the baseline for implementation of the Pilot Common Projects (PCP) in the SESAR Deployment.

Currently WG-59 is waiting for input from SESAR, that has taken over the coordination and development of requirements and validation activities.

The current activities are shown in tabular form below.

WG-81 will focus its work on ED-148. The objectives are to identify the overall process and associated activities allowing two or more ATM Validation Platforms to interoperate. The WG is further developing a new release of the Interoperability of ATM Validation Platforms ED-147A.

#### 4.3.2 ATM – Flight Data processing

##### 4.3.2.1 Current activities of this Sub-Domain

EUROCAE working group WG-59 Flight Data Processing (FDP) Interoperability is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

It must be pointed out that these activities must be operationally driven. In particular, the functions must be validated operationally before being derived in system requirements. For this reason, the SJU launched at the end of 2015 an analysis team within SESAR to develop operational and technical requirements aiming at achieving the required level of maturity (EOCVM V2) for the Initial IOP SESAR related solution, representing the baseline for the work to be done in SESAR2020 to validate (at EOCVM V3 maturity) the full IOP solution.

This solution would be made available for all stakeholders in time to implement PCP ATM functionalities related to ground-ground flight plan exchange (e.g. AF5).

The Council has decided that WG-59 shall suspend all activities on ED-133 until the results of the SJU activities are available. This is expected for 2020. In the meantime, periodic progress review webexes are held with the SJU to maintain a sufficient level of awareness of WG-59 members.

#### 4.3.2.2 Anticipated evolutions affecting this Sub-Domain

SESAR Deployment Manager

A major driver for short/medium term standardisation is the Deployment Programme of the SESAR Deployment Manager, building on EU Regulation 716/2014 for synchronised implementation of the Pilot Common Project (PCP) for Europe. Prioritisation of standardisation work will be undertaken in the EASCG and this forms the core of ATM Functionality (AF) AF5.

The revised timescale is reflected in the Rolling Development Plan of the EASCG.

The EASCG acknowledged the new working arrangements within SJU and EUROCAE but noted that there is a risk on the availability of results depending on the completion of SESAR2020 activities in 2018.

#### 4.3.2.3 Vision of future EUROCAE activities in this Sub-Domain

Possible future standardisation activities could be envisaged in the area of virtual centre concepts covering aspects such as cloud-based deployment of ATM systems and services.

This activity would support strategic development in SESAR (and in SESAR 2020). It appears in the Rolling Development Plan as a possible follow-up of architecture work initiated in SESAR and further developed in SESAR 2020.

As expressed in the ATM Master Plan (Edition 2015), the technology evolution is enabling the modernisation of the infrastructure as well as the virtualisation of centres supported by common support services providing the required information when and where needed.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
Virtual Centre Concepts	INTEROP	Medium Term	ANSPs Industry	SESAR
Flight Object Concept	INTEROP	Medium Term	ANSPs Industry	SESAR

Another possible development is anticipated for support to implementation of the ICAO Flight and flow information for a collaborative environment (FF-ICE). ICAO expressed the need for a global interoperable trajectory-based operations (TBO) and seamless ATM environment. Europe is proposing to initiate the development of provisions to ensure a globally interoperable TBO environment taking account of regional responses to B2-FICE such as the European IOP/Flight Object concept (ANC-13).

#### 4.3.3 ATM – Digital Voice communications

##### 4.3.3.1 Current activities of this Sub-Domain

EUROCAE working group WG-67 Voice on Internet protocol (VoIP) for ATM is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

##### 4.3.3.2 Anticipated evolutions affecting this Sub-Domain

SESAR Deployment Manager

A major driver for short/medium term standardisation is the Deployment Programme of the SESAR Deployment Manager, building on EU Regulation 716/2014 for synchronised implementation of the SESAR Masterplan for Europe. Prioritisation of standardisation work will be undertaken in the EASCG, but as of today the following needs for standards can be identified for relevant ATM-Functions (AF) of the Deployment Programme:

AF3: ATM VoIP communications enabling Dynamic Airspace Configurations

ICAO is expected to reference EUROCAE deliverables in support of worldwide implementation by 2018. As a consequence, these activities are now supported by experts from outside Europe, namely the United States, Australia and Brazil.

#### 4.3.3.3 Vision of future EUROCAE activities in this Sub-Domain

The whole VoIP standard suite may need to be restructured for ICAO use, including new findings from worldwide (and European) VoIP implementation. In addition, SESAR research into flight-centric operations may express some new requirements.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
Voice over IP Ground/Ground Communication	TS	Medium Term	Industry EUROCONTROL ANSPs	ICAO SESAR

#### 4.3.4 ATM Simulators

##### 4.3.4.1 Current activities of this Sub-Domain

EUROCAE working group WG-81 Interoperability of ATM Validation Platforms is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

##### 4.3.4.2 Anticipated evolutions affecting this Sub-Domain

Several low-level technical solutions have to be proposed in order to achieve a concrete interoperability of ATM validation platforms so that ED-147 and ED-148 do not remain at high-level interoperability concepts only.

The SESAR programme uses simulators to validate many solutions. Extensive use of simulators within the SESAR programme should enable standards for air traffic management simulators, and their interoperability, to be identified.

In the domain of Virtual Centre, validation work is ongoing on CWP / FDP Interface. The goal is to define a functional/service level interface independent of underlying system design and suitable to enable virtual control centres. Validation work will be continued in SESAR2020, results are expected in SESAR 2020 First Wave (2018).

##### 4.3.4.3 Vision of future EUROCAE activities in this Sub-Domain

ATM Validation Platforms from different domains will be the driver in SESAR 2020 projects to support validation activities. In order to provide the required functionalities those ATM Validation Platforms need to be interoperable and might require enhancement of the standards, e.g.:

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
Enhanced Guidance Assistance to Aircraft and Vehicles on the Airport Surface Combined with Routing	OSED / SPR / INTEROP TS / IRS	Medium term	ANSPs Industry	SESAR
Airport Safety Nets	OSED / SPR / INTEROP TS / IRS	Medium term	ANSPs Industry	SESAR
Remote Tower	OSED / SPR / INTEROP TS / IRS	Medium term	ANSPs Industry	SESAR
4D Trajectory Management	INTEROP / TS / IRS	Medium term	ANSPs Industry	SESAR

Virtual Centre Concept such as CWP / FDP Interface	OSED / SPR / INTEROP TS / IRS	Medium term	ANSPs Industry	SESAR
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#### 4.4 Airports

##### 4.4.1 Purpose & Scope of activities of this Domain

As airports are considered an important stakeholder in the ATM system, it is necessary to facilitate the integration of airports in the ATM system in support of the European concept of operations. Traffic growth on local airport level as well as in the surrounding airspace drives the need to optimise procedures, systems and interfaces to avoid congestions in air traffic. In addition, airports are key economical players in their region where modernisation of their infrastructure is expected together with their expansion.

##### 4.4.2 A-SMGCS

###### 4.4.2.1 Current activities of this Sub-Domain

EUROCAE working group WG-41 Advanced Surface Movement Guidance and Control System is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

###### 4.4.2.2 Anticipated evolutions affecting this Sub-Domain

A-SMGCS is widely referred to in regulations (PCP) and in the ATM Master Plan. It is split into several sub-ATM functionalities, which has to be reflected in the existing EUROCAE EDs. The latest update of ED-87 (to ED-87D), has created the demand to coordinate specifically with MLAT and other surveillance sensor standardisation as well as to arrange interoperability with other ATC domains such as ACDM or SWIM.

In addition to the PCP elements, the ATM Master Plan prepared by SJU contains other standardisation needs related to new essential operational changes for airports:

- AMAN/DMAN integration including multiple airports,
- Airport Collaborative Decision Making (ACDM) evolution,
- Integrated surface management.

Those standardisation needs will affect airport vehicles as well as the deployed aerodrome systems. The integration of surface management data link has to be coordinated with data link experts.

The A-SMGCS domain will in the future include new surveillance technologies like video tracking and any kind of potential non-cooperative surveillance. To support existing systems, EUROCAE's role is to provide specifications to allow interoperability of those systems.

##### 4.4.3 Airport Equipment

###### 4.4.3.1 Current activities of this Sub-Domain

With airports becoming more integrated into the ATC network and new technologies available to support improving airport processes, EUROCAE is expanding its activities in this domain. Given the operating ICAO SARPS, particularly through Annexes 6, 14 and 15, the regulatory developments in progress and technical limitations of the current methods EUROCAE is tasked to develop standards to define the performance expected from airport systems and define the way of verification. The WGs will also consider other possible relevant information needed.

EUROCAE working groups WG-83 Airport Foreign Object Debris (FOD) Detection Systems and WG-109 Runway Weather Information Systems are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

###### 4.4.3.2 Anticipated evolutions affecting this Sub-Domain

None at this time.

**4.4.3.3 Vision of future EUROCAE activities in this Sub-Domain**

EUROCAE will monitor the development of new technologies and concepts of operations for enhancement of FOD systems that might not only cover FOD on runways but also FOD or unwanted small objects in the air (UAS, birds, etc.).

New systems and data protocols for runway friction measurement and the corresponding data exchange may require the creation of MASPS in this domain.

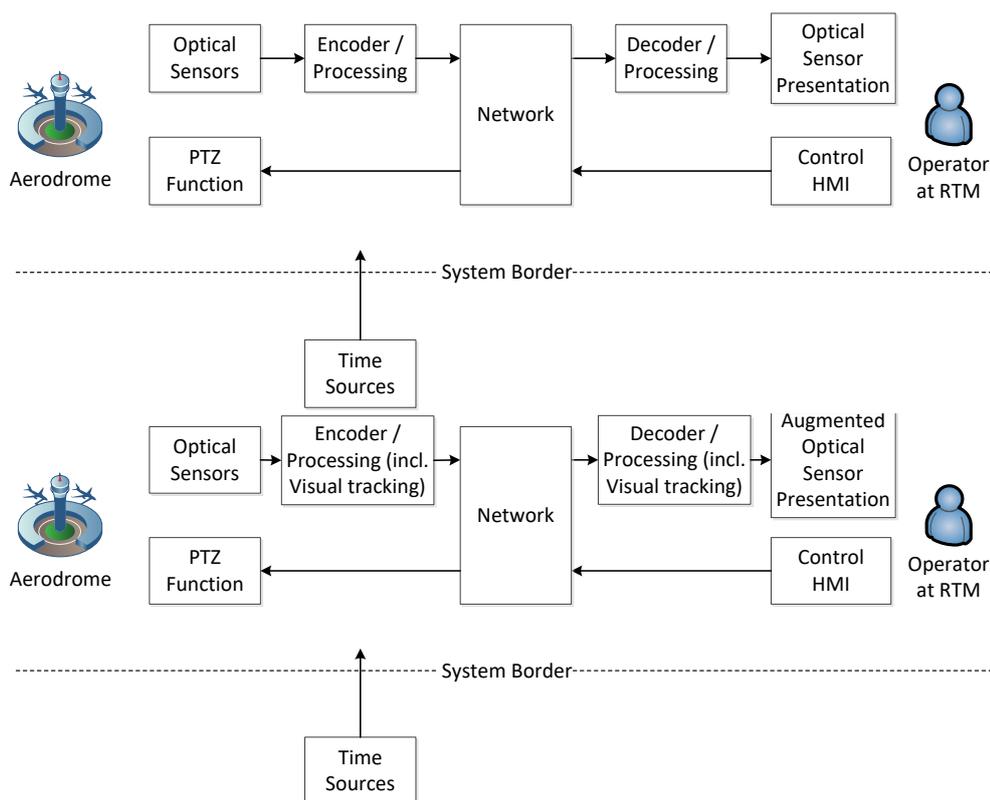
The evolution of the ATM system and the development of new technologies in all aviation related domains will require airports to provide innovative systems. Domains of concern could be the provision of ground stations for UAS, autonomously operating vehicles on the aerodrome surface or the provision of airport infrastructure for innovative flight handling, e.g. electric supply or hydrogen supply to airplanes using alternative power.

**4.4.4 Remote and Virtual Tower (RVT)**

**4.4.4.1 Current activities of this Sub-Domain**

EUROCAE WG-100 Remote and Virtual Towers (RVT) is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

The current WG-100 MASPS pertains to remote tower systems, which in their basic implementation level focus on optical sensors only. The standard describes the end-to-end performance of the optical sensor presentation, which is a type of visual presentation that displays video images from cameras to the operator, which could be infrared as well as visible spectrum devices. Revision A of the MASPS will be extended with the inclusion of Target Tracking technologies



**REMOTE TOWER OPTICAL SYSTEM CONCEPTUAL BUILDING BLOCKS (INCL. VISUAL TRACKING)**

#### **4.4.4.2 Anticipated evolutions affecting this Sub-Domain**

Within the next 18 months, WG-100 will update the MASPS (revision A) to include remote tower optical target tracking technologies. It will consider existing surveillance standards as for instance an assessment of the applicability of MASPS already produced for A-SMGCS (ED-87C). Furthermore, the group will monitor ongoing developments regarding remote provision of ATS to Multiple Aerodromes. It may become apparent that this application of the concept has additional standardisation needs regarding, for instance, new HMI input technology, planning assistance, adapted radio communication or visual presentation concepts, data fusion or visual and other sensors.

#### **4.4.4.3 Vision of future EUROCAE activities in this Sub-Domain**

More visionary concepts that could affect the work of WG-100 are technology solutions like ADS-B, which could revolutionise current optical remote tower solution, when becoming a mandatory, reliable, integer, cooperative surveillance sensor for ground operations.

Another technology vision that could reconfigure remote tower technology standards could be the transmission from sensor to the visual presentation with a broader bandwidth performance and or via radio, terrestrially or even via satellite.

The scope of work in the subdomain could possibly go into the supporting area of guidance on HMI standardisation and best practices.

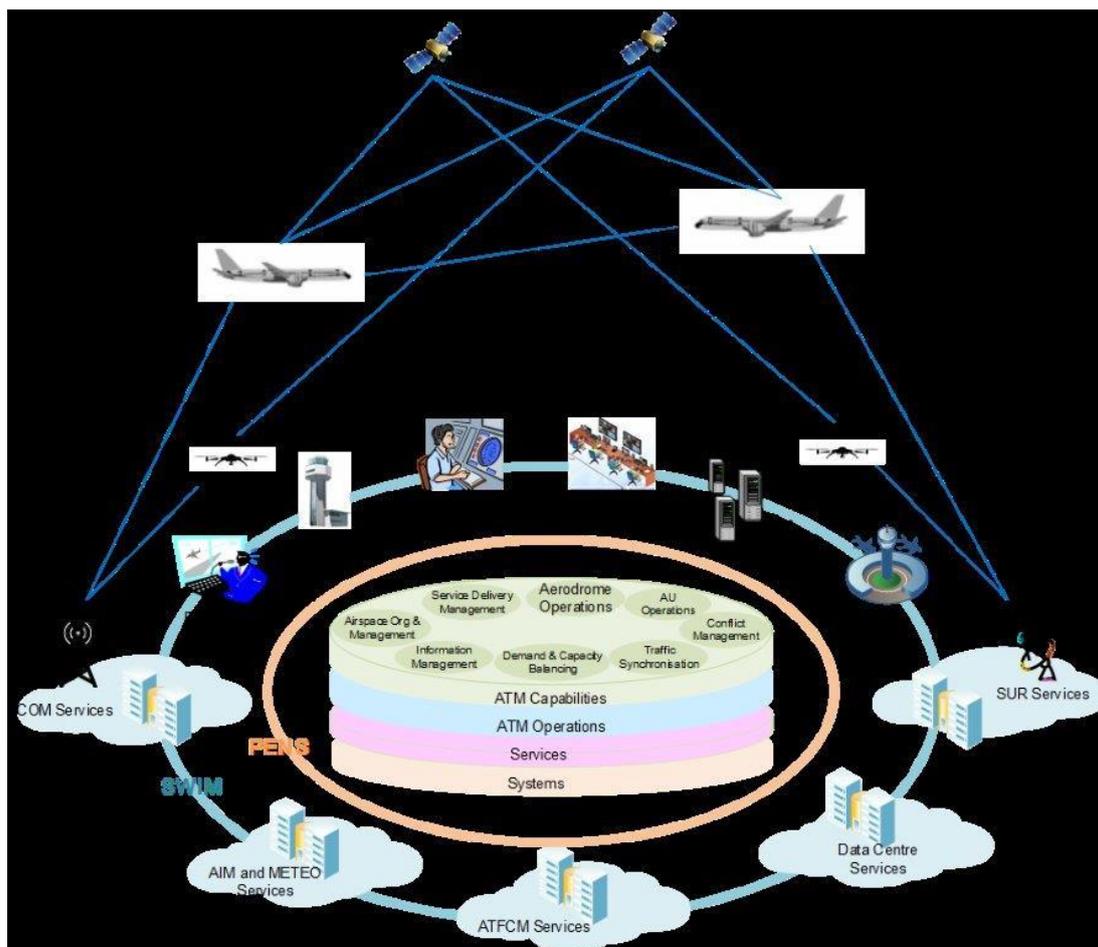
Adaptation of presentation and HMI input technologies from other industries with full integration of all ATC tools presented on HUD or using VR technology with safe and intuitive HMI input technology. With proven cost-effective optical and radar target tracking technologies and remote provision of ATS to Multiple Aerodromes, the application of artificial intelligence and increased automation are visionary concepts for RVT.

This activity supports strategic development in High Performing Airports as expressed in section 3.17 on Airport environment evolution.

### **4.5 Services**

#### **4.5.1 Purpose & Scope of activities of this Domain**

This Domain encompasses all standardisation activities which are related to services. The scope of the activities currently includes the current work on SWIM Services as well as AIS/MET and datalink services (WGs-104, 44, 76, 78).



**DIAGRAMME ILLUSTRATING SERVICES<sup>7</sup>**

#### 4.5.2 System Wide Information Management) (SWIM) Services

Through the SESAR programme, Europe has made great progress on defining, developing and validating SWIM.

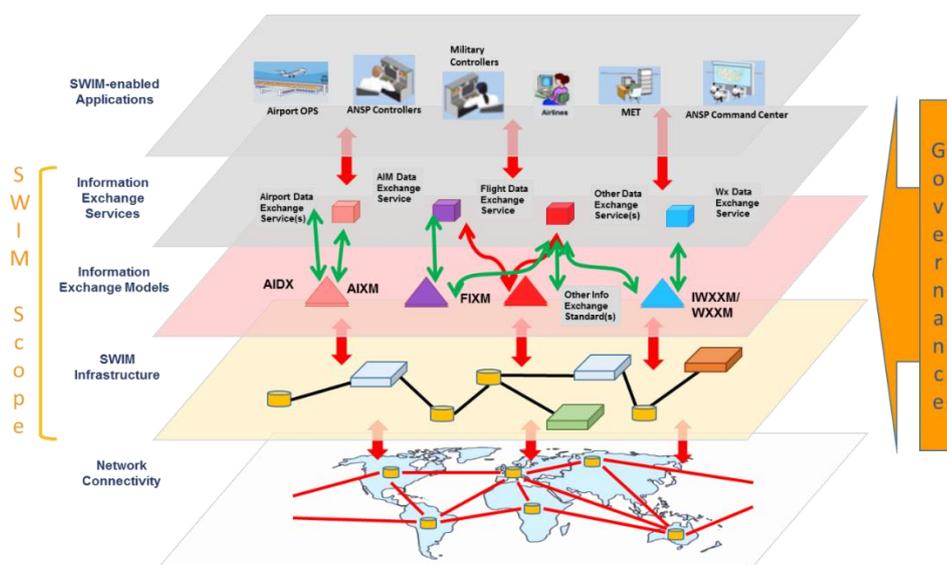
A key document hereby has been the SESAR SWIM Concept of Operations which includes the SWIM definition, SWIM principles, the rationale for change and the associated benefits. It also captures practical examples of SWIM pioneers (e.g. Network Manager B2B) that explain their gradual evolution towards SWIM. Some initial ideas on governance are described, covering the full lifecycle from participating in SWIM to providing or consuming services on SWIM. All this is documented with use-cases to better illustrate how SWIM works in practice.

The agreed SWIM definition: “SWIM consists of standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable services”.

This definition brings several elements:

- It structures SWIM (see also attached picture) into several layers: Services, Information and technical Infrastructure.
- It focuses on the need to have standards for all layers.
- It identifies the need for governance.

<sup>7</sup> Diagramme issued from ATM MP Chapter 4 (figure 7 in the draft 2.0 of July 2018)



Further the SESAR SWIM Concept of Operations has also become the main source of the (being finalised for publication) ICAO manual on system wide information management (SWIM) Concept (Doc 10039) as developed through the ICAO ATM Requirements and Performance Panel (ATMRPP).

This ICAO document is the basis for the ICAO Information Management Panel (IMP), which has been set-up. An essential element of the ICAO SWIM manual is the so-called Global Interoperability Framework that identifies the need for all SWIM standardisation actors to act together in a globally harmonised way.

SWIM services are defined to operate on a defined technical infrastructure as foundation, which is SWIM technical services are organised in so-called SWIM profiles. A SWIM profile is a particular set of standards tailored at meeting specific functional and non-functional requirements.

The latest SESAR definition is: “a SWIM profile is a coherent, appropriately-sized grouping of middleware functions/services for a given set of technical constraints/requirements that permit a set of stakeholders to realise Information sharing. It will also define the mandated open standards and technologies required to realise this coherent grouping of middleware functions/services.” Two profiles have been defined so far: one around web services (yellow profile, fully based on open and mature industry standards), one around the data distribution service -DDS (blue profile). A third profile (still draft) for air-ground SWIM exchanges (purple profile) is also being developed.

#### 4.5.2.1

#### Current activities of this Sub-Domain

WG-104 SWIM services has created a concept how to standardise SWIM compliant services by using the Extended horizon AMAN service as a first implementation.

Having reached a first specification of a SWIM compliant standard of a service, a guideline supporting the standardisation of future SWIM services needed and a lesson learned report about standardising a service are available.

For details on the deliverables please consult the table in annex.

Within the context of the Work Programme WG-104 has developed a list of services for future standardisation from 2018 onwards. This included the following steps:

- Development of criteria how to prioritise the available services,
- Definition of different areas where services are applicable,
- Prioritisation of services within these areas,
- Provision of the prioritised list of services to TAC.

As a result, the following services groupings have been identified as potential candidates for standardisation:

- MET Services
- A-CDM Services
- AIM Services
- AMAN Services

In addition to the standardisation of a SWIM service, the group was also tasked to provide a report capturing the lessons learned from their work and provide recommendation regarding the methodology for further SWIM service standardisation. This report also contains a proposal for potential future activities regarding the standardisation of ATM SWIM services, as mentioned above.

Initially set up as three individual reports, these documents have been grouped under ER-018 and published as one comprehensive EUROCAE report.

For future standardisation activities in the SWIM area, any stakeholder may propose the initiation of a new task. For this, any interested party is invited to contact the EUROCAE Secretariat

The governance aspect of SWIM is currently developed by the SWIM stakeholders in a project under the umbrella of the SESAR Deployment Manager. Close cooperation with this project is envisaged to support the standardisation and interoperability needs.

To this end, EUROCAE has already engaged with the SWIM Governance Project reiterating the availability of EUROCAE to undertake an active role with regard to SWIM standardisation.

Furthermore, EUROCONTROL has completed the task from EASCG to develop functional information exchange service implementation specifications – a SWIM Standards Package consisting of three EUROCONTROL Specifications: for SWIM Service Description, for SWIM Information Definition, and for SWIM Technical Infrastructure Yellow Profile have been published.

#### **4.5.2.2 Anticipated evolutions affecting this Domain**

As it is based on IT technologies, SWIM will naturally mature and evolve according to the possibilities of such technologies.

The main driver for the SWIM will be the deployment programme lead by the SESAR Deployment Manager (SDM) who coordinates the roll-out of the set of SWIM services mandated by the PCP Implementing Regulation.

Airports will be connected to the ATM Network as defined by SESAR through the NOP/AOP integration using the “Yellow Profile”. SWIM A-CDM Service should define the interoperability between the ATM and Airport domain. Impact to the definition of CDM may require WG-69 to be re-activated and develop versions of MASPS and/or Guidance documents reflecting the latest developments in this domain. ACI World has defined standards for B2B Communication developed by the Airport Community Recommended Information Services (ACRIS) Working Group of the ACI World Airport IT Standing Committee (WAITSC). The ACRIS WG has developed an A-CDM Webservice based on the Aviation Information Data Exchange (AIDX) that should serve as basis for the A-CDM standards. Functional evolution of A-CDM as well as requirements derived from the PCP or other domains with close connection to A-CDM (such as A-SMGCS with regard to dynamic taxi times) also require to be reflected in updates on the MASPS and Guidance Documents for A-CDM.

In addition, SESAR 2020 programme activities around SWIM are on-going.

#### **4.5.2.3 Vision of future EUROCAE activities in this Domain**

Not all SWIM services require standardisation activities: EUROCAE activities regarding SWIM are most relevant for services that will be provided by more than one provider and where service provision is regulated.

SWIM services in need for standardisation will in the future be identified by the prospective SWIM Governance function, where a close coordination with EUROCAE is already foreseen.

SWIM services in the airport domain and for information exchange in Air Traffic Control Centres (“Virtual Centre services”) may be future candidates for standardisation.

### **4.5.3 Datalink Applications**

#### **4.5.3.1 Current activities of this Sub-Domain**

EUROCAE working groups WG-78 Air Traffic Data Communications Services and WG-76 AIS/MET Datalink Applications are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

#### **4.5.3.2 Anticipated evolutions affecting this Sub-Domain**

Datalink services and applications provide key enabler to support major ATM enhancements, foreseen in both SESAR and NextGen programmes.

Baseline 2 standards have been defined:

- to continue supporting existing Data Link operations
- DCL and en-route CPDLC in oceanic and domestic airspaces
- surveillance via ADS-C for oceanic airspace
- to support the introduction of new ATM functions
- D-TAXI
- 4D Trajectory Based Operations
- Advanced Interval Management (Adv-IM)
- Dynamic-RNP (D-RNP)

The Revision A of Baseline 2 standards package provides a solid basis for SESAR programme to initiate very large-scale demonstrations, a preparatory step towards initial deployment, of 4D trajectory air-ground information sharing, in order to comply with the Pilot Common Project AF6 requirements.

The package will also be used a baseline for further validation of the latest ATM functions, i.e. Adv-IM and D-RNP, expected to be mostly conducted under the FAA NextGen umbrella.

#### **4.5.3.3 Vision of future EUROCAE activities in this Sub-Domain**

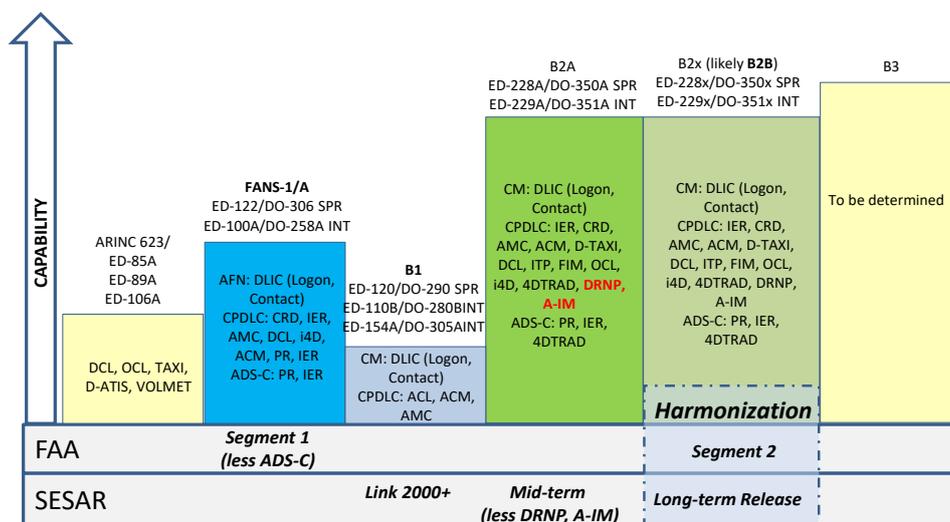
After finalisation of the Revision A of Baseline 2 standards, the WG-78 is now in a dormant phase, allowing first industrialisations of Data Link systems, on aircraft and on ground, to take place.

These implementations and the associated entry into service (either for validation or for deployment) may provide feedback to EUROCAE WG-78 and RTCA SC-214 committees.

The date when the committee would reconvene, should the need to provide a revision B of the standards be confirmed, mostly depends on the progress of Baseline 2 validation and implementations in coming years.

The work is driven by the ICAO plans for global harmonisation and the progressive transition towards Trajectory Based Operations.

As depicted in the Figure below, the revision B was identified by both NextGen and SESAR programmes as being the target for capability convergence (particularly through the inclusion of Advanced-IM and D-RNP).

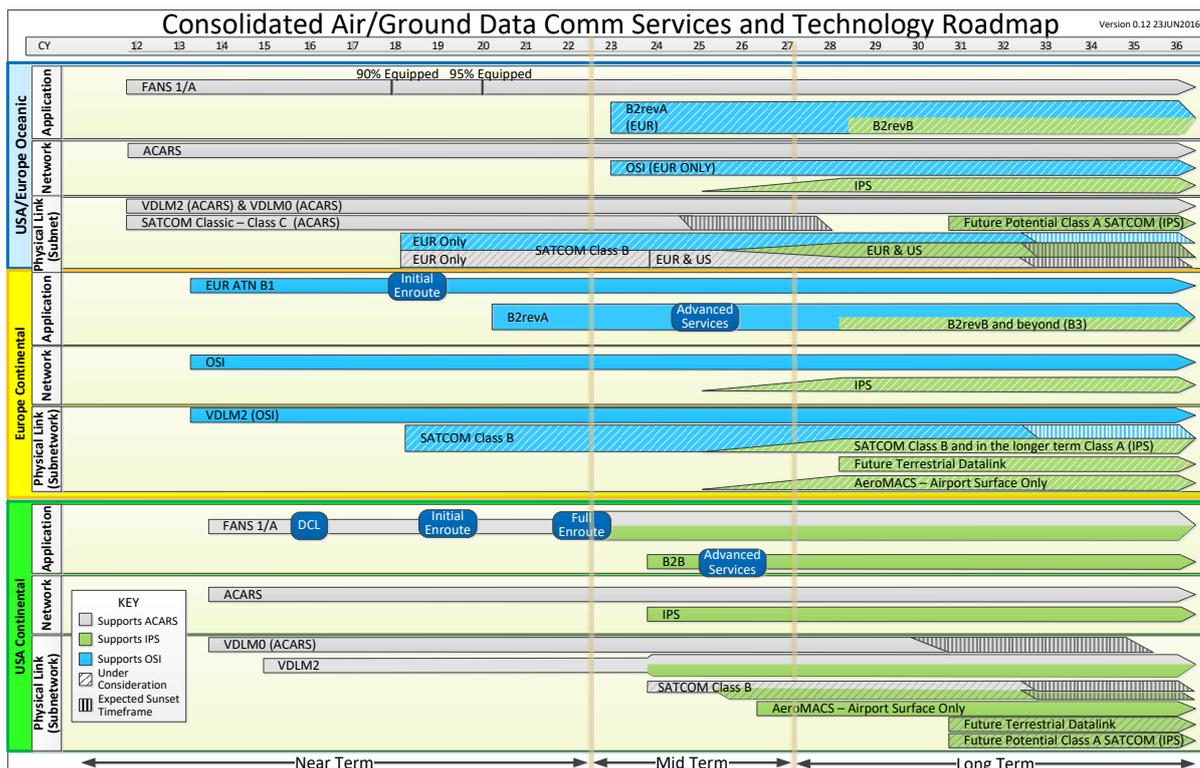


**APPLICATION DEFINITIONS FOR VARIOUS ATIS DATA COMMUNICATIONS VERSIONS**

These capabilities will support the communication roadmaps in Europe and in the United States. A joint SESAR NextGen communication strategy was developed under the joint EU-US coordination plan and reflects this vision. The main reason for this strategy was to identify potential interoperability and harmonisation challenges and opportunities and to address these further in the context of the MoC U.S./FAA/NextGen – EU/SESAR to be able to achieve interoperability and harmonisation to the level needed for airspace users flying in/out or overflying respective airspaces without having to be equipped with separate and specific capabilities for respective ATM and airspace environments

Figure YY below shows the combinations of Applications, Networks, and Physical links supported by both the EU and the U.S. A common combination of the three is required for respective continental and oceanic ATM and airspace environments allowing for interoperability.

It is important to mention as well that, the agreed joint target of going in the longer term towards the use of IPS for the network component, triggers interoperability and harmonisation opportunities to be clarified and elaborated upon across all three elements: applications, networks and physical links. Therefore, it is essential to support the IPS standards development in parallel.



**CONSOLIDATED US AND EUROPE AIR/GROUND DATA COMMUNICATIONS SERVICES AND TECHNOLOGY ROADMAP**

RTCA SC-223 and EUROCAE committees will work together as a joint committee to develop a globally harmonised aviation standard for IPS.

The EUROCAE Working Group 108 was established and held their kick-off meeting in February 2018.

WG-108 and SC-223 have aligned their deliverables to produce a MASPS. Deliverable schedule for SC-223 and WG-108 have been aligned for both the profiles document and the MASPS to enable joint publication of technically equivalent documents.

This activity also supports strategic development in SESAR Deployment and cooperation with RTCA.

**4.5.4 Aeronautical Information Services**

**4.5.4.1 Current activities of this Sub-Domain**

At present, the active EUROCAE groups in this domain are WG-44 Aeronautical Databases. In addition, WG-76 works on the specification of AIS/MET Datalink Services.

The work aims at providing a framework to enable the development of aviation-specific applications using geographic and appropriate aeronautical information/data as it relates to terrain, obstacles, and aerodrome mapping.

WG-44 completed the work on ED-76A, ED-98C, ED-99D and ED-119C. These documents were published in 2015.

**4.5.4.2 Anticipated evolutions affecting this Sub-Domain**

The purpose of the AIS is to ensure the flow of aeronautical information necessary for safety, regularity, economy and efficiency of international air navigation. The importance of aeronautical data has increased significantly with the implementation of area navigation (RNAV), performance-based navigation (PBN), airborne computer-based navigation systems and datalink systems. Corrupt or erroneous aeronautical data can potentially affect the safety of air navigation.

Aeronautical information based on paper documentation and telex-based text messages can no longer satisfy the requirements of the integrated and interoperable ATM system. Therefore, the AIS is evolving from the paper product-centric service to the data-centric aeronautical information management (AIM) with a different method of information provision and management. For that purpose, ICAO has developed a roadmap to reflect the importance of the evolution and to address the required changes.

This evolution is being referred to as the transition from AIS to AIM. The major changes in the transition to AIM will be the increased emphasis on information management requirements such as digital data exchange and distribution, which is expected to place the future AIM in a position to better serve airspace users and ATM. Another evolution that is affecting this domain is the development of the SWIM context that does have an impact on AIM in terms of a general need to comply with the various information models as far as they are part of the global ICAO framework for all SWIM related EUROCAE activities including the recently updated Annex 15 and the new PANS-AIM).

#### 4.5.4.3

#### **Vision of future EUROCAE activities in this Sub-Domain**

EUROCAE activities in the domain of AIS need to be in line with and support the evolution from AIS to AIM.

Recently, the ToR of WG-44 were revised to include the activity to update ED-77/DO-201A. The objective is to bring ED-77 up-to-date with developments in the navigation domain over the past years in general and in particular with the PBN concept.

The update will consider the requirements of new ATM applications as well as changes suggested by industry and derived from authorities' experience feedback. The focus of the work will be on data quality requirements for navigation data, with a view to cover new operational needs such as PBN.

WG-44 is expected to continue to work on the update to the family of standards related to terrain, obstacle and aerodrome data supporting evolving user requirements and new envisaged applications. This could lead to new updates to ED-98/99/119 in the medium term.

The increased emphasis on digital data exchange and distribution will result in an increased capability to present data and information in graphical form. In this context, digital NOTAM is planned to be implemented in Europe as of 2018, thus improving the Pre-flight Information Briefing (PIB) by providing graphical presentation of dynamic data. This is not an isolated European development; the United States Federal Aviation Administration having already deployed an operational Digital NOTAM system at more than 300 US airports. To achieve a harmonised digital NOTAM implementation, an agreed standardised graphical symbol library (primarily targeted to ground operations, such as Digital NOTAM encoding and pre-flight briefing in the ARO environment) is needed. An activity should be foreseen in the Medium Term to address this standardisation need in order to avoid diverging implementations, which could lead to different interpretations and eventually safety issues. SAE International has published the standard "Human Factors Minimum Requirements and Recommendations for the Flight Deck Display of Data Linked Notices to Airmen (NOTAMs)" (Document ARP6467). This SAE standard is mostly a human factors standard. The EUROCAE work, which can be performed in partnership with SAE International, could build upon the SAE document, in order to develop a complete standard for representation of digital NOTAM in PIB.

This activity supports the transition from AIS to AIM.

<b>Activities</b>	<b>Deliverables</b>	<b>Time frame</b>	<b>Interested parties</b>	<b>Cooperation Body</b>
User Requirements for Terrain and Obstacle Data	Revised ED-98C	TBD (Medium/ Long Term)	Industry	RTCA SC-217
User Requirements for Aerodrome	Revised ED-99D	TBD (Medium/	Industry	RTCA SC-217

Mapping Databases		Long Term)		
Interchange standards for Terrain, Obstacle, Aerodrome Mapping Data	Revised ED-119C	TBD (Medium/Long Term)	Industry	RTCA SC-217
Standard for graphical symbol library for representation of dynamic AIS data and information	ED-xx	Medium Term	ANSPs Pre-flight Briefing Offices Industry	SAE RTCA

#### 4.5.5 MET Services

##### 4.5.5.1 Current activities of this Sub-Domain

Apart from the ongoing work of WG-76 AIS/MET Datalink Applications (addressed in the CND 6 communications sub-domain), there are no other current activities in this sub-domain.

The RTCA activity in SC-206 regarding weather information upload using TIS-B should be noted. WG-76 and SC-206 are expected to work jointly again in the near future.

##### 4.5.5.2 Anticipated evolutions affecting those Sub-Domains

The evolution and development of any MET information services is expected to take place within the scope of SWIM activities.

Another driver in this domain is the fact that weather is identified as one significant contributor to several recent accidents. Today we do not have a European service available providing updated weather information into transport category aircraft which are then displayed in a graphical format.

In the US there is XM weather service available. This information is distributed through a satellite radio service with mainly North American coverage. An RTCA MASPS is describing the high-level function without specifying the link element.

The potential establishment of a similar European service may drive the need to create standards in this domain to address e.g. the link specification, a more harmonised cockpit display, standards for the data, which are not falling directly under the AIS oversight provisions but are used as addendum to those ones, etc.

There are ongoing discussions between RTCA SC-206 working on a standard for weather information upload using TIS-B and WG-76 to join again. Some of the activities may fall more into this domain instead of the WG-76 domain developing data link applications.

##### 4.5.5.3 Vision of future EUROCAE activities in those Sub-Domains

The work of WG-104 on SWIM Services has delivered a report on a potential work programme for future SWIM service standards. This report should include an analysis of the possible future standardisation needs in the MET Information Services domain.

With respect to any standardisation activities on MET sensors, the rationale for possible EUROCAE work needs to be further elaborated.

EASA is working to promote that weather information is brought in current and graphical format into the cockpit for strategic decision making. This will be reflected in the currently updated safety promotion plan. Resulting standard work has more a long-term character today.

## 4.6 Security

### 4.6.1 Purpose & Scope of activities of this Domain

The Aeronautical Systems Security (ASS) Working Group (WG) shall address the cybersecurity for Aeronautical Information Systems (AIS) from an air-ground and end-to-end perspective from information production, processing, management, communication to operational usage and to maintenance. AIS cybersecurity therefore encompasses the aircraft, supporting infrastructure including communication and the supply chain.

WG-72 is developing Aeronautical Information System Security guidelines addressing the cybersecurity objectives and specifying the cybersecurity requirement including the operational concept rather than technological solutions in order to ensure their stability over time.

WG-72 is adopting a holistic approach, addressing cybersecurity and safety-related topics throughout the entire lifecycle of products/services developed, manufactured, operated and maintained by many different civil aviation stakeholders in both the air and ground segments.

Within the scope described above WG-72 are therefore addressed both the airborne systems and ground systems in their end-to-end interdependence from the operational and cybersecurity standpoints recognising however, that cybersecurity requirements may apply differently for airborne and ground systems.

WG-72 shall serve as a resource and coordinator for Aeronautical and ATM information security-related matters with all EUROCAE Working Groups. As part of its performance-based rulemaking, and in light of the emerging competency as per the new Basic regulation, EASA will increasingly rely on industry standards, including the ones on Cybersecurity in Aviation. Due to its long-term experience, WG-72 is playing a pivotal role in this realm of industry standards.

### 4.6.2 Current activities of this Domain

The purpose is to develop and maintain acceptable processes and methods of compliance addressing security issues in support of existing safety processes and analytical methods (e.g. ED-79, ED-135), including associated methods/processes for ground-based systems.

- Develop and maintain guidelines and objectives for evaluating security architectures and security procedures, demonstrating their compliance with security and safety objectives.
- Determine and maintain design and operational compliance methods appropriate and adequate for the application of security solutions to safety-related functions.
- Address the necessity and objectives for the management of security “events” and guidelines for “response” to detected or suspected attacks.
- Provide guidance for post-response recovery, including identification of affected systems, restoration of system configurations, notification requirements, and other related activities.

EUROCAE working group WG-72 Aeronautical Information System Security is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### 4.6.3 Anticipated evolutions affecting this Domain

Following items need further attention:

- CNS/ATM communication and application interfaces (data only, not analogue voice) constitute tactical interfaces, which require very high availability and also need to meet high integrity and authenticity requirements. The only technical fallback is analogue voice, which presents strong service contingency constraints. (driver: SESAR1/SESAR2020, EUROCONTROL, EASA → ED-205).

- Maintaining high uniform levels of security for safety require constant surveillance of the security environment. Only limited recommendations have been put in place. Systems (avionics and ground) need to be prepared for the collection of security indicator information. ARINC Standard A852 is available as: *ARINC Report 852 Guidance for Security Event Logging in an IP Environment* and should be used as input to future WG-72 work.

The need for joint deliverables with RTCA and alignment of deliverables will impact the activities. The RTCA ToR update following the outcome of the published recommendations from the ARC report is still outstanding awaiting the FAA strategy how to implement the topic.

Future competencies anticipated for EASA may lead to a need for further industry standards in this domain. Given that the civil aviation regulatory framework(s) are about to evolve in many places of the world (e.g. US) one shall ensure that coordinated work is developed to avoid duplication or inconsistencies between carried out standardisation work that would be detrimental to the industry and the overall effectiveness of the cybersecurity defence strategy; this “situational awareness” activity shall encompass all those organisations that will likely play a role in the development of the European regulatory framework. Given also that cybersecurity in civil aviation has a lot of commonalities with cybersecurity of other domains precautions shall be taken to develop only the standards that are specific to civil aviation and rely upon the useful already existing ones.

#### 4.6.4

#### Vision of future EUROCAE activities in this Domain

The need for the WG-72 to work on the ConOps for Security Logging (potentially only the top-level objectives) could arise.

This action should be coordinated with the RTCA-216 roadmap.

Activities	Deliverables	Time frame	Interested parties	Cooperation Body
Vulnerability Management (WG-72)	Specification	Medium term	CAAs, Operators, Manufact., ANSPs, Airports	Arinc (TBC)
Incidence Response and recovery Management (WG-72)	Guidance	Medium term	CAAs, Operators, Manufact., ANSPs, Airports	Arinc (TBC)
Supply Chain Security (WG-72)	Guidance	Medium term	Manufact. CAAs, Operators, ANSPs	TBD
Forensic Analyses and Accident Investigation (WG-72)	specification	Medium Term	FAIs, CAAs, Operators, Manufact.	TBD
Maintenance Security (WG-72)	Guidance	Medium term	CAAs, Operators, Manufact.	TBD
Development & Production Security (WG-72)	Guidance	Medium Term	CAAs, Manufact.	TBD
Cybersecurity Testing	Guidance	Medium Term	Manufact. CAAs, Operators, ANSPs, Airports	
Risk assessment methodology	Specification	Mid Term		
Cyber resilience requirements (overarching & per domain)				

This activity supports strategic development in ICAO, EASA, RTCA and SESAR Deployment Domain and is driven by developments in Aeronautical Industry (Aircraft and avionics manufacturers) and ANSPs.

Activities will also be coordinated in the framework of the ECSCG, expected to be established in Q4/2018.

## **4.7 UAS & General Aviation**

### **4.7.1 Purpose & Scope of activities of this Domain**

It has been realised that the specific needs of General Aviation have been left aside when developing or updating the aviation system. Now it has been recognised that a strong GA is as well of value and several activities are on their way to better adopt some systems and regulations to the needs of the GA community. This may lead to the development of specific derivate of existing standards or the inclusion of specific classes. The new approach for more high level, non-prescriptive regulation may drive as well the creation of industry best practice standards.

A similar situation exists for the integration of Unmanned Aircraft Systems (UAS). The integration of those aircraft into the existing ATM system needs industry standards to achieve worldwide harmonisation.

### **4.7.2 UAS**

#### **4.7.2.1 Current activities of this Sub-Domain**

Unmanned Aircraft Systems (UAS) is a wide domain ranging from a small 300 g remotely controlled drone up to a big transport category aircraft, which may even carry passengers. In the current EU regulation proposal, a classification into the open, specific and certified category is planned to allow a proportional approach. This classification is reflected in the activities.

Similarly, the airspace in which UAS are planned to be operated ranges from dedicated airspace blocks, low level operation, to full integration into the ATM system. At EUROCAE, the UAS related activities are successfully integrated into one working group having six Focus Teams to deal with the various stakeholder demands. Two EUROCAE Working Groups (WGs) were active in this Sub-Domain. In 2016 one new WG under a revised ToR was started in order to develop the necessary standards to enable safe integration of all classes of UAS into all classes of airspace. That ToR contain the following activities/deliverables to be developed in parallel work in six dedicated Focus Areas. The focus areas are:

- Command, Control, Communication, Spectrum and Security (C3S);
- Detect and Avoid (DAA);
- Enhanced RPAS Automation (ERA);
- U-space (currently referred in the ToR as UAS Traffic Management (UTM));
- Specific Operations Risk Assessment (SORA);
- Design & Airworthiness Standards (D&AW).

This structure allows that the Focus Teams (FT) are working in parallel, but with a coordinated view and exhaustive harmonisation with external stakeholders (EASA, JARUS, EDA, SESAR JU, EUROCONTROL) and other standardisation organisations like RTCA SC-228, ASTM F38, ISO TC20 SC16 (their focussed UAS subcommittees).

#### **Focus Area 1: Detect and Avoid (DAA)**

EUROCAE WG-105 Sub-Group 11 DAA against conflicting traffic for RPAS operating under IFR in Class A-C airspaces, WG-105 DAA against conflicting traffic for RPAS operating under IFR and VFR in all airspace classes and WG-105 Sub-Group 13 DAA for UAS operating in VLL are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### **Focus Area 2: Command, Control and Communication, Spectrum and Security (C3&S)**

EUROCAE WG-105 Sub-Group 21 RPAS C2 Datalink, WG-105 Sub-Group 22 Spectrum and WG-105 Sub-Group 23 Security are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### **Focus Area 3: UAS Traffic Management (UTM)**

EUROCAE WG-105 Sub-Group 31 General, WG-105 Sub-Group 32 Identification and WG-105 Sub-Group 33 Geo-Fencing are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### **Focus Area 4: Design & Airworthiness (D&AW)**

EUROCAE WG-105 Sub-Group 41 RPAS System Safety Assessment Criteria and WG-105 Sub-Group 42 Remote Pilot Stations are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### **Focus Area 5: Enhanced RPAS Automation (ERA)**

EUROCAE WG-105 Sub-Group 51 Automatic Take-off and Landing, WG-105 Sub-Group 52 Automatic Taxiing and WG-105 Sub-Group 53 Automation & Emergency Recovery are already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

### **Focus Area 6: Specific Operational Risk Assessment (SORA)**

EUROCAE WG-105 Sub-Group 61 SORA is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

In addition, as the small UAS industry is developing rapidly, there are currently competing organisations that are defining standards for UAS automation of “small” UAS. These competing standards are considered to be more attractive than ED-12/DO-178 by the UAS manufacturers, as our standards are mistakenly thought to be only for airline equipment and too onerous and difficult to use. RTCA and EUROCAE have formed an ad-hoc group with members of the Forum on Aeronautical Software to address this question. This group is focused on understanding the concerns and claims raised against the applicability of the ED-12/DO-178 and related documents to small UAS. The outcome of this activity will provide recommendations for future EUROCAE/RTCA activities.

#### **4.7.2.2**

### **Anticipated evolutions affecting those Sub-Domains**

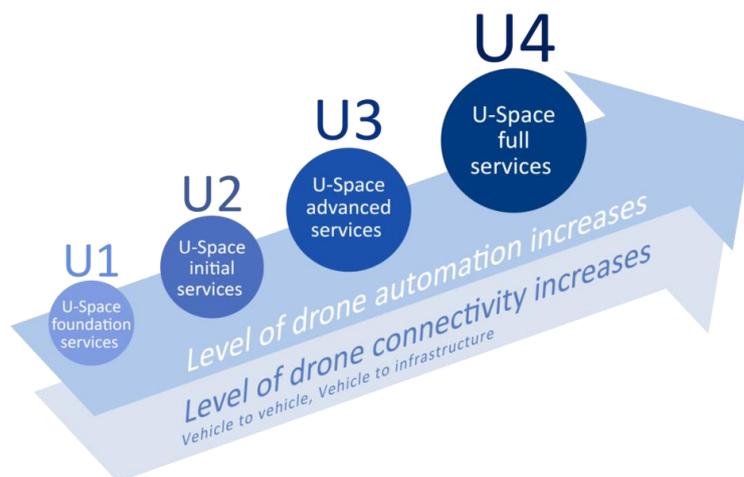
The UAS domain has the potential to be a disruptive market segment with high growth rates and high number of aircraft especially in the domain of smaller aircraft flying at lower altitudes. This segment of the domain may not follow the approach established for transport category aircraft. The stakeholder community is different as well as main small UAS manufacturers are located in Asia.

U-space is the European vision for the safe, efficient and secure handling of drone traffic, and is a key enabler for the growing drone market to generate economic and societal benefits.

U-space is a set of services and procedures, for which the detailed definition and applicable environments are the subject of ongoing research and development.

Ultimately, U-space will enable complex drone operations with a high degree of automation to take place in all types of operational environments, including urban areas.

The progressive deployment of U-space is linked to the increasing availability of blocks of services and enabling technologies. Over time, U-space services will evolve as the level of automation of the drone increases, and advanced forms of interaction with the environment are enabled (including manned and unmanned aircraft) mainly through digital information and data exchange.



By 2019, U-space is expected to be established with U1 foundation services (identification, registration and geo-fencing) facilitating a great number of current drone operations while enabling new ones. In addition, SESAR plans to deliver some pre-operational SESAR demonstrations of the initial U-space services (U2), as well as first results from SESAR research and development projects, which will pave the way for the roll-out of U-space (U2-U4). To support this, standardisation is required in a number of areas including but are not limited to:

- Flight planning management
- Deconfliction/Separation
- Emergency management/ contingencies
- Surveillance/ Monitoring/Situational awareness
- Interface with ATC.

Another stream in this domain is coming from military applications aiming to integrate quite big aircraft into the General Air Traffic (GAT). EDA is a major player and envisions achieving international acceptance through standardisation of topics through EUROCAE.

On the regulator side, we see three main streams. The European approach lead by the European Commission aiming to have a common set of regulations. Main focus is here today on the smaller size as market demands clarity and member states started to develop individual regulations. Support is provided by EASA and SJU developing elements needed for such regulation. Further coordination of requirements is performed at JARUS while development of Acceptable Means of Compliance is done at the level of standardisation bodies and EUROCAE has an exposed position in leading this activity.

In the US, the development focus is similar to that in Europe, but the demand is different as beside the big cities there is still a lot of area having low-density population. This has led to differences e.g. in the domain of detect and avoid principles which make joint activities difficult as the European demand is not considered in the first place. The FAA is working closely with RTCA for standards developments.

It seems that the differences in the approach lead to a kind of third way resulting from the coordination at ICAO level.

Other standardisation organisations like ASTM, SAE, ISO are approaching this area as well and it has to be evaluated on a case by case basis if cooperation is useful for EUROCAE. This may be the case in case of ASTM, developing standards for manned aircraft of similar size and using a new performance-oriented approach. A close monitoring of those activities is essential to avoid duplication of activities. Contact with ASTM has been established to implement such coordination. Despite the cooperation effort, no joint activity is started but this option needs to be constantly explored.

EASA is working on the development of rules in this domain based on tasking from the European commission while awaiting to completely cover this domain through the update of commission regulation (EU) No 216/2008. After an advanced NPA and the

development of a prototype rule now a proposed regulation is consulted. The initial focus is on the smaller UAS having the biggest distribution. In parallel certification requirements are developed for running certification applications on a case by case basis.

One of the major players in the development of regulatory material is JARUS, the Joint Authority for Rulemaking on Unmanned Systems. Close coordination of the EUROCAE activities is required and has already been implemented. JARUS has established the Stakeholder Consultation Board (SCB) to ensure that industry is informed about the JARUS activities. As SCB member EUROCAE gets access to the JARUS activities and coordination is established to avoid duplication of work.

In accordance with the European Commission plans, SJU is tasked to develop the so-called U-Space concept for integration into the ATM Master Plan. It is anticipated that this will drive further standardisation needs.

Activities will also be coordinated in the framework of the EUSCG.

#### **4.7.2.3 Vision of future EUROCAE activities in those Sub-Domains**

The vision for future activities will be defined based mainly on the developments related to the EASA rulemaking activities, the developments in JARUS and of the SESAR Exploratory Research programme SESAR 2020. Activities performed in the ICAO RPAS Panel may in future also have an impact on the EUROCAE Work Programme.

This activity is driven by developments in EASA, JARUS, EDA, SJU and ICAO.

In addition, following the outcome of the FAS ad-hoc group on the applicability of ED-12 to small UAS, this activity might be extended to other currently available EDs with the aim to provide guidelines tailored to the UAS stakeholder's needs.

### **4.7.3 General Aviation**

#### **4.7.3.1 Current activities of this Sub-Domain**

In the past, no activities related to General Aviation have been handled by EUROCAE. The development of standards recording the industry best practices in the domain of aircraft certification and supporting the revised performance-based certification standard CS-23 is mainly performed by ASTM.

Realising that there has long been a need for the interests of general aviation users to be represented in the EUROCAE standards process EUROCAE and the International Council of Aircraft Owner and Pilot Associations (IAOPA) formalised the inclusions of General Aviation in the development of standards with the signature of a new Memorandum of Understanding on March 26, 2018. IAOPA Europe represents over 45,000 members belonging to 35 autonomous, nongovernmental, national general aviation organisations in almost every nation in Europe. IAOPA Europe has represented general aviation in Europe for over 50 years and is the voice for general aviation pilots in Europe. Representatives and subject matter experts for IAOPA advocate for general aviation and the freedom to fly, with local, national, and regional organisations such as the European Aviation Safety Agency (EASA), the European Commission, the European Parliament, EUROCONTROL, SESAR Joint Undertaking and National CAA's. IAOPA Europe is the largest regional affiliation of IAOPA which is an observer organisation with the International Civil Aviation Organization (ICAO) represents general aviation globally.

The cooperation between the EUROCAE and IAOPA Europe will take various forms, including but not limited to exchange of general and technical information; sharing of expertise and best practices; participation in each other's working groups; coordinated communication activities. The MoU paved the way for the next steps, welcoming IAOPA as a member and IAOPA experts joining EUROCAE working group activities and the development of standards.

#### 4.7.3.2 Anticipated evolutions affecting those Sub-Domains

The GA may need specific adopted standards for their domain handled by existing working groups. The specific low power transponder standard or the development of a not mandated ADS-B out standards for visibility purposes as performed by WG-51 may be seen as example for such activities.

The GA community is considered alongside other stakeholder groups in the SESAR 2020 programme and consequently it is possible that the need for specific GA standardisation requirements may emerge.

It has to be noted that new technologies and functions are often introduced into the GA environment for the first time. This is often not directly leading to standardisation activities due to the novelty aspects but later on standard development may follow. Currently fully automated flight concepts and non-stable aircraft designs, demanding automated stabilisation functions are presented as concepts and may drive standards in future.

Urban Air Mobility (UAM) is an evolving concept that covers 'flying taxis', or even personal 'flying cars'. At present, the concept is immature, and it is being considered as part of the U-space domain, even though such machines are not technically unmanned. However, in time, the distinction between UAM vehicles and GA is likely to blur and it is certain that standardisation activity will become necessary.

#### 4.7.3.3 Vision of future EUROCAE activities in those Sub-Domains

The following areas have been identified as possible work areas that will impact the general aviation domain. These may result in contributions to existing or proposals for new standardisation activities by the GA community.

General items:

- GA Interoperability with CAT and UAS

Areas for potential standardisation activities:

- Traffic and Weather uplink
- Connection between TPX, ADS-B, ACAS (X), DAA, Flarm
  - Eventually new technologies
  - E-registration for UAS

Areas with potential interfaces

- EFB
  - EFB a potential alternative to certified equipment
- EVS/SVS/CSV
  - operational benefits for GA
- RMT TWR
  - Example GA airfields in US
  - Option - remote AFIS
- Heli TAWS
  - Updates for helicopters proposed
  - Possible updates for GA to review
- ADS-B and Mode-S
  - Light weight and light cert ADS-B
  - Mode-S update
- ELT
  - ED 62B now in open consultation, AOPA to review and comment
  - New activity on return link service (RLS)
- UAS
  - GA needs to have a voice in WG-105

## 4.8 Aircraft Energy Management

### 4.8.1 Purpose & Scope of activities of this Domain

This Domain encompasses all standardisation activities which are related to energy management of aviation needs.

Scope of activities currently includes Hydrogen Fuel cells and is expected to develop in the near future. For example, electric supply for aircraft is already a hot topic and is expected to gain in importance in the coming years requiring standardisation efforts.

### 4.8.2 Hydrogen Fuel Cells

#### 4.8.2.1 Current activities of this Sub-Domain

EUROCAE working group WG-80 Hydrogen Fuel Cell Systems is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

The Hydrogen Fuel Cell activity is part of the more electrical aircraft strategy. The joint activity is run in parallel to an FAA Aviation Rulemaking Committee (ARC) created in 2015. The ARC is looking into hydrogen fuel cell technology use cases and certification objectives. The recommendation report has been published end of 2017.

For the storage of electrical energy currently several activities for standardisation are running at RTCA or SAE. This includes lithium battery requirements, development of specifications for electrical actuators, traditionally powered by hydraulic systems, electrical aircraft engines, or solar cells etc. The EUROCAE role in this sector depends on the willingness of European industry and EUROCAE stakeholders to engage in this domain.

WG-80 has released the joint Minimum Aviation System Performance Specification (MASPS) / Aviation Standard (AS) document ED-245/AS-6858 in 2017, addressing technical guidelines for the safe development, testing, integration, validation and certification of Gaseous Hydrogen (GH<sub>2</sub>) based PEM Fuel Cell Systems (FCS).

The Working Group now intends to work on:

- a) The development of a joint EUROCAE Report / SAE AIR that describes general safety aspects of on-board hydrogen storage and fuel cells and the benefits of such hydrogen-based solutions for aerospace applications. This document will describe the existing applications and the experience gained with exploiting these technologies. The experience with these existing uses will help alleviate safety concerns and will underline the relevance of these solutions for usage in aviation.
- b) The processing of the recommendations coming out of the final ARC report: development of a formal joint EUROCAE / SAE document which captures these recommendations and provides relevant means of compliance (for one of the applications investigated in the ARC report).

The work will also consist in ensuring that these recommendations are appropriately captured in the documents which have been published (AIR-6464/ED-219 and AS-6858/ED-245) and in the Technical Guidelines which will be produced in the future (see items c and d below). This may mean that new issues of the existing documents be created.

- c) The development of a joint document MASPS ED-yyy / AS(ARP)-yyyy that defines the technical guidelines for the safe development, testing, integration, validation and certification of the following:
  1. Liquid Hydrogen (LH<sub>2</sub>) including LH<sub>2</sub> fuel storage and LH<sub>2</sub> fuel distribution
  2. Material based storage of Hydrogen (solid and chemical).
- d) The development of a joint document MASPS ED-yyy / AS(ARP)-yyyy that defines the technical guidelines for the safe development, testing, integration, validation and certification of onboard reforming of:
  1. The aircraft kerosene
  2. Propylene Glycol Water mixture (PGW)

3. Any other fuel.

#### **4.8.2.2 Anticipated evolutions affecting this Sub-Domain**

Nothing anticipated at the moment.

FAA Advisory Rulemaking Committee (ARC) Report on Hydrogen Fuel Cells completed.

#### **4.8.2.3 Vision of future new EUROCAE activities in this Sub-Domain**

Nothing anticipated at the moment.

### **4.9 Artificial Intelligence**

#### **4.9.1 Purpose & Scope of activities of this Domain**

Artificial Intelligence (AI) technologies combine the raw computing power of machines with the cognitive power to reason, learn and make decisions.

AI technologies are attempting to provide computers the ability to:

- Recognise and understand inputs like handwritten inputs, natural language, audio, pictures, video and more;
- Interact / respond;
- Reason and make decisions.

AI technologies are developing fast and appear to become accessible, providing attractive future capabilities, thanks to the processing power significant increase in the recent years, enabling machine learning and computing so that they can perform certain tasks as well as or better than a human.

#### **4.9.2 Current activities of this Sub-Domain**

No activities address yet Artificial Intelligence introduction in Aviation.

#### **4.9.3 Anticipated evolutions affecting this Sub-Domain**

Several AI applications can be envisaged with the aim to:

- Replace flight crew on very specific tasks
- Predict and alert the flight crew about a potential hazardous situation (sense & avoid)
- Support flight crew decision making in particular under significant workload
- Perform predictive maintenance
- Enable reduced crew operations
- Perform Flight Operations optimisations
- Supporting Air Traffic Controllers by automating certain ATC task, making predictions, based on recognition of patterns, and supporting decision-making

#### **4.9.4 Vision of future new EUROCAE activities in this Sub-Domain**

The future activities will highly depend on the type of applications of AI technologies. However, several aspects must be addressed independently of the applications and will probably require adapting existing standards and methods or to create new ones in particular for the development of computer processes and algorithms, their qualification and certification, including of the machine learning processes, the resulting updated processes and algorithms as well as the nature and amount of data to be used to perform the incremental training.

### **4.10 Miscellaneous**

#### **4.10.1 Purpose & Scope of activities of this Domain**

The scope of this section is to work as a home for activities that do not fit 100% into other domains but are clearly within the scope of EUROCAE.

Currently this domain hosts the Electronic Flight Bag (EFB) activity, which is shared by aircraft certification aspects and flight operation aspects.

#### **4.10.2 Current activities of this Domain**

EUROCAE WG-106 Electronic Flight Bag is already active in this Sub-Domain. For details on the deliverables please consult the table in annex.

#### **4.10.3 Anticipated evolutions affecting this Domain**

Electronic Flight Bags are a fast-evolving domain. Functionality is offered as applications, which can be hosted on portable platforms or on those, which are integrated into the aircraft. While the installed hardware falls under aircraft certification requirements, the applications are overseen under the operation regulations. This drives the need for application developers having a clear set of objectives and acceptable means of compliance for the acceptance/approval of their applications by the various National Airworthiness Authorities responsible for operator oversight. To support such demand and to open an ETSO one-time only certification path through the EASA ETSO authorisation process a MOPS is currently under development. While staying generic in principle, some need for requirements that are more detailed have been identified for those applications needing specific mitigation means to justify that the maximum failure effect, which may be caused by misleading information or loss of the function, remains minor.

When starting the activity, a need to have an ETSO certification path for the installed hardware elements has been identified. Beside the environmental qualification, the further integration of EFB and “standard avionics” functionality on the same hardware and on the same display drives the need for standardised requirements. This MOPS may be one potential next activity.

There may be an upcoming demand to standardise further EFB applications especially when demanding mitigations to justify that their failure effect is minor. The integration of the airline operation centre and the aircraft by having frequent data exchange through EFB applications is one domain of development, which may shift the focus of the crew from strategic decision support to more tactical support having by nature higher criticality. The developments may lead to a mid-term need to update the MOPS just under development.

#### **4.10.4 Vision of future EUROCAE activities in this Domain**

Nothing is currently foreseen for the time being since this Domain is the home for activities which are within the scope of EUROCAE, but do not fit 100% into other domains.

##### **4.10.4.1 Space**

The use of satellite navigation services for aeronautical navigation has been growing steadily over the past two decades. Based on the use of the Global Position System (GPS) operated by the United States, the introduction of satellite navigation has revolutionised the way to navigate as well as the organisation of airspace. It has brought numerous benefits, increasing efficiency of routing and rendering the sky a safer place.

Galileo, developed by the European Union, is already offering a free global state-of-the-art navigation capability with three signals offered to civil users and outstanding accuracy performance. The initial operational capability was declared in 2016 and the services delivered continue to improve every day. Full capability of the constellation is planned by 2020. In addition, GPS is being modernised and new signals will soon be made available to civil users. Russia has rebuilt a full constellation of their GLONASS system and is gradually transitioning to modernised signals. China is also developing its own navigation constellation, Beidou.

In parallel to Galileo developments, EGNOS is the Satellite Based Augmentation Service operated by the European Union. It has offered flawless services to the aviation community since 2011, enabling more than 400 EGNOS-based approach procedures at airports throughout Europe. Current EGNOS services are provided on a single frequency and only augment GPS. However, the European Commission has launched an ambitious modernisation plan for EGNOS that will deliver dual-frequency services augmenting both Galileo and GPS by 2025.

These developments in Europe fully embrace the new concept of multi-constellation services developed by the International Civil Aviation Organization. The Navigation System Panel of ICAO is steadily developing "*standards and recommended practices*" for new satellite navigation constellations and modernised augmentation systems. Strategic directions for the evolution of GNSS are soon to be provided by the ICAO 13<sup>th</sup> Air Navigation Conference, scheduled in October 2018. Plans are already underway in several European countries to transition to "Performance Based Navigation" in the 2030 timeframe and to rationalise conventional navigation aids still in operation, thereby contributing to the reduction of aviation Route Charges.

In this context, the leading European actors in the field (EC DG GROW and DG MOVE, EASA, GSA and EUROCAE) are joining forces and aligning the schedule of their respective activities to prepare the operational introduction of new satellite navigation services for aviation in the shortest timeframe. The four organisations will be working together to ensure availability of a modernised infrastructure, user equipment, standards and a regulatory environment ready for the delivery of dual-frequency augmentation services of Galileo and GPS as of 2025. The workplan, currently under development, is expected to include incentives for ensuring a collaborative approach with other SBAS providers in other world regions, as well as with other standardisation bodies such as ICAO and RTCA.

Moreover, industry is seeking for harmonisation and a predictable environment to develop, produce and operate solutions. Today launches of rockets are done through the traditional airspace structure, fully segregated by closing huge amount of airspace, proper integration in the ATM, handed over to STM (space traffic management) and re-enter into ATM back to land at the space- or airport. The European Commission (DG GROW) wants to strengthen Europe as global actor, not only in aviation, also with a tailored space strategy to foster innovation and entrepreneurship and to encourage applications as well as to reinforce autonomy and security. This is divided in three main sectors:

1. Space based solutions, CNS
  - a. EGNOS
  - b. Galileo
  - c. Copernicus
  - d. Space based surveillance and tracking
    - i. Re-entry
    - ii. Space weather
    - iii. Near Earth objects
2. Rocket launches
  - a. Increasing need of launching pay-loads
    - i. Launch through traditional ATM structure –
    - ii. Integration into ATM structure
3. Commercial Space transportation
  - a. regulatory framework for orbital and suborbital activities
    - i. Licensing
    - ii. Authorisation
    - iii. Supervision
    - iv. Acceptable level of safety

All this is foreseen as performance-based regulation, supported by standards. Industry and operators are calling already today for more harmonisation and standardisation in order to develop quick and innovative in a predictable environment worldwide.

## ANNEX 1

### Current EUROCAE WG activities

Domain	WG   Document Project	ED reference	ED title	Current target date for submission to OC	Current target date for publication
<b>Avionics (non-CNS)</b>					
Avionics Architecture and Network	WG-96   DP002	ED-XXX	MOPS for a Wireless Avionics Intra-Communication System	31/10/2021	30/04/2022
	WG-96   DP003	ED-XXX	Minimum Aviation System Performance Specification (MASPS) for Coexistence of Wireless Avionics Intra-Communication Systems within 4200-4400 MHz	31/01/2019	31/07/2019
Sensors & Indications	WG-68   DP001	ED-140A	Minimum Operational Performance Standard for Air Data Modules	31/08/2018	31/12/2018
Safety systems	WG-88   DP001	ED-XXX	MOPS for Onboard Weight and Balance Systems	31/12/2018	31/03/2019
	WG-98   DP001	ED-62B	MOPS for Aircraft Emergency Locator Transmitters 406 MHz and 121.5 MHz (optional 243 MHz)	31/03/2018	30/06/2018
	WG-98 SG-1   DP001	ED-XXX	Minimum Aviation System Performance Standard for Aircraft Emergency Locator Transmitter Return Link Service	31/12/2019	30/06/2020
	WG-110   DP001	ED-xxx	MOPS for Class A HTAWS for Offshore Helicopter Operations	31/12/2021	30/06/2022
System Engineering	WG-97   DP001	ED-247A	TS - Tests in Virtual or Hybrid Bench	31/03/2019	30/06/2019
System Safety Assessment	WG-63   DP002	ED-135	Guidelines and methods for conducting the safety assessment process on civil airborne systems and equipment	31/03/2018	31/03/2018
	WG-63   DP003	ED-79B	Guidelines for Development of Civil Aircraft and Systems	30/09/2018	30/09/2018
	WG-63   DP004	ER-xxx	Use of STPA During Development and Safety Assessment of Civil Aircraft	30/06/2020	30/06/2020
Environment	WG-14   DP001	ED-14H	Environmental conditions and test procedures for airborne equipment	31/12/2021	30/06/2022
	WG-14   DP002	ED-234A	User Guides to ED-14H	31/12/2021	30/06/2022
	WG-14   DP003	ED-XXX	Minimum Standard Environmental Test Conditions and Applicable Test Procedures for Ground Based Equipment	30/06/2020	31/12/2020
	WG-31   DP002	ED-XXX	User guide for lightning protection of fuel tank structure and systems	31/12/2019	30/06/2020
	WG-31   DP003	ED-158	User Manual for certification of aircraft Electrical and Electronic systems for the indirect effects of lightning	31/12/2018	30/06/2019
	WG-31   DP005	ED-91A	Lightning Zoning	30/06/2018	31/12/2018
	WG-31   DP006	ED-105B	Aircraft Lightning test methods	30/09/2020	31/03/2021

Domain	WG   Document Project	ED reference	ED title	Current target date for submission to OC	Current target date for publication
	WG-31   DP007	ED-XXX	Qualification test for indirect and direct effects	30/06/2020	31/12/2020
	WG-31   DP008	ED-XXX	Guidance for using military standards in support of civil compliance process	30/06/2020	31/12/2020
<b>CNS</b>					
Navigation	WG-28   DP004	ED-114B	MOPS For Global Navigation Satellite Ground Based Augmentation System Ground Equipment To Support Category I Operations	28/09/2018	31/12/2018
	WG-28   DP005	Internal Report	Report on status of GBAS Multi-Constellation Multi-Frequency developments in SESAR	31/08/2019	31/12/2019
	WG-62   DP001	ED-XXX	Status of Single Constellation GALILEO OS receiver MOPS	31/08/2018	31/12/2018
	WG-62   DP002	ED-XXX	MOPS on GPS-GALILEO L1-L5 E1-E5a Antenna	30/09/2018	31/12/2018
	WG-62   DP003	ED-XXX	MOPS Receiver using Dual Frequency GPS-GALILEO with multi constellation SBAS	31/08/2018	31/12/2018
	WG-107   DP001	ED-57A	Minimum Performance Specification for Distance Measuring Equipment (DME/N and DME/P) – Ground Equipment	31/12/2019	30/06/2020
	WG-107   DP002	ED-XXX	Minimum Aviation Systems Performance Specification (MASPS) for RNP Reversion using DME/DME Positioning	31/12/2019	30/06/2020
	WG-85 – no current activities (dormant)				
Approach and Landing Systems	WG-79   DP002	ED-255	MASPS for a Combined Vision Guidance System for Rotorcraft Operations	31/12/2017	30/06/2018
	WG-79   DP003	ED-257	Safety Performance and Interoperability Requirements Document Defining Takeoff Minima by Use of Enhanced Flight Vision Systems	31/12/2017	30/06/2018
Surveillance	WG-41   DP001	ED-87D	MASPS for A-SMGCS	31/12/2018	30/06/2019
	WG-41   DP002	ED-128A	Guidelines for Surveillance Data Fusion in A-SMGCS	30/09/2021	31/03/2022
	WG-41   DP003	ED-87E	MASPS for A-SMGCS	30/09/2020	31/03/2021
	WG-41   DP004	ED-116A	MOPS for Surface Movement Radar Sensor Systems for Use in A-SMGCS	30/06/2022	31/12/2022
	WG-41   DP005	ED-xx	Interop Document on Surveillance, Routing, Safety Support and Guidance Service data exchange	30/09/2020	31/03/2021
	WG-49   DP001	ED-73F	MOPS for Secondary Surveillance Radar Mode S Transponders	31/12/2019	31/12/2019
	WG-49   DP002	ED-115A	Minimum Operational Performance Standard for Light Aviation Secondary Surveillance Radar Transponders	31/12/2019	30/06/2020
	WG-51 SG-1   DP002	ED-102B	MOPS for 1090 MHz Extended Squitter ADS-B and TIS-B	31/12/2019	30/06/2020

Domain	WG   Document Project	ED reference	ED title	Current target date for submission to OC	Current target date for publication
	WG-51 SG-3   DP001	ED-194B	Minimum Operational Performance Standards (MOPS) for Aircraft Surveillance Applications (ASA) System	31/12/2019	30/06/2020
	WG-51 SG-3   DP002	ED-195B	Safety and Performance and Interoperability Requirements Document for Airborne Spacing Flight-deck Interval Management (ASPA-FIM)	31/12/2019	30/06/2020
	WG-51 SG-3   DP003	ED-236A	Minimum Operational Performance Standards (MOPS) for Flight-deck Interval Management (FIM)	31/12/2019	30/06/2020
	WG-51 SG-3   DP004	ED-194A Ch. 1	Minimum Operational Performance Standards (MOPS) for Aircraft Surveillance Applications (ASA) System	14/09/2018	14/03/2019
	WG-51 SG-4   DP001	ED-142A	Technical Specification for Wide Area Multilateration Ground System with Composite Surveillance Functionality	31/03/2019	30/09/2019
	WG-51 SG-4   DP002	ED-129C	Technical Specification for an ADS-B Ground System	28/06/2019	31/12/2019
	WG-75   DP001	ED-XXX	MASPS: Specification for the Interoperability of Airborne Collision Avoidance Systems	30/06/2017	29/12/2017
	WG-75   DP002	ED-256	MOPS for ACAS Xa with ACAS Xo functionality	29/06/2018	31/12/2018
	WG-75 SG-1   DP001	ED-XXX	MOPS for ACAS Xu		30/09/2020
	WG-102   DP001	ED-XXX	Safety and Performance Requirements (SPR) for a Generic Surveillance System	31/12/2018	30/06/2019
	WG-103   DP001	ED-XXX	Technical Specification (TS) for an Independent Non-Cooperative Surveillance (INCS) System	31/03/2019	30/09/2019
Communication means	WG-82   DP001	ED-242A	MASPS for AMS(R)S Data and Voice Communications	31/07/2018	31/12/2018
	WG-82   DP002	ED-243A	MOPS for Avionics Supporting NGSS	31/07/2018	31/12/2018
	WG-91   DP001	ED-92C	Minimum Operational Performance Standard (MOPS) for an Airborne VDL Mode-2 System Operating in the Frequency Range 118-136.975 MHz	30/06/2018	31/12/2018
	WG-92   DP002	ED-XXX	Ground VDL Mode 2 systems expected behaviour	31/12/2018	31/12/2018
	WG-108   DP001	ED-XXX	Guidance on ATN-IPS end-to-end interoperability and certification	31/07/2019	31/12/2019
	WG-108   DP002	ED-xxx	Technical Standard of Aviation Profiles for ATN/IPS	31/12/2018	30/06/2019
<b>ATM</b>					
ATM – Flight Data processing	WG-59   DP001	ED-133A	Flight Object Interoperability	30/06/2017	29/12/2017
ATM – Digital Voice communications	WG-67   DP002	ED-137C/2	Interoperability Standard for VOIP ATM Components - Volume 2: Telephone	31/12/2018	30/06/2019

Domain	WG   Document Project	ED reference	ED title	Current target date for submission to OC	Current target date for publication
	WG-67   DP003	ED-137C/4	Interoperability Standard for VOIP ATM Components - Volume 4: Recording	31/12/2018	30/06/2019
	WG-67   DP004	ED-137C/5	Interoperability Standard for VOIP ATM Components - Volume 5: Supervision	31/12/2018	30/06/2019
ATM Simulators	WG-81   DP001	ED-147 RevB	ATM Validation Platforms Interoperability Specification	31/07/2019	31/12/2019
	WG-81   DP003	ED-148A	Guidance to Achieve ATM Validation Platforms Interoperability	31/07/2019	31/12/2019
<b>Airport</b>					
A-SMGCS	See above				
Airport Equipment	WG-83   DP001	ED-XXX	Operating Requirements for FOD detection systems	31/05/2018	30/11/2018
	WG-109   DP001	ED-XXX	Minimum Aviation System Performance Standards (MASPS) for Runway Weather Information Systems	05/11/2020	05/05/2021
Remote and Virtual Tower (RVT)	WG-100   DP002	ED-240A	Minimum Aviation System Performance Standards (MASPS) for Remote Tower Optical Systems	31/01/2018	31/07/2018
	WG-100   DP003	ED-240B	MASPS for Remote Tower Optical Systems	30/09/2020	31/03/2021
<b>Services</b>					
System Wide Information Management) (SWIM) Services	WG-104 – no current activities (dormant)				
Datalink Applications	WG-78 – no current activities (dormant)				
	WG-76   DP001	ED-XXX	Minimum Aviation Systems Performance Standard (MASPS) for AIS/MET Datalink Services	31/12/2020	30/06/2021
Aeronautical Information Services	WG-44   DP001	ED-77A	User Requirements for Navigation Data	30/06/2018	31/12/2018
MET Services	WG-76 – see above				
<b>Security</b>					
	WG-72 SG-2   DP002	ED-205	Process Standard for Security Certification and Declaration of ATM ANS Ground Systems	30/06/2018	31/12/2018

Domain	WG   Document Project	ED reference	ED title	Current target date for submission to OC	Current target date for publication
<b>UAS &amp; General Aviation</b>					
UAS	WG-105 SG-11   DP001	ED-XXX	Minimum Aviation System Performance Standard for Detect and Avoid (Traffic) in Class A-C airspaces under IFR	30/06/2018	30/12/2018
	WG-105 SG-11   DP002	ED-XXX	Minimum Operational Performance Standard (MOPS) for Detect & Avoid [Traffic] in Class A-C airspaces under IFR	30/06/2019	31/12/2019
	WG-105 SG-12   DP001	ED-XXX	Operational Services and Environment Description (OSED) for Detect & Avoid [Traffic] in Class D-G airspaces under VFR/IFR	30/08/2018	28/02/2019
	WG-105 SG-12   DP002	ED-XXX	Minimum Aviation System Performance Standard for Detect & Avoid [Traffic] under VFR/IFR	30/06/2019	31/12/2019
	WG-105 SG-12   DP003	ED-XXX	Minimum Operational Performance Standard for Detect & Avoid [Traffic] under VFR/IFR	30/06/2020	31/12/2020
	WG-105 SG-13   DP001	ED-XXX	Operational Services and Environment Description for Detect & Avoid in Very Low Level Operations	30/06/2018	31/12/2018
	WG-105 SG-13   DP002	ED-XXX	Minimum Operational Performance Standard for Detect & Avoid in Very Low Level Operations	30/06/2020	31/12/2020
	WG-105 SG-21   DP001	ED-XXX	Minimum Operational Performance Standard for RPAS Command and Control Data Link (Terrestrial)	30/06/2020	31/12/2020
	WG-105 SG-21   DP002	ED-XXX	Minimum Operational Performance Standard for RPAS Command and Control Data Link (C-Band Satellite)	30/11/2018	31/05/2019
	WG-105 SG-21   DP003	ED-XXX	Minimum Aviation System Performance Standard for RPAS Command and Control Data Link	30/09/2019	31/03/2020
	WG-105 SG-22   DP002	ED-XXX	Minimum Aviation System Performance Standard for management of the C-Band Spectrum in support of RPAS C2 Link services	31/12/2018	30/06/2019
	WG-105 SG-22   DP003	ER-XXX	Guidance on Spectrum Access, Use and Management for UAS	31/03/2019	30/09/2019
	WG-105 SG-23   DP001	ED-XXX	Minimum Aviation System Performance Standard on RPAS C3 Security	30/06/2019	31/12/2019
	WG-105 SG-23   DP002	ER-XXX	Guidance on UAS C3 Security	31/12/2019	30/06/2020
	WG-105 SG-31   DP001	Internal Report	Support Work Plan on UTM	31/12/2018	30/06/2019
	WG-105 SG-32   DP001	ED-XXX	Minimum Aviation System Performance Standard for UAS e-identification	31/12/2019	30/06/2020
	WG-105 SG-32   DP002	ED-XXX	Minimum Operational Performance Standard for UAS e-identification	30/06/2019	31/12/2019
	WG-105 SG-33   DP001	ED-XXX	Minimum Aviation System Performance Standard for UAS geo-fencing	30/11/2018	31/05/2019
	WG-105 SG-33   DP002	ED-XXX	Minimum Operational Performance Standard for UAS geo-fencing	30/06/2019	31/12/2019
	WG-105 SG-41   DP001	ER-XXX	Inputs to RPAS AMC 1309	30/09/2018	31/03/2019

Domain	WG   Document Project	ED reference	ED title	Current target date for submission to OC	Current target date for publication
	WG-105 SG-42   DP001	ED-XXX	Minimum Aviation Systems Performance Standard for Remote Pilot Stations supporting IFR operations into non-segregated airspace	30/06/2019	31/12/2019
	WG-105 SG-51   DP002	ED-XXX	Minimum Aviation Systems Performance Standard for RPAS Automatic Take-off and Landing	30/06/2020	31/12/2020
	WG-105 SG-52   DP002	ED-XXX	Minimum Aviation Systems Performance Standard for RPAS Automatic Taxiing	30/06/2020	31/12/2020
	WG-105 SG-53   DP001	ED-253	Operational Services and Environment Definition (OSED) for Automation and Emergency Recovery	31/12/2018	30/06/2019
	WG-105 SG-53   DP002	ED-XXX	Minimum Aviation Systems Performance Standard for RPAS Automation & Emergency Recovery functions	30/06/2020	31/12/2020
	WG-105 SG-61   DP001	Internal Report	SORA Support Work Plan	30/09/2018	---
General Aviation	No current activities				
<b>Aircraft Energy Management</b>					
Hydrogen Fuel Cells	WG-80   DP002	ER-XXX	Report on general safety aspects and benefits of on-board hydrogen storage and fuel cells for aircraft applications	31/07/2018	30/09/2018
<b>Artificial Intelligence</b>					
	No current activities				
<b>Miscellaneous</b>					
EFB	WG-106   DP001	ED-XXX	MOPS for Electronic Flight Bag (EFB) Software Applications	30/09/2018	31/12/2018
Space	No current activities				

## ANNEX 2

### Acronyms

AC: [FAA]: Advisory Circular	ARAC: [FAA] Aviation Rulemaking Advisory Committee
ACAS: airborne collision avoidance system	ARAIM: Advanced Receiver Autonomous Integrity Monitoring
A-CDM: Airport Collaborative Decision Making	ARINC: aeronautical Radio Inc
CP: [ICAO] Communication Panel	ARO: Aviation Recreational Organization
AD: Airworthiness directive	ARP: [SAE] aviation Recommended Practice
ADS-B: Automatic Dependent Surveillance-Broadcast	ASBU: [GANP] Aviation System Block Upgrades
Adv-IM: Advanced Interval Management	ASD: AeroSpace and Defence Industries Association of Europe
AEEC: Airlines Electronic Engineering Committee	ASD-STAN: ASD-Standards
AEH: Airborne Electronic Hardware	ASISP: [FAA ARAC] Aircraft Systems Information Security/Protection
Aromas: Aeronautical Mobile Aircraft Communication System	ASTM: American society for testing and materials
AF: ATM Functionalities	ATC: Air Traffic Control
AIA: Aerospace Industries Association	ATFCM: Air Traffic Flow and Capacity Management
AIM: Aeronautical Information Management	ATFM: Air Traffic Flow Management
A-SMGCS: Advanced Surface Movement Guidance and Control System	ATM: Air Traffic Management
PANS AIM: Aeronautical Information Manual - Procedures for Air Navigation Services	ATM MP: ATM Master Plan
AIMSG: Aeronautical Information Manual Sub Group	AVSECP: [ICAO] Aviation Security Panel
AIS: Aeronautical Information Services	BEA: Bureau d'Enquetes et d'Analyses
AMAN: Arrival Manager	CA: Collision Avoidance
AMC: [EASA]: Acceptable Means of Compliance	CAA: Civil Aviation Authority
AMS(R)S: Aeronautical Mobile-Satellite (R) Service	CAP: Civil Aviation Publication
ANC: [ICAO] Air Navigation Conference	CCO: Continuous Climb Operation
ANSP: Air Navigation Service Provider	CDO: Continuous Descent Operation
A-PNT: Alternative Positioning, Navigation, and Timing	CEN: European Committee for Standardization
	CENELEC: Comité Européen de Normalisation Électrotechnique
	CFIT: controlled flight into terrain

CNS:	Communications Navigation Surveillance	ESA: European Space Agency
CONOPS:	concept of operations	ESO: European Standardisation Organisations: i.e. CEN, CENELEC, ETSI
COTS:	Commercial off-the- shelf	ETSI: European Telecommunications Standards Institute
CPDLC:	Controller–pilot data link communication	ETSO: European Technical Standard Orders
[SES] CS:	Community Specifications	EUROCONTROL: the European Organisation for the Safety of Air Navigation
CWP:	Council Work Paper	EUSCG: European UAV Standards Coordination Group
DCL:	Departure Clearance	EVS: Enhanced Vision System
DCT:	Direct route Trajectory	FAA: Federal Aviation Administration
DG:	[EC] Directorate General	FDP: flight data processing
DME:	Distance Measuring Equipment	FMS: Flight management System
DO:	[RTCA] Document	GA: General Aviation
DOA:	Design Organisation Approval	GADSS: [ICAO] Global Aeronautical Distress & Safety System
DP:	[EUROCAE TAC] Discussions Paper	GALILEO: Europe's own global navigation satellite system
DP:	[SES] Deployment Programme	GAMA: General Aviation Manufacturers Association
D-RNP:	Dynamic - Required navigation Performance	GANP: [ICAO] Global Air Navigation Plan
D-TAXI:	Data link taxi	GASP: [ICAO] Global Aviation Safety Plan
E-AMAN:	extended Arrival Management	GBAS: Ground-Based Augmentation System
EASA:	European Aviation Safety Agency	GEN: Generic
EASCG:	European ATM Standards Coordination Group	GNSS: Global Navigation Satellite System
EASp:	[EASA] European Aviation Safety Plan	GPS: Global Positioning System
EATMN:	European Air Traffic Management Network	HTAWS: Helicopter Terrain Awareness System
EC:	European Commission	HUD: Head-up display
ED:	Eurocae Document	HW: hardware
EDA:	European Defence Agency	ICAO: International Civil Aviation Organization
EFVS:	Enhanced Flight Vision System	ICB: Industry Consultation Body
ELSA:	VDL Mode 2 measurement, analysis, testing and simulation campaign Study	IEEE: Institute of Electrical and Electronics Engineers
ELT:	Emergency Locator Transmitters	IM: Interval Management
EPP:	Extended Projected Profile	INCS: Independent Non- Cooperative Surveillance
ER:	Essential Requirements	
ERA:	Enhanced RPAS Automation	

INTEROP: Interoperability Requirements	PIB: Pre-flight Information Briefing
IOP: Interoperability	PUR: Passive Underwater Resonator
IPS: Internet Protocol Suite	RAIM: Receiver autonomous integrity monitoring
IR: Interoperability Regulation	RBDM: Risk Based Decision Making
ISO: International Organization for Standardization	RDP: ATM Standardisation Rolling Development Plan
ITU: International Telecommunication Union	RMP: Rule Making Programme
I4D: Initial 4D	RNP: Required navigation performance
JARUS: Joint Authorities for Rulemaking on Unmanned Systems	ROAAS: Runway Overrun Awareness and Alerting System
KPA: Key Performance Area	RPAS: Remotely Piloted Aircraft Systems
LOA: Letter of Acceptance	RTA: Required Time of Arrival
LPV: Localizer performance with vertical guidance	R&D: Research and Development
LVP: Low visibility procedures	SAE: Society of Automotive Engineers
MASPS: Minimum Aviation System Performance Specifications	SARPs: Standards and Recommended Practices
MBSE: Model Based System Engineering	SBAS: Satellite-based augmentation systems
MET: Meteorological	SCB: [JARUS] Stakeholder Consultation Board
MOC: Means of Compliance	SDM: SESAR Deployment Manager
MOPS: Minimum Operational Performance Specifications	SDO: Standard Developing Organization
MoU: Memorandum of Understanding	SDR: System Design Review
NAC: [RTCA] NextGen Advisory Committee	SES: Single European Sky
NextGen: Next Generation Air Transportation System	SESAR: Single European Sky ATM Research
NPA: Notice of Proposed Amendment	SJU: SESAR Joint Undertaking
NOP: Network Operations Plan	SPR: Safety and Performance Requirements
NOTAM: Notice To Airmen	SUR: Surveillance
NSA: National Security Agency	SURF-IA: Surface - Indications and Alerts
NTSB: National Transportation Safety Board	SVS: Synthetic vision system
OEM: Original Equipment Manufacturer	SW: Software
OJEU: Official Journal of the European Union	SWIM: System Wide Information Management
PANS: [ICAO] Procedures for Air Navigation Services	TAC: [EUROCAE] Technical Advisory Committee
PBN: Performance Based Navigation	TAWS: Terrain Awareness System
PCP: [SES] Pilot Common Project	TBS: Timed-Based Separation
PED: Portable Electronic Devices	

TCAS: Traffic alert and Collision Avoidance System  
TIAM: Technology Independent Assurance Method  
TMA: Terminal Manoeuvring Area  
TOPMS: Take Off Performance Monitoring System  
ToR: Terms of Reference  
TS: Technical specification  
TSO: Technical Standard Order  
TWP: Technical Work Programme  
UAS: Unmanned Aircraft System  
UAV: Unmanned Aerial Vehicle  
US: United States  
VDL: VHF Digital Link  
VHF: Very High Frequency  
VoIP: Voice over IP  
WAIC: Wireless Avionics Intra-Communications  
WG: Working Group  
WIMAX: Worldwide Interoperability for Microwave Access  
WRC: World Radio Conference



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