SESAR 2020 Exploratory Research and Very Large Scale Demonstrations Open Call Technical Specification

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Abstract

This document comprises the Technical Specification Document for the 2016 SESAR 2020 Exploratory Research and Very Large Scale Demonstrations Open Call (H2020 – SESAR – 2016 -2).

The document is designed to offer to potential applicants a more detailed description of the Call specifications than can be found on the European Commission Research and Innovation Participant Portal.

It contains detailed descriptions of all Topics to be awarded under the Call.

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1 Introduction

1.1 Purpose of the document

This document constitutes the Technical Specifications and the Call Conditions for the 2016 SESAR 2020 Exploratory Research and Very Large Scale Demonstration Open Call (H2020-SESAR-2016-2).

It is designed to offer to potential applicants a more detailed technical description of the Call requirements which complements the information that can be found in the Annual Work Programme 2016 and on the European Commission Research and Innovation Participant Portal. It contains comprehensive descriptions of all Topics to be awarded under the Call.

1.2 SESAR programme objectives and scope

The SESAR programme aims to ensure the modernisation of the European air traffic management (ATM) system by coordinating and concentrating all relevant research and development efforts in the European Union.

The SJU is responsible for the execution of the European ATM Master Plan and in particular for carrying out the following tasks:

- Organising and coordinating the activities of the development phase of the SESAR project in accordance with the European ATM Master Plan, by combining and managing under a single structure public and private sector funding;
- ensuring the necessary funding for the activities of the development phase of the SESAR project in accordance with the European ATM Master Plan;
- ensuring the involvement of civil and military stakeholders of the air traffic management sector in Europe and in particular; air navigation service providers, airspace users, professional staff associations, airports, the manufacturing industry and relevant scientific institutions and members of the scientific community;
- organising relevant research and development to be carried out under its authority;
- ensuring the supervision of activities related to the development of common products identified in the European ATM Master Plan, either through grants to members or other appropriate mechanisms following proposals to achieve specific programme objectives (in accordance with Regulation 1271/2013).

The SESAR programme includes projects extending through Exploratory Research, Industrial Research and Validation and Very Large Scale Demonstrations, as shown in figure 1.

This call covers Exploratory Research activities and Very Large Scale Demonstrations activities.

- SESAR Exploratory Research (ER) drives the development and evaluation of innovative or unconventional ideas, concepts, methods and technologies; that can define and deliver the performance required for the next generation of European ATM system. It is the initial part of SESAR 2020 Research and Innovation (R&I) and covers two types of activities: Fundamental Scientific Research (to TRL1) and Application-oriented Research (to TRL2). In particular, the Application oriented Research help to mature new concepts for ATM beyond those identified in the ATM Master Plan as well as help mature emerging technologies and methods to the level of maturity required to feed the applied research conducted in the Industrial Research and Validation phase of SESAR.
- The Very Large Scale Demonstrations (VLD) are designed to help fill the gap between the development and deployment phases and in particular, to:

- Generate further confidence to support buy-in from main stakeholders including regulators for future deployments.
- Significantly reduce the business risks for both operational stakeholders and industry, in particular for changes included in the Common Projects.
- Provide further inputs to related standardisation activities.
- Raise awareness regarding SESAR activities related to ATM performance issues and their results.
- Accompany SESAR pioneers all the way to pre-deployment.
- To assess full-scale deployment readiness.

Figure 1: ER and VLD activities within SESAR programme

1.3 Background and Context

2016 is a year of transition for the SJU and the SESAR programme with the closure of SESAR1 as well as the launch and execution of Exploratory Research & Industrial Research and Innovation projects within the framework of SESAR2020. All these activities are described in the Annual Work Programme 2016 Amendment n°1 which provides an overview of objectives and activities to be carried out in the SJU in 2016.

The SESAR 2020 programme covers the 3 types of R&D activities (ER, IRV and VLD) launched either to the Members or through Opens calls, as shown in figure 2.

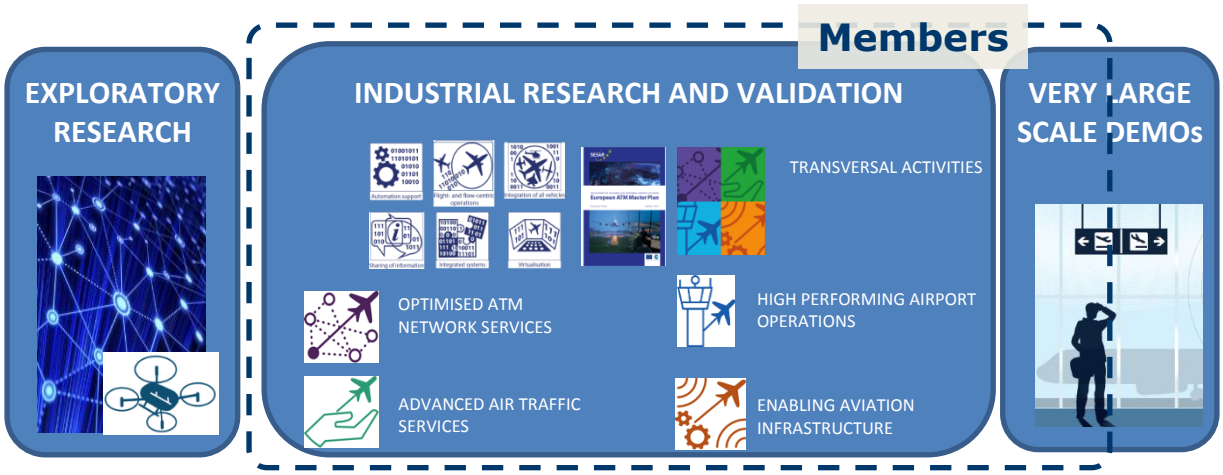

Figure 2 SESAR 2020 programme structure

In accordance with the published multi-annual work programme for SESAR 2020, the first call for projects under the Industrial Research and Validation (IRV) and Very Large Scale Demonstration (VLD) phases of SESAR2020 was launched end of 2015. A second call for ER projects was launch mid-2016.

With reference to the Annual Work Programme 2016 amendment n°1, this call for proposals is an open call which combines ER and VLD activities. It corresponds to the 3rd open Exploratory Research call (ER3) and the first open VLD call (VLD1) under SESAR2020 programme.

It consists of two Work Areas (WA) with a clear scope of activities structured at the level of Topics:

- WA 1: Exploratory Research activities with 6 topics covering Transversal Exploratory Research activities (1 topic) and Application-Oriented Research (5 topics).
- WA 2: Very Large Scale Demonstrations with 10 topics covering SESAR Solutions demonstrations for High Performing Aviation in Europe (6 topics), Global Interoperability (2 topics), and Safe Integration of all Air Vehicles (2 topics).

1.4 Overall Scope

1.4.1 WA 1: Exploratory Research

In this Work Area, there are 2 sub Work Areas covering 6 topics:

- Sub Work Area 1.1: Transversal exploratory research activities

It includes one topic (SESAR-ER3-01-2016) that shall establish an overarching view across ATM Exploratory Research, providing a coordinated exchange of research knowledge across a wide range of relevant theme. Within the context of this networking, it is expected to help in further stimulating the Future ATM Skilled work-force for ATM.

The SJU is looking to award one project, with a maximum duration of 4 years.

- Sub Work Area 1.2: Application-oriented research

This will help mature new concepts for ATM beyond those identified in the ATM Master Plan as well as help mature emerging technologies and methods to the level of maturity required to feed the applied research conducted in the Industrial Research and Validation phase of SESAR; thus connecting the ATM Exploratory Research to the ATM Applied Research in the context of the European ATM Master Plan.

It covers 5 topics (from SESAR-ER3-02-2016 to SESAR-ER3-06-2016), as described below:

- **Advanced Air Traffic Services** – will address the extension of current separation concepts, by proposing new separation minima when non-surveillance information on the aircraft position is available.
- **Optimised ATM Network Services** – will address the application of Trajectory Based Operations in support of DCB functions, independent to any specific system architecture allowing the extension of such functions to a global context leading to a consistent and coherent trajectory management approach within and between regions.
- **Enabling Aviation Infrastructure** – will address how technology for voice and data link communications, PBN, surveillance, and collision-avoidance, could be regulated and approved by aviation authorities without having to undergo the rigorous and costly certification processes associated with existing full-specification devices.
- **Enabling Aviation Infrastructure** – will address the use, or adaptation, of new technologies being developed outside ATM to support ATM Communication, navigation and surveillance (CNS) needs including analysis of the safety, performance and security implications for the ATM system.
- **ATM Operations, Architecture, Performance and Validation** - will address activities on ATM system design and architecture while guaranteeing its robust transition towards the future, including the needs and challenges in developing a harmonised technical infrastructure for ANS along with its operational and economic impacts.

The SJU is looking to award around 8-12 projects, with an indicative duration of 2 years. This means the SJU considers that proposals requesting a contribution from the EU between EUR 0,5 and 1 million, with an indicative duration of 2 years, would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

1.4.2 WA 2: Very Large Scale Demonstrations

This Work Area includes 10 topics covered through 3 sub-WAs as described below.

SESAR Solutions demonstrations for High Performing Aviation in Europe

This sub-Work Area is aiming at securing the involvement of additional end-users to perform operational demonstrations to confirm the benefits and increase awareness of promising solutions targeting specific operational scenarios and environments. The scope is structured into separate topics that are all geared at securing the involvement of additional end-users to perform operational demonstrations to confirm the performance of SESAR Solutions and raise awareness.

The SJU is looking to award around 10-15 projects, with an indicative duration of 2 years, across the following six topics:

- Arrival Management Extended to En-Route Airspace (SESAR-VLD1-01-2016)
- Integrated Airport Operations (SESAR-VLD1-02-2016)
- Network collaborative Management (SESAR-VLD1-03-2016)
- Initial Trajectory Information Sharing (SESAR-VLD1-04-2016)
- Efficient services and infrastructure delivery (SESAR-VLD1-05-2016)
- Increased access to airports for low visibility mixed fleet operations (SESAR-VLD-06-2016)

The SJU therefore considers that proposals requesting a contribution from the EU between EUR 0.5 and 1 million, with an indicative duration of 2 years, would allow this specific challenge to be

addressed appropriately, nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Global Interoperability

This sub-Work Area is structured into two topics that both recognise that aviation is a global industry and interoperability together with global harmonisation are key for its safe and sustained growth. The activities under this work area shall address global interoperability demonstrations targeting operational changes that are considered to be on the critical path for ATM modernisation.

The SJU has put in place Memoranda of Cooperation (MoC) under the EU bilateral agreements and relations with non-EU States. These MoC´s provide the international context and frame for the activities to be conducted under this work area, in particular with regards to link the International Civil Aviation Organisation's (ICAO), Global Air Navigation Plan, GANP/ASBU´s development and implementation efforts.

The SJU is looking to award around 2-4 projects, with an indicative duration of 2 years, across the following two topics:

- Applications for trajectory based flow and queue management using EPP extended into Oceanic/Inter-continental operations (SESAR-VLD1-07-2016)
- Applications for improved flight trajectories using SWIM B2B services (SESAR-VLD1-08-2016)

The SJU therefore considers that proposals requesting a contribution from the EU of the order of EUR 1.5 million, with an indicative duration of 2 years, would allow this specific challenge to be addressed appropriately, nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Safe Integration of all Air Vehicles

The activities to be performed under this sub Work area are geared at demonstrating solutions which support interoperability and allow the integration of all airspace users (including general aviation, rotorcraft and drone operators) in an efficient and non-discriminatory manner, whilst also ensuring safety.

The SJU is looking to award around 7-10 projects, with an indicative duration of 2 years, across the following two topics:

- Solutions for General Aviation and Rotorcraft(SESAR-VLD-9-2016)
- Safe integration of drones (SESAR-VLD-10-2016)

The SJU therefore considers that proposals requesting a contribution from the EU between EUR 0.5 and 1 million, with an indicative duration of 2 years, would allow this specific challenge to be addressed appropriately, nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

1.5 Implementation Guidelines

For the WA1 Exploratory Research, please refer to the Project Execution Guidelines for SESAR 2020 Exploratory Research.

For the WA2, Very Large Scale Demonstration, please refer to the Project Execution Guidelines for SESAR 2020 Very Large Scale Demonstrations.

In particular, some projects to be awarded under this call will have to coordinate with existing VLD projects awarded under the call H2020-SESAR-2015-2. The SESAR JU will set up a dedicated platform to allow these projects to coordinate and share information as necessary.

The concerned topics are the following:

- Arrival Management Extended to En-Route Airspace (topic SESAR-VLD1-01-2016)
- Integrated Airport Operations (SESAR-VLD1-02-2016)
- Network collaborative Management (SESAR-VLD1-03-2016)
- Initial Trajectory Information Sharing (SESAR-VLD1-04-2016)

Further information could found in the section 3 topics long descriptions (§4.1.1, 4.1.2, 4.1.3, 4.1.4).

1.6 Acronyms and Terminology

Term	Definition
3G / 4G / 5G	Third, fourth and fifth-generation mobile telecommunications
4DT	4 dimensional trajectory
ACC	Area control centre
ADS-B	Automatic Dependent Surveillance – Broadcast
ADS-C	Automatic Dependent Surveillance – Contract
AF	ATM Functionality
A-FLEX	Arrival Flexibility
AMAN	Arrival manager
ANS(P)	Air Navigation Service (Provider)
AOC	Airline Operations Centre
ASBU	Aviation System Block Upgrade
ASM	Airspace management
ASMA	Arrival Sequencing and Metering Area
ATC	Air Traffic Control
ATFCM	Air traffic flow and capacity management
ATM	Air Traffic Management
ATN B2	Aeronautical telecommunications network – Baseline 2
ATN/IPS	Aeronautical telecommunications network - Internet Protocol Suite
ATN/OSI	Aeronautical telecommunications network – Open Systems Interconnection
ATS	Air traffic Service
ATSAW	Air traffic situational awareness
AU	Airspace user

B2B	Business-to-business
B-VLOS	Beyond Visual Line of Sight
CDM	Collaborative decision-making
CI	Cost Index
CNS	Communication, Navigation, Surveillance
CPDLC	Controller-Pilot Data Link Communications
CTOT	Calculated take-off time
CWP	Controller working position
D&A	Detect and avoid
DBS	Distance Based Separation
DCB	Demand and capacity balancing
DFS	German ANSP
DSNA	French ANSP
D-TAXI	Datalink taxi
E-AMAN	Extended A-MAN
EASA	European Aviation Safety Agency
EFB	Electronic Flight Bag
EFPL	Extended flight plan
EFVS	Enhanced flight vision systems
EGNOS	European Geostationary Navigation Overlay Service
ELSA	Enhanced Large Scale ATN deployment (SJU study)
ENAIRE	Spanish ANSP
EPP	Extended projected profile
ER	Exploratory Research
E-TMA	Extended TMA
FCU	Flight Control Unit
FDR	Flight Data Recorder
FF-ICE	Flight and flow information in a collaborative environment
FIXM	Flight Information Exchange Model
FMP	Flow management position
FMS	Flight Management System
FSPD	Flight Specific Performance Data

GA	General Aviation
GANP	Global Air Navigation Plan
GBAS	Ground-based augmentation system
GLS	GNSS landing system
GNSS	Global navigation satellite system
GUFI	Globally Unique Flight Identifier
HMI	Human machine interface
i4D	Initial 4D trajectory
IA	Innovation Action
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument landing system
IRV	Instrument Runway Visual Range
KPA	Key performance area
KTN	Knowledge Transfer Network
LPV	Low visibility procedure
MoC	Memorandum of cooperation
MUAC	Maastricht upper area control centre
NATS	UK ANSP
NCM	Network Collaborative Management
NM	Nautical Miles
NM	Network Manager
NOTAM	Notice to Airmen
PBN	Performance-based navigation
PCP	Pilot common project
PNT	Position, Navigation and Timing
PPP	Public private partnership
P-RNAV	Precision area navigation
QoS	Quality of Service
RIA	Research and Innovation Action
RNP	Required navigation performance
Satcomm	Communication using satellites

SBAS	Satellite-based augmentation system
SBB	Swift broadband
SESAR (2020)	Single European Sky ATM Research Programme (2020)
SJU	SESAR Joint Undertaking
SMO	Standards making organisation
SOA	Service-oriented architecture
STAM	Short-term ATFCM measures
SVS	Synthetic vision system
SWIM	System-Wide Information Management
TBO	Trajectory Based Operations
TBS	Time-based separation
TRL	Technology readiness level
TT	Target time
TTA	Target time of arrival
UDPP	User-driven prioritisation process
UTM	Unmanned Traffic Management
VFR	Visual Flight Rules
VLD	Very Large Scale Demonstrations
VLL	Very Low Level
VLOS	Visual Line of Sight
VNAV	Vertical navigation
WA	Work area
XLS	Precision landing systems (either ILS or GLS)

Table 1: List of acronyms

2 Topic short descriptions

This section provides a short description of each topic to be researched and demonstrated. For more details, refer to the descriptions in Sections 3 and 4.

2.1 Work area 1: Exploratory Research (ER)

In this Work Area there are six topics to be covered: 1 topic under sub Work Area 1.1 Transversal Exploratory Research activities (SESAR-ER3-01-2016) and 5 topics under sub Work area 1.2 Application-oriented Research (from SESAR-ER3-02-2016 to SESAR-ER3-06-2016).

2.1.1 Sub Work Area 1.1: Transversal exploratory research activities

2.1.1.1 SESAR-ER3-01-2016 Knowledge Transfer Network (KTN)

This topic is about supporting the SJU by focussing on the assessment, transfer, communication and sharing of research results among the ATM community. The challenge is to support and encourage collaborative research on future and emerging innovative ideas, expertise and knowledge for the benefit of the future evolution of the European ATM system and its people. The Knowledge Transfer Network will also include the organisation and running of interdisciplinary or 'themed' network activities based around key ATM research subjects and SJU exploratory research projects with the aim to stimulate learning and the exchange of knowledge between academia, the research community and industrial partners. Introducing knowledge from other disciplines will encourage the exploration of innovative and unconventional ideas in ATM.

2.1.2 Sub Work Area 1.2: Application-oriented research

2.1.2.1 SESAR-ER3-02-2016 Advanced Air Traffic Services: Separation Management

Current separation minima are for the most part defined to be dependent on the reliability and accuracy of the position information displayed to the controller. In some cases reduced minima have been defined for flights guided by specific navigation equipment, as is the case for aircraft on parallel Instrument Landing System (ILS) localizers, based on the fact that the knowledge that the aircraft is on the localizer reduces both the uncertainty of the present position and how its future position may evolve. This topic will address the extension of this concept, proposing new separation minima when non-surveillance information on the aircraft position is available, for example for aircraft flying on PBN routes, flights having downlinked their FMS-predicted trajectory, or flights having agreed to comply with specific ATM constraints.

2.1.2.2 SESAR-ER3-03-2016 Optimised ATM Network Services: Trajectory Based Operations (TBO)

The sharing and management of trajectory information provides consistent information which allows the use of each flight's agreed trajectory as a unique, common reference for decision-making. Today Europe's Network Manager (NM) carries out regional coordination of Demand and Capacity Balancing (DCB) in a centralised architectural approach. This topic will address the application of Trajectory Based Operations in support of DCB functions, independent from any specific system architecture allowing the extension of such functions to a global context, leading to a consistent and coherent trajectory management approach within and between regions.

2.1.2.3 SESAR-ER3-04-2016 Enabling Aviation Infrastructure: CNS for General Aviation

This topic addresses how lightweight and/or low-cost devices suitable for airspace users such a General Aviation (GA), could be allowed to operate safely and effectively alongside full-specification devices without compromising safety or adversely impacting the aviation spectrum environment.

The topic will address how technology for voice and data link communications, PBN, surveillance, and collision-avoidance, could be regulated and approved by aviation authorities without having to undergo the current costly certification processes associated with existing full-specification devices mainly designed for commercial aviation.

2.1.2.4 SESAR-ER3-05-2016 Enabling Aviation Infrastructure: CNS new technology options

The use, or adaptation, of new technologies being developed outside ATM to support ATM Communication, navigation and surveillance (CNS) needs will be considered including analysis of the safety, performance and security implications for the ATM system. More flexible system architectures for ground and airborne systems will be considered in this context (e.g. building on integrated modular avionics and an open interface approach to ground system development) to help unlock us from legacy technologies.

2.1.2.5 SESAR-ER3-06-2016 ATM Operations, Architecture, Performance and Validation

This topic will address activities on ATM system design and architecture using novel methods to analyse and propose evolutionary approaches aimed at guaranteeing its robust transition towards the future. This includes the needs and challenges in developing a harmonised technical infrastructure for ANS, including its operational and economic impacts. The potential of architecture in providing suitable means of assurance for validation or evidence to support decision-making and strategic thinking.

2.2 Work area 2: Very Large Scale Demonstrations (VLD)

In this Work Area there are ten topics to be covered: 6 topics under sub Work Area 2.1 SESAR Solutions for High Performing Aviation in Europe from (SESAR-VLD1-01-2016 to SESAR-VLD1-06-2016), 2 topics under sub Work area 2.2 Global Interoperability (SESAR-VLD1-07-2016 to SESAR-VLD1-08-2016) and 2 topics under sub Work area 2.3 Safe Integration of all Air Vehicles (SESAR-VLD1-09-2016 to SESAR-VLD1-10-2016).

All VLDs shall aim, as a minimum, at including a demonstration in a close-to-operational environment along with the preparation for platform availability to support demonstrations in targeted operational environments that engages relevant end-users and stakeholders.

VLDs are an integral part of the SESAR Solutions delivery approach towards the SESAR deployment phase. The objective of VLDs is to bridge “industrial research” and “deployment”, and not to replace either type of activity.

2.2.1 Sub Work Area 2.1: SESAR Solutions for High Performing Aviation in Europe

2.2.1.1 SESAR-VLD1-01-2016 Arrival Management Extended to En-Route Airspace

The Arrival Management (AMAN) extended to en-route extends the AMAN horizon from 100-120 NM to 180-200 NM from the arrival airport, allowing traffic sequencing to be conducted in the en-route and early descent phases. The arrival constraint generated by the extended AMAN takes into account the different flows of arrival flights delivered by different neighbouring ACCs and this information is passed to two or more upstream ACCs.

2.2.1.2 SESAR-VLD1-02-2016 Integrated Airport Operations

This topic addresses efficient provision of approach and aerodrome control services through improved both runway safety and throughput and optimised surface operations. This encompasses advanced departure management procedures and tools, enhanced surface management including planning and routing, and the use of ground safety nets to monitor routing conformance, detect conflicting clearances and deliver alerts to the controller.

2.2.1.3 SESAR-VLD1-03-2016 Network Collaborative Management (NCM)

This topic addresses cooperative traffic management environment based on the exchange, modification, and management of trajectory information in both pre-departure and execution phases of the flight in order to improve the European Network performance, particularly capacity and flight efficiency. It consists in optimising the delivery of traffic in sectors and airports while assessing accurately the capacity needs corresponding to the traffic demand. It includes an enhanced evaluation of the demand through identification of hotspots and assessment the traffic complexity and the proposal of appropriate ATFCM solutions which integrate multiple local dynamic capacity balancing (DCB) constraints.

2.2.1.4 SESAR-VLD1-04-2016 Initial trajectory Information Sharing

The trajectory will become the standard for ATM and requires to be regularly updated and shared among involved stakeholders including ANSPs/ACCs and network management. This is a first step which is expected to bring already significant improvement in flight efficiency and particularly predictability. It consists in equipping an adequate number of mainline aircraft and assessing technical and operational impact of downlinking trajectory information contained in the FMS during commercial flights.

2.2.1.5 SESAR-VLD1-05-2016 Efficient services and infrastructure delivery

This topic addresses common support function which would allow temporary provision of some services or information such as Flight plan or radar information in order to ensure continuity in the delivery of efficient ATS services in case of major technical failure at one of the ACCs.

2.2.1.6 SESAR-VLD1-06-2016 Increased access to airports for low visibility mixed fleet operations

A great number of medium and small size European airports are not equipped with advanced ground infrastructure that allows Cat II/III procedures in bad weather conditions and especially in low visibility conditions (particularly true but not limited to medium and small airports). This topic addresses the use of advanced on-board equipment as well as GNSS (such as EGNOS) to support safe airport access for mixed fleet operations including Business Aviation as well as mainline.

2.2.2 Global interoperability

2.2.2.1 SESAR-VLD1-07-2016 Applications for trajectory based flow and queue management using EPP extended into Oceanic/Inter-continental operations: Inter-continental trajectory based operations enabled by Satellite based CNS

This topic addresses the use of aircraft derived EPP information in a simulated and/or live environment to improve operational applications for ATS/ATC- traffic synchronisation and ATFM purposes with a specific emphasis on global interoperability including demonstrations on technical feasibility and benefits of using satellite communications during the entire flight to exchange trajectory information.

2.2.2.2 SESAR-VLD1-08-2016 Applications for improved flight trajectories using SWIM B2B services

Building on the results achieved in previous SWIM global demonstration activities, this topic addresses the use of specific SWIM services for improved flight planning, flight briefing and flight following through global interoperability. This encompasses in particular pre-departure flight plan information that could be exchanged in an agreed standard but also other kind of B2B services relevant during the execution of the flight.

2.2.3 Safe Integration of all Air Vehicles

2.2.3.1 SESAR-VLD1-09-2016 Solutions for General Aviation and Rotorcraft

This topic addresses specific solutions linked to SESAR concepts using non certified on-board equipment and shall demonstrate the benefits of such solutions regarding the improvement of situation awareness and safety. Although demonstrations are expected to occur in class G airspace, they should be geared to the possible extent, at building confidence for safe integration of GA and rotorcraft operations in all classes of airspace.

2.2.3.2 SESAR-VLD1-10-2016 Safe integration of drones

Safe integration of drones in the airspace has to be considered in the relevant context according to mission type, altitude, class of airspace and type of drone. This topic addresses “quick win” demonstrations to build confidence on solutions that would support the safe integration of drones in all classes of airspace (including Very Low Level Operations) and that could be deployed at a larger scale within the next 5-8 years or earlier. Particular focus should be put on solutions enabling the following mission types: long range surveying (primarily BVLOS), light load movement (primarily BVLOS) and long endurance surveying (primarily at altitudes above 150 metres).

3 Topic long descriptions Work Area 1: Exploratory Research

This section provides full descriptions of the topic to be researched in Work Area 1, structured into Specific Challenges, Scope, Expected Impact and Type of action.

For further details regarding budget allocations and calls conditions, please refer to chapter 5.

3.1 Sub Work Area 1.1: Transversal exploratory research activities

3.1.1 SESAR-ER3-01-2016 Knowledge Transfer Network (KTN)

This Knowledge Transfer Network topic focusses on the assessment, transfer, communication and sharing of research results among the ATM community.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 1.1 topic a).

Specific Challenge

The specific challenge is to be addressed by the Knowledge Transfer Network, in order to support and encourage collaborative research on future and emerging innovative ideas, expertise and knowledge for the benefit of the future evolution of the European ATM system. The KTN will address the challenge to stimulate the learning and exchange of knowledge from academia, research community and industrial partners following up already on the SESAR 1 research network results and also stimulating the transfer of new knowledge from other disciplines.

The Knowledge Transfer Network will also include the organisation and running of interdisciplinary or 'themed' research network activities based around key ATM research subjects and SJU exploratory research projects with the aim to stimulate learning and the exchange of knowledge between academia. The interdisciplinary or "themed" research activities will include a provision of a platform for training, transfer of knowledge and PhD research activities.

The range of possible themes for the network activities to be included covers the key subject areas for SESAR 2020 exploratory research:

- Automation,
- Robotics & Autonomy;
- Complexity Data Science & Information Management;
- Environment & Meteorology for ATM;
- Performance, Economics,
- Legal & Regulation; ATM role in Intermodal transport;
- CNS for ATM;
- High Performing Airport Operations;
- Optimised ATM Network Services;
- Advanced Air Traffic Services;
- Enabling Aviation Infrastructure

Scope

The Knowledge Transfer Network shall cover the following research activities:

- Communication – organisation of workshops and symposiums, ATM research summer schools, the development of newsletters and other actions aimed at the dissemination and sharing of SESAR exploratory research results.
- Observatory and roadmap – monitoring, identification and analysis of new opportunities for innovative ATM research of relevance to the evolution of the European ATM system and the development of a long-term roadmap development of innovative and interdisciplinary ATM concepts beyond SESAR 2020. The Observatory is expected to host the open source framework models, tools and metrics developed by SESAR 1 WP-E projects and in addition contain information (e.g. scientific articles, PhD theses, conference presentations, etc.) about worldwide long-term research in ATM related trends. Based on the generated knowledge from the KTN activities combined with the knowledge from the Observatory. The KTN is expected to produce a long-term roadmap for innovative and interdisciplinary ATM concepts beyond SESAR 2020 in the timeframe. The roadmap may contain information on the SESAR R&D Priorities in the long-term period for SESAR Concepts evolution and beyond SESAR 2020.
- Take-up – stimulate the transfer of exploratory research results towards ATM applications-oriented research and onwards towards industrial research. This will include the assessment of direct/indirect impacts of SESAR Exploratory Research program on the long-term evolution of the European ATM system including establishing stronger links performance measures. The Networks will identify the maturity of research results and facilitate the link with research at higher-levels of maturity for example within the SESAR Industrial research programme.
- Future ATM Skilled work-force – supports European ATM education and training in the ATM Community to develop new talent with a deep knowledge of the future ATM scientific research needs which will sustain a supply of bright young ATM research talent in the long term as well as stimulating the next generation of ATM operational and engineering staff. The future ATM skilled work-force activity will provide opportunities for postgraduate students to participate and contribute to ATM research in Europe including support for PhD research projects. The specific PhD topics themselves do not need to form part of the proposal but will be administered by the KTN. The proposal should outline how this will be achieved. PhD proposals must contain innovative research ideas and address the long-term evolution of the European ATM system. The PhD researchers are expected regularly to present their research at summer schools and workshops, organized by the Knowledge Transfer Networks and submit scientific papers for the SESAR Innovation Days conferences.
- Support to SJU initiatives – support the organisation of the SESAR Innovation Days research conference and the SESAR Young Scientist Award. The SJU will provide a link to its Scientific Committee who also takes a key role in these activities.

This action allows for the provision of financial support to third parties in line with the conditions set out in Part K of the General Annexes and in accordance with the SJU Annual Work Programme (Amendment 1) and the Single Programming Document 2017-2019.

Expected Impact

The expected impacts from the KTN activities will be cross-fertilization of knowledge from other disciplines that will encourage the exploration of innovative and unconventional ideas and research directions in ATM. Research proposals are expected to contribute to transferring SESAR exploratory research results to SESAR Industrial Research. In parallel the PhD researchers who are part of the KTN are expected to become Europe's scientific and technological leaders in the European ATM

environment. Other expected impacts are the kick-starting of new ideas, new research directions and roadmaps contributing to the evolution of the European ATM system beyond SESAR 2020.

The KTN activities will be encouraging European research leadership of new and emerging ATM concepts and ideas with the strong engagement of scientists, citizens, innovators and policy makers and non-ATM stakeholders.

Type of action

Coordination and Support Action

3.2 Sub Work Area 1.2: Application-oriented research

3.2.1 SESAR-ER3-02-2016 Advanced Air Traffic Services: Separation Management

Keeping aircraft separated from each other is one of the core functions of ATM. In the SESAR concept, ground automation supports air traffic controllers in their task of providing separation management. Separation management starts by strategically limiting the density of potential separation conflicts (i.e. limiting traffic density and traffic complexity), but is ultimately ensured tactically by keeping aircraft separated at or above the pre-defined separation minima. The tactical separation minima are defined for each surveillance environment, and are essentially the same as they were decades ago.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 1.2 topic a)

Specific Challenge

The exploratory research challenge is to hypothesize and test a set of conditions in which lower tactical separation standards may be safe within the current surveillance environment. Any newly proposed separation scheme needs to be assessed against the risk of collisions and the probability of disruptive wake vortex encounters.

Scope

This is an applications-oriented research topic. Proposals submitted for this topic should clearly formulate a hypothesis that tactical separation minima can be reduced below current minima under a specific and clearly defined set of conditions without safety being degraded, and explain what their rationale is.

Even though this topic is not addressing collision avoidance, it is expected that a collision-risk assessment must be conducted whenever a reduction of separation minima is considered. It is also expected that wake-encounter risk assessments be carried out in support of any proposed reduction to the minima. Project proposals should explain whether they will conduct the wake-encounter risk assessment, the collision risk assessment, or both, explain the rationale for their proposed approach and describe the methodology that they will use for collecting input data and for conducting the analysis. The proposal must also explain the validation techniques they plan to use in their research. It is expected that the validation techniques include any of the validation techniques that are commonly used for concepts at low Technology Readiness Levels (TRL), including expert groups, and model based validations. Innovative validation approaches may also be proposed. The objective of the project will be to either confirm or reject their hypothesis.

The following is a non-exhaustive list of potential areas for research:

- The use of Time-Based Separation (TBS) on final approach has already been validated in SESAR. In headwind conditions TBS are lower than Distance Based Separation (DBS) thus maintaining capacity that would otherwise be reduced. At higher altitudes, winds are usually stronger, which may result in a larger difference between TBS and DBS than in final approach. Exploratory research projects may analyse the potential benefits of defining TBS minima in environments other than final approach. Research into the use of TBS may include the definition of speed-based minima (i.e. separation minima as a function of aircraft speed), potentially considering the higher resistance to wake vortex of slower propeller-powered aircraft.
- Current tactical separation minima are defined either as a lateral or as a vertical minimum. Exploratory research projects may investigate the possibility of defining separation minima that combine lateral and vertical minima. Combined separation minima would specify lateral and vertical separation minima that are individually below the existing vertical and lateral minima, but when attained simultaneously are as safe as current minima (e.g. in an environment where aircraft are currently separated 5NM laterally *or* 1.000 ft. vertically, separate them X NM laterally *and* Y feet vertically, with X less than 5NM and Y less than 1.000 ft.).
- The concept of Performance Based Navigation (PBN) brings with it the capability of clearly defined and predictable navigation performance. Projects may investigate the contribution that PBN and the associated navigation applications, specifications and technologies could make to the revision of separation minima (e.g. by reducing applicable minima when two aircraft are known to be established on tracks that they will conform to as per a specific RNP value).

Expected Impact

Applications-oriented projects in this topic are expected to contribute to the body of knowledge in the field of how separation minima can be reduced without compromising safety. The reduction of separation minima will allow for an increase of airspace capacity, which is one of the key objectives of the SESAR programme.

Type of action

Research and Innovation Action

3.2.2 SESAR-ER3-03-2016 Optimised ATM Network Services: TBO

The sharing and management of trajectory information provides consistent information which allows the use of each flight's agreed trajectory as a unique, common reference for decision-making. In a trajectory-based environment, the starting point for a flight's agreed trajectory is the Extended Flight Plan (EFPL) that has been accepted by the NM and distributed to all concerned Air Navigation Service Providers (ANSP). The agreed trajectory is the trajectory that the Airspace User (AU) agrees to fly and the ANSP agrees to facilitate, and it is used as the basis of the tactical prediction of traffic demand. However, in Trajectory-Based Operations (TBO) constraints on the flight trajectory are not systematically applied unless it is necessary to do so to fulfil an Air Traffic Management (ATM) function (i.e. separation, arrival sequencing, etc.). For this reason, the agreed trajectory is not a 4D contract that the AU is expected to adhere to within specific tolerances, and when a deviation larger than a pre-defined value is detected the agreement will be automatically updated. Moreover, due to the dynamic nature of the ATM system, the ANSP may be unable to facilitate the trajectory as agreed; in such cases a Collaborative Decision Making (CDM) revision process will be triggered. The

uncertainty over how the agreed trajectory will be executed is translated into an uncertainty on the prediction of the volume and complexity of traffic demand that is used as the basis for DCB.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 1.2 topic b).

Specific Challenge

The exploratory research challenge is to explore how the two types of uncertainties associated with the agreed trajectory (AU-originated uncertainty and ATM-originated uncertainty) affect the quality of the prediction of traffic demand, and how their impact on the quality of the predictions and on the effectiveness of DCB processes may be mitigated.

Scope

This is an applications-oriented research topic. Consortia applying for this topic shall formulate a new operational improvement in their proposal, explain the rationale for their expectation that it will provide benefits, and develop how the project would perform an initial validation of their proposed concept. It is expected that the validation techniques include any of the validation techniques that are commonly used for concepts at low Technology Readiness Levels (TRL), including expert groups, and model based validations. Innovative validation approaches may also be proposed.

The research may propose new prediction models and metrics for better understanding current and predicted traffic patterns. For example, projects may develop methods for the continuous and automatic monitoring of post-operations data in order to identify where the quality of the prediction of demand is affected by divergence between the trajectories that were actually flown from the trajectories that were agreed, and possibly identify patterns that allow the anticipation of where new divergences may happen in the future and derive correction factors that will allow an improvement in the quality of the predictions.

Projects may also propose new methods for using trajectory data for evaluating the complexity of a particular flight-list in order to improve the prediction of controller workload, and explore new concepts for Short Term Air Traffic Control Flow Management Measures (STAM) for fine-tuning the agreed trajectories in order to limit complexity or in order to bound specific uncertainties with the objective of improving the quality of the prediction. Projects may also develop innovative TBO processes for modifying already agreed trajectories in order to solve a demand and capacity imbalance, or consider how TBO processes can support innovative dynamic sectorisation concepts.

Expected Impact

The research will contribute to the improvement of the effectiveness of DCB processes in a trajectory-based environment. This will have a positive impact on the safety and cost-efficiency of the ATM system.

Type of action

Research and Innovation Action

3.2.3 SESAR-ER3-04-2016 Enabling Aviation Infrastructure: CNS for General Aviation

Communication, navigation and surveillance (CNS) systems are the building blocks on which air traffic management operates. Despite many activities in the CNS domain there remain a number of areas where more research is needed. This topic looks at CNS for GA.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 1.2 topic c).

Specific Challenge

The GA community is large and operates a wide variety of aircraft types, ranging from para-gliders costing under 2,000 € to multi-engined aircraft costing several million Euros. As CNS technologies become more complex to support the needs of the commercial aviation community, the GA community can find it hard or impossible to afford the many complex certified systems that are being developed. One possible solution is to allow smaller non-certified technologies, developed specifically to be used by the GA community, to be used alongside the more-expensive full specification, certified devices.

Scope

Research projects are expected to propose ideas for combining existing on-board, new and evolving technologies and ground equipment for enhancing CNS capabilities for GA and rotorcraft. The target community for this research is at the lower end of the capability, where many operators are private with a real need for low-cost devices. Ideas should include not only technological issues, but also how use of such equipment could be enabled through an appropriate measure of standardisation, certification and regulation.

Research ideas shall address CNS solutions for GA and rotorcraft communities, which are combined due to the similar needs for miniaturization and integration capabilities. However, it should not be assumed that all ideas will be appropriate for both communities, and differences, where identified, should be clearly addressed.

Applicants are free to select areas of research, but the following ideas are presented to stimulate thinking:

- In the communication domain, 3G and 4G (and maybe 5G) mobile telecommunications networks could be used to deliver a low-cost data link capability to enable flight, aeronautical and meteorological information to be shared with the pilot in flight.
- In the navigation domain innovative research ideas, concepts and technologies for small aircraft are needed as a suitable back-up/continuity system for GNSS (e.g. affordable inertial systems and use of ‘other’ signals (signals of opportunity) for navigation integrity). The options for advanced alternative PNT systems should also be considered.
- In surveillance, ADS-B is being widely adopted, and benefits to pilots and ATC are clear. However, take-up in the GA community is low, mostly due to the cost of certified GNSS units and transponders. Projects could investigate how non-certified units could be used to provide the benefits to the GA community and to ATC, at a reasonable cost, without adversely affecting other airspace users or the wider ATC environment.

GA pilots sometimes lack the training and experience of their professional counterparts, and so the introduction of an array of new technologies and displays into the cockpit has the potential to distract the pilot from his/her primary actions. Such information-overload, from new displays such as traffic situational awareness, moving-map displays or data link terminals, could introduce a safety

hazard by distracting the pilot from his/her visual traffic scan or from monitoring the primary flight instruments. The project shall also research the safety impact in terms of human factors associated with the introduction of new low-cost devices into the GA cockpit.

Applicants must demonstrate a good understanding of airborne aspects of GA operations and ATC. In addition, they must possess a good technological understanding of the technologies being researched and, where appropriate, spectrum management. Finally, applicants shall demonstrate a good understanding of standardisation, certification and regulation in the aviation domain.

The research activities shall cover the full picture. This includes development of the concept of operations, participation in periodic meetings, production of all the documentation related to the research (most notably including the project management plan and the final report), and results dissemination and communication activities. The demonstration report shall include a full analysis of operational, technological and regulatory issues for each technology researched. Recommendations for standardisation and regulation should be made, and anticipated difficulties should be highlighted.

Expected Impact

There is a risk that, as the aviation environment becomes more complex and CNS technologies advance, GA operators could be priced out of the market, or their activities could be restricted by not being able to integrate with more advanced aviation stakeholders and environments. This research will help to narrow the gap, ensuring continued safe and unrestricted operations by the GA community.

Type of action

Research and Innovation Action

3.2.4 SESAR-ER3-05-2016 Enabling Aviation Infrastructure: CNS

The current state of the art CNS systems are the result of very slow process where products have performed small incremental evolutions across the years. This process led to an important technological gap between what is implemented in the ATM domain and what is currently available in the public domain.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 1.2 topic d).

Specific Challenge

Projects should investigate ways to brake this cycle and introduce innovative and disruptive technologies that, when applied to the CNS ATM domain could unlock unforeseen possibilities for the community. The investigated solutions should be compatible with the aviation requirements in terms of safety, security etc.

Scope

Projects are expected to propose ideas for combining existing on-board and ground equipment for enhancing CNS capabilities. Solution for integrated CNS solutions and the implications of having one technology performing the three services at the same time can be studies (single point of failure..).

In the communications domain future innovative data-link technologies (e.g. high-bandwidth) for ATM going well beyond current ATM developments and taking into account research and

development outside ATM should be studied. This should include technology options suitable for the airport domain, continental airspace and oceanic and remote areas (including high latitudes and polar region). Research proposals are expected to address the research issues related to resistance/prevention to jamming and spoofing.

In the navigation domain innovative research ideas for advanced alternative PNT systems should be considered. Furthermore the transition from barometric to geometric (GNSS) altitude for collision avoidance issues can be studied. In addition the re-examination of both vertical and horizontal separation practices are needed in the light of improved navigation accuracy (better than declared RNP performance).

In surveillance domain research projects can address the Surveillance Performance analysis and Quality of Services (QoS) leading to a "performance based surveillance" approach that facilitates adoption of new technologies. Furthermore, research ideas are needed in the assessment of future role of non-cooperative technologies with global coverage (e.g. satellite-based, etc.) for ATM.

Expected Impact

This research will demonstrate and quantify the potential for CNS developments to improve the efficiency and performance of the ATM system at many levels. Successful research in this topic will have the potential to generate high positive benefits for ATM in terms of resource efficient and fit-for-purpose CNS capabilities as well as improvements in security.

Type of action

Research and Innovation Action

3.2.5 SESAR-ER3-06-2016 ATM Operations, Architecture, Performance and Validation

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 1.2 topic e).

Specific Challenge

The architecture of the overall ATM system is vast and complex; it has evolved piecemeal over many decades with no single 'design authority'. Introducing change into this system is often difficult since it needs to take into account the many tight interdependencies that exist across the technical subsystems together with incumbent operational and institutional frameworks. A consequence of this situation is the difficulty to know the full implications of introducing change in any part of the system or on the system as a whole. Failure to properly understand this could mean that changes are introduced that result in uncontrolled system-wide degradation. This could be a particular concern with the increasing dependence on automation.

The challenge is therefore to better understand and model how architectural and design choices influence the ATM system and its various behaviours. This may be done using existing or novel approaches from systems analysis, architecture or complexity science.

Scope

Proposals for research activities on ATM system design and architecture may start by capturing the characteristics of today's system, using an existing or novel method, to then analyse and propose evolutionary approaches aimed at guaranteeing its robust transition towards the future.

Proposals may also take a 'clean sheet' approach, exploiting the benefits of an unconstrained perspective. In either case it may be possible to learn lessons from other industries that have used new devices such as, for example, participatory design.

Research projects may propose innovative ideas for ATM system design incorporating flexibility, agility and resilience applying formal mathematical approaches at early phases of system design, or for modelling change. Furthermore, research projects may seek to provide a better understanding of the degree of coupling (loose/tight) among the different ATM subsystems, the nature of these interdependencies and their impact on the overall ATM system. New approaches should normally build on Service Oriented Architecture (SOA) principles, with multiple service levels and tailored service provision. Agility should allow the ATM system to scale and adapt to meet different requirements for different times and places. Projects may also investigate the potential use of open-source and commercial off the shelf solutions. Finally, new designs should take into account security threats.

Harmonized infrastructure is a prerequisite for developments such as virtual centers and for the possible opening of the ANS market. Research projects may assess the potential benefits, analyse how the harmonization could be introduced through regulation, incentives and EC grants. It should address transition and standardization aspects as well as the restructuring of ANS and associated cost.

Projects should be careful not to spend time re-doing previous work on architecture that has been done in SESAR or elsewhere.

Expected Impact

This research will support the ATM industry in better understanding the needs and challenges of developing a harmonised technical infrastructure for ANS, including its operational and economic impacts. Projects may demonstrate through examples and case-based arguments the potential of architecture in providing suitable means of assurance for validation or evidence to support decision-making and strategic thinking. Or the research projects may seek to provide a better understanding of the degree of coupling (loose/tight) among the different ATM subsystems, the nature of these interdependencies and their impact on the overall ATM system.

Type of action

Research and Innovation Action (RIA)

4 Topic long descriptions Work Area 2: Very Large Scale Demonstrations

This section provides full descriptions of the topics to be demonstrated within Work Area 2, structured into Specific Challenges, Scope, Expected Impact and Type of action

Some topics address SESAR Solutions defined within the SESAR programme. Full details of the SESAR Solutions can be found on the SESAR web site[1] or in the Solutions Catalogue[2].

4.1 Sub Work Area 2.1: SESAR Solutions demonstrations for High Performing Aviation in Europe

4.1.1 SESAR-VLD1-01-2016 Arrival Management Extended to En-route airspace

The demonstration will demonstrate the benefits for Airspace User (AU) in the operation of cross-border Arrival Management systems (AMAN) with an extended horizon in accordance with the Pilot Common Project (PCP)[3] First Air Traffic Management (ATM) Functionality (AF#1), as well as the demonstration of AU involvement in the operation of two AMAN-related advanced concepts: the Target Time (TT) management concept and the Arrival Flexibility (A-FLEX) concept, which connect the Extended AMAN concept to the PCP Fourth ATM Functionality (AF#4).

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 2.1 topic a).

Specific challenge

The use of an extended horizon for Arrival Management (AMAN) creates an overlap in terms of look-ahead time between queue management processes and Air Traffic Flow Control Management (ATFCM) Target Time (TT) management processes, as well as introducing an increased need for cross-border coordination. These challenges also create new opportunities for the development of operating methods that make it possible the increased participation of AUs through Collaborative Decision Making (CDM) Processes, including A-FLEX processes. The active involvement of AUs in this demonstration is needed for the evaluation in a live environment of these concepts and the quantification of their benefits.

Scope

Extended AMAN and TT management have been subject to research and development in the SESAR programme, with deployment-ready results published as solution packs (SESAR Solution 5, Extended Arrival Management Horizon, and SESAR solution 18, Calculated Takeoff Time (CTOT) and Target Time of Arrival (TTA)). The Extended AMAN, the AFLEX and the TT management concepts are subject to continuing current Industrial Research (IR) and Very Large Scale Demonstration (VLD) activities within the SESAR 2020 programme. This project will demonstrate the airspace user perspective of these concepts, and it must ensure that its activities are to be coordinated with parallel projects working in this area. In particular, this action follows on from the Project PJ25 XSTREAM funded under call H2020-SESAR-2015-2.

[1] http://www.sesarju.eu/solutions
[2] http://www.sesarju.eu/newsroom/all-news/sesar-solutions-catalogue-and-interactive-map
[3] EC IR (EU) No 716/2014

Consortia applying to this topic must include at least one AU, and they may include additional entities provided their role in supporting the demonstration from the AU perspective is adequately justified in the proposal. Participation of AUs with a variety of airframe/engine configurations so as to be representative of the fleet composition currently operating in Europe is considered as significant added value. Applicants should demonstrate how their flying programme will provide the benefits expected to be derived from the project.

For the Extended AMAN trials there is no need for specific avionics equipment beyond what is currently required for operating in European airspace, and there will be no need for updating Airline Operations Centre (AOC) systems either. For the demonstration of the TT management and A-FLEX concepts, no avionics modifications are required, but AOC systems and processes may need to be updated.

AUs shall perform the demonstrations in collaboration with parallel demonstration projects dealing with the same subject to develop the concept of the demonstrations, participation in activities preparing the trials, participation in periodic follow-up meetings, production of all the documentation related to the demonstration as well as results dissemination and communication activities. Output from the demonstration shall include a report by each participating AU containing a full analysis of the impact of the procedures on AU performance.

Participating AUs will not need to dispatch any flights for the sole purpose of the demonstrations, i.e. participation shall always be through revenue flights. The demonstration flights shall land at the following major European Hubs: London Heathrow and Gatwick, Paris CDG/ORLY, or Zurich; their route must overfly one or more of the following ACCs: Maastricht, Reims, Paris, London, Karlsruhe, Brest, Shannon, Prestwick, Langen, Munich, Genève, Marseille, or Bordeaux.

The consortium shall provide support to the ANSPs running the demonstrations in which they participate through this grant all along the demonstration lifecycle. This expected support includes collaboration for developing the concept of the demonstrations, participation in activities preparing the trials, periodic follow-up meetings and support for the production of all the documentation related to the demonstration, as well as participation in the demonstration dissemination and communication activities. Output from the demonstration shall include a report by each participating AU containing a full analysis of the impact of the procedures on AU performance.

The consortium shall provide to the ANSP running the demonstrations in which they participate relevant data from their demonstration flights for the operational evaluation of the performance of the concepts under demonstration. These data may include, among others, questionnaires or other feedback by airline staff (flight-crews and/or Airline Operations Centre (AOC) personnel), fuel burn data (potentially including suitably aggregated and de-identified FDR data), scheduling and punctuality data and descent efficiency data.

Applicants should note that all flights operating in the areas where SESAR extended AMAN demonstrations are taking place will need to comply with all instructions issued by ATC that originate from the extended AMAN concept (typically speed commands or lateral route revisions).

Expected Impact

The demonstration will pave the way for implementing the E-AMAN as required in the PCP Regulation i.e. within an integrated global collaborative management of arrivals, including Airports, ACCs and Airlines, as well as for the implementation of the related advanced concepts AFLEX and advanced TT management. The objective is to reduce ATFCM and Arrival Sequencing and Metering

Area (ASMA) delays in the TMA/E-TMA and also to increase flight efficiency. Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan.

Type of Action

Innovation Action

4.1.2 SESAR-VLD1-02-2016: Integrated Airport

This demonstration project will coordinate the Airspace User (AU) involvement in the demonstration of innovative airport operations functionalities designed to improve airport operations. The functionalities that will be demonstrated are advanced concepts that are related to the core scope of the second Air Traffic Management (ATM) Functionality of the Pilot Common Project (AF#2 of the PCP).

In particular it demonstrates the use of two distinct functionalities designed to improve airport operations from an airspace user perspective: ***on-board surface traffic alerting system*** and ***On-board taxi route guidance.***

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work Area 2.1 topic b).

Specific Challenge

Traffic growth is expected to strengthen for the coming years in most European airports. One of the major challenges, those airports will have to encounter within the next years is to manage increased congestion while maintaining safety. Whilst ground technology will play a significant part in addressing these challenges, the airspace users must integrate seamlessly, without incurring unacceptable additional costs.

Scope

This action, which follows on from the project PJ28 IAO funded under call H2020-SESAR-2015-2, will organise the participation of airspace users in the demonstration of two distinct functionalities being developed to improve airport integration and throughput:

- On-board surface traffic alerting; and
- On-board taxi-route guidance.

Consortia applying for this topic must include at least one AU, and may include additional entities provided their role in supporting the demonstration from the AU perspective is adequately justified in the proposal.

The intended function of the ***on-board surface traffic alerting system*** is to increase flight crew's situational awareness and reduce a risk of collision with other traffic on the airport's surface through the use of a dedicated display featuring an airport moving map showing an airport layout and also the position and state of the own aircraft and its surrounding traffic, using ADS-B data.

This Wave 1 demonstration will focus on gathering a large amount of ADS-B data from revenue flights to allow off-line analysis with a view to verifying its performance and assessing its suitability for use in the traffic-alert context.

The off-line analysis, comparing the logged ADS-B data with data from A-SMGCS systems, will be undertaken by a parallel demonstration project. AU involvement shall be as follows:

- Several aircraft shall be equipped with logging equipment. The flights shall be conducted mainly within Europe. The data that will be logged consists of the own aircraft and other ADS-B information received during these regular flights.
- The equipment installation will need to be approved by appropriate authorities.
- Data shall be logged and provided to the parallel project for off-line analysis.
- The airspace users will support the off-line analysis by providing pilot feedback on the alerting that is possibly required to adjust thresholds for alerts.

On-board taxi route guidance can be provided either through manual taxi clearance insertion made by flight crews, or by the D-TAXI capability. The taxi clearance information depicted in the cockpit on a suitable display with an airport moving map significantly increases flight crews' situational awareness, especially on complex airports.

Since D-TAXI is not widely available, this demonstration will demonstrate, on several aircraft platforms, the safety and situational awareness improvements associated with the provision of manual taxi routes to the flight crews on an Electronic Flight Bag (EFB) device, using a single airline and several taxiing aircraft. This demonstration will thus support SESAR Solution #26: Manual Taxi Routing Function.

The demonstration approach will be:

- An on-board surface routing and guidance system that has already achieved proven V3 maturity in SESAR will be provided to the airline. The system provider will support the airline in obtaining all required operational approvals from local authorities.
- Once approved, the airline will use the on-board surface routing and guidance system on several aircraft flying their regular short- and long-haul revenue flights within and possibly outside of Europe.
- Once flight crews receive the taxi clearance information from ATC via radio communication means, they will manually insert the taxi clearance information into the on-board surface routing and guidance system EFB application.
- The system will depict the taxi clearance on the EFB display layered over an airport moving map.
- Flight crews will use the display during all airport surface operations as needed, and will have a better awareness of the taxi situation on the airport, allowing safety and operational improvements.
- Flight crews will be required to use the EFB application when taxiing on the airport surface, e.g. before taxiing for take-off as well as after landing. In cooperation with the parallel demonstration project, operational feedback will be periodically retrieved from flight crews to evaluate and confirm the system's performance and benefits.

AUs shall perform the demonstrations in collaboration with parallel demonstration projects dealing with the same subject to develop the concept of the demonstrations, participation in activities

preparing the trials, participation in periodic follow-up meetings, production of all the documentation related to the demonstration as well as results dissemination and communication activities. Output from the demonstration shall include a report by each participating AU containing a full analysis of the impact of the procedures on AU performance.

Participating AUs will not need to dispatch any flights for the sole purpose of the demonstrations, i.e. participation shall always be through revenue flights. Participating AUs shall make available data from their revenue flights for the operational evaluation of the performance of the concepts under demonstration. These data may include, among others, questionnaires or other feedback by airline staff (flight-crews and/or Airline Operations Centre (AOC) personnel), fuel burn data (potentially including suitably aggregated and de-identified FDR data), and scheduling and punctuality data. Applicants shall demonstrate how the scale and nature of their proposed flying programme will provide the benefits expected to be derived from the project.

Expected Impact

This demonstration project aims to form a bridge between SESAR 1 industrial research and the deployment phase by deploying demonstration platforms in a close-to operational environment in order to demonstrate the advantages of the new functionalities and to serve as a de-risking activity for the large-scale deployment of PCP-related functionalities.

Therefore, the ambition of the demonstration is to minimize the risk of the Airport Safety Nets concept deployment as well as of the on-board traffic alerting system and the Manual Taxi Clearance insertion function. Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan.

Type of Action

Innovation Action

4.1.3 SESAR-VLD1-03-2016 Network collaborative Management

Network Collaborative Management (NCM) processes includes the participation of local actors in Air Traffic Flow Control Management (ATFCM). Airports, Flow Management Positions (FMP) located at European Air Navigation Service Providers (ANSP) now bear collaboratively with the Network Manager (NM) the management of DCB processes.

This demonstration will demonstrate Airspace User (AU) involvement in Demand Capacity Balancing (DCB) Collaborative Decision Making (CDM) processes managed by FMPs and by airports, in accordance with the PCP AF#4.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work Area 2.1 topic c).

Specific Challenge

The new NCM concept of operations offers increased opportunities for AUs to participate in DCB CDM processes, because they can now collaborate with local DCB actors as well as with NM. The active involvement of AUs in this demonstration is needed for the evaluation in a live environment of these concepts and the quantification of their benefits.

Scope

NCM has been subject to research in the SESAR programme. Mature results are publicly available in the solution packs for the following SESAR solutions:

- SESAR solution 56 (ATFM Slot Swapping)
- SESAR solution 57 (UDPP Departure)
- SESAR solution 17 (Advanced Short Term ATFCM Measures (STAM))
- SESAR solution 18 (CTOT and TTA)
- SESAR solution 21 (Airport Operations Plan and Network Operations Plan seamless integration)

NCM is subject to continued Industrial Research (IR) and Very Large Scale Demonstration (VLD) activities within the SESAR 2020 programme. This project must ensure that its activities are coordinated with parallel projects working in this area.

In particular, this action follows on from the project PJ24 NCM funded under call H2020-SESAR-2015-2. Consortia applying for this topic must include at least one AU, and may include additional entities provided their role in supporting the demonstration from the AU perspective is adequately justified in the proposal. Applicants should demonstrate how their flying programme will provide the benefits expected to be derived from the project.

In current operations, AUs participate in DCB processes though NM's Airport Operators Liaison Office (AOLO), that allows, for example, the coordination of re-routing options for avoiding delays. Slot-swapping processes are also available through NM. In this demonstration, new AU participation concepts will be demonstrated, in order to allow their business priorities to be taken into account in locally-managed DCB processes.

AUs shall perform the demonstrations in collaboration with parallel demonstration projects dealing with the same subject to develop the concept of the demonstrations, participation in activities preparing the trials, participation in periodic follow-up meetings, production of all the documentation related to the demonstration as well as results dissemination and communication activities. Output from the demonstration shall include a report by each participating AU containing a full analysis of the impact of the procedures on AU performance.

Participating AUs will not need to dispatch any flights for the sole purpose of the demonstrations, i.e. participation shall always be through revenue flights. For participating in these trials there is no need for specific avionics equipment beyond what is currently required for operating in European airspace. However, Airline Operations Centre (AOC) processes and systems may need to be updated, and participating AUs may be required to file Extended Flight Plans (EFPL) for the demonstration flights.

Demonstration flights must be in at least one of the following two categories:

- Flights overflying the area controlled by the following ANSPs: MUAC, DSNA, DFS, NATS or ENAIRE.
- Flight taking off or landing at one of the following airports: Madrid, Barcelona, Palma de Mallorca, Alicante, London Heathrow or Split.

The expected involvement of consortia answering to this open call shall be in accordance to the following requirements:

- The consortium shall work in collaboration with other demonstration project on NCM all along the project including preparation of the trials. This expected support includes

collaboration for developing the concept of the demonstrations, participation in activities preparing the trials, periodic follow-up meetings, support for the production of all the documentation related to the demonstration, as well as participation in the demonstration dissemination and communication activities. Output from the demonstration shall include a report by each participating AU containing a full analysis of the impact of the procedures on AU performance.

- Consortia shall provide to the ANSP relevant data from their demonstration flights for the operational evaluation of the performance of the concepts under demonstration. These data may include, among others, questionnaires or other feedback by airline staff (flight-crews and/or Airline Operations Centre (AOC) personnel), fuel burn data (potentially including suitably aggregated and de-identified FDR data), scheduling and punctuality data and descent efficiency data.

Participation in advanced Target Times (TT) management demonstration concepts shall be optional. AUs submitting bids to this call should specify whether their offer includes their participation in the demonstration of TT management concepts, which will be considered an added value in the evaluation of proposals. AUs participating in the demonstration of TT management concepts shall be required to operate flights fully in accordance with the concept being demonstrated (e.g. potentially by flying at a Cost Index (CI) different from the AU's preferred CI or rejecting a tactical path-shortening instruction for the purpose of complying with an assigned TT).

Expected Impact

The demonstration will pave the way for implementing concepts from the PCP Air Traffic Management (ATM) NCM functionality, which is a cornerstone of the future performance-driven ATM environment in Europe. The objective is to ensure cost-efficiency and capacity performance goals are met while at the same time AU's operational needs and requirements are fulfilled. Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan.

Type of Action

Innovation Action

4.1.4 SESAR-VLD1-04-2016: Initial Trajectory Information sharing

This demonstration will demonstrate the airborne aspects of the synchronization of the air and ground views of the trajectory based on the downlinking of the Automatic Dependent Surveillance (Contract) (ADS-C) Aeronautical Telecommunications Surveillance Baseline 2 (ATN B2) Extended Projected Profile (EPP) data from aircraft to the ground systems, in accordance with the provisions of the PCP AF#6.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 2.1 topic d).

Specific Challenge

The collection of ADS-C data from revenue flights operated from different AUs in a variety of operational conditions is necessary in order to understand the impact of a diversity of operating practices on the data that is effectively downlinked. This will allow the fine tuning of the requirements for the integration of the downlinked data into the ground systems.

Scope

Initial trajectory sharing has been researched in the SESAR programme. Full details of the SESAR Solutions can be found on the SESAR web site[4] or in the Solutions Catalogue[5]. As a guide, SESAR solution 115 "Initial Trajectory Information Sharing" is the most relevant solution demonstration activity. Note that Solution 115 is under development and is, at the time of writing, not yet published.

The airborne trajectory prediction done by the Flight Management System (FMS) takes into account flight performance data that is updated in real time during the execution phase, such as descent planning information, aircraft weight, and the most updated temperature and wind predictions. This solution allows the downlinking of data based on the airborne trajectory prediction using the Extended Projected Profile (EPP), as defined by the Aeronautical Telecommunications Network Baseline 2 (ATN B2). The downlinked data is used by the ground systems to enrich their trajectory prediction.

The topic is subject to on-going Industrial Research (IR) and Very Large Scale Demonstration (VLD) activities within the SESAR 2020 programme. This project must ensure that its activities are coordinated with parallel projects working in this area. In particular, this action follows on from the project PJ31 DIGITS funded under call H2020-SESAR-2015-2. Consortia applying for this topic must include at least one AU, and may include additional entities provided their role in supporting the demonstration from the AU perspective is adequately justified in the proposal.

Demonstration flights shall take place in the area controlled by the following ACCs: Maastricht, Karlsruhe and London. Participating Airspace Users (AU) will not need to dispatch any flights for the sole purpose of the demonstrations, i.e. participation shall always be through revenue flights. It is desirable that a variety of airframes participate in this demonstration, so as to be representative of the fleet operating in the International Civil Aviation Organization (ICAO) EUR region. Applicants should demonstrate how their flying programme will provide the benefits expected to be derived from the project.

It is a pre-requisite for each airframe taking part in this demonstration that it is equipped with datalink able to deliver "Best in Class" performance as defined by the ELSA report [8] Each airframe taking part in this demonstration will need to be equipped with ATN B2 communications equipment, potentially including the full automatic upload onto the FMS of uplinked Controller Pilot Datalink Communications (CPDLC) commands. ATN B2 upgraded aircraft will need to retain their ATN B1 equipment, and will need to be capable of either switching between one and the other or operating them in parallel as required by the demonstration. The upgrade of Flight Management Systems (FMS) to DO236C standards may also be necessary.

The final equipment and configuration will need to have final airworthiness approval by EASA. The cost of those upgrades to the avionics that are necessary for the demonstration will be eligible for co-financing under this grant.

During the demonstration flights, flight crews will be required to perform the tasks associated with the management of the newly installed equipment, but will otherwise be expected to conduct their flights as usual in order to provide realistic data for the operational evaluation of the concept of air/ground trajectory synchronization. The demonstration may include the uplink through ATB B2 CPDLC of 3D routes (e.g. descent routes with constraint along the way). 3D routes may be uplinked

[4] http://www.sesarju.eu/solutions

[5] http://www.sesarju.eu/newsroom/all-news/sesar-solutions-catalogue-and-interactive-map

without a clearance (e.g. through EXPECT CPLDC messages) in accordance with the innovative share-the-ground-plan concept, in order to allow the FMS to anticipate the descent profile before a clearance can be effectively delivered by ATC.

The expected involvement of consortia answering to this open call shall be in accordance to the following requirements:

- AUs shall perform the demonstrations in collaboration with parallel demonstration projects dealing with the same subject to develop the concept of the demonstrations, participation in activities preparing the trials, participation in periodic follow-up meetings, production of all the documentation related to the demonstration as well as results dissemination and communication activities. Output from the demonstration shall include a report by each participating AU containing a full analysis of the impact of the procedures on AU performance.
- Participating AUs will not need to dispatch any flights for the sole purpose of the demonstrations, i.e. participation shall always be through revenue flights. Participating AUs shall provide to the ANSP relevant data from their revenue flights for the operational evaluation of the performance of the concepts under demonstration. These data may include, among others, questionnaires or other feedback by airline staff (flight-crews and/or Airline Operations Centre (AOC) personnel), fuel burn data (potentially including suitably aggregated and de-identified FDR data), scheduling and punctuality data and descent efficiency data.
- In addition to the aforementioned data, it would be preferable that a log of how each individual demonstration flight was managed (flight crew FMS/Flight Control Unit (FCU) automatically-recorded flight-crew input log and data and voice communications log) was made available for the portion of the flight in which the demonstration takes place. This detailed log is valuable in order to perform a comparison against the downlinked EPP data logs, with the objective of better understanding the interrelation of operational flight management actions and the data that is downlinked from the aircraft. AUs applying for this call must specify in their bid if they will provide these logs, and if so they must also describe how they will ensure that the confidentiality and access rights of the participating flight crews are respected.

Expected Impact

This demonstration will pave the way for the implementation of the AF6 of the PCP. The synchronization of the air and ground trajectories is expected to bring benefits in terms of flight efficiency, mainly by enabling better descent profiles and improved arrival sequencing. The better quality of the ground trajectory prediction will also allow the improvement of the tools that support controllers, thereby increasing ANS productivity. Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan.

Type of Action

Innovation Action

4.1.5 SESAR-VLD1-05-2016: Efficient services and infrastructure delivery

This demonstration will address common support function which would allow temporary provision of some services or information such as Flight plan or radar information in order to ensure continuity in the delivery of efficient ATS services in case of major technical failure at one of the ACCs.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work Area 2.1 topic e).

Specific Challenge

As the airspace of Europe becomes ever more congested, the ability of the Network to absorb the disruption resulting from a significant loss of capacity for numerous reasons, including technical failure, degrades. This has the potential to lead to widespread delays and eventually cancellations to flights which result in unacceptable disruption and unexpected extra costs for airlines and passengers alike.

Scope

The aim of this topic is to demonstrate examples of how resilience in ATM service provision can be increased through the geographical decoupling of the ATM Data Service Providers from the Air Traffic Service Units so that, in the event of failure, ATM data services could be provided from a remote location. This concept is known as 'virtualisation'.

Projects should build on the introductory work conducted within SESAR 1 and SESAR Industrial Research project PJ.16 ('CWP/HMI'). However, while the latter will be investigating the full scope of the Virtual Centre concept, projects awarded under this topic will have to identify and demonstrate quick-wins that will help to provide valuable insight and experience with the concept of virtualisation, and so provide 'lessons-learned' to the wider investigation and developments conducted in SESAR2020.

The services identified as candidates for virtualisation are as follows:

- Flight Data Management;
- Flight Data Distribution;
- Coordination and Transfer;
- Correlation Management;
- Correlation Distribution ;
- Arrival Sequence Distribution and Management (AMAN);
- Monitoring Aids (MONA) Distribution;
- Safety Nets (SNET) Distribution and Management;
- Medium Term Conflict Detection (MTCD) and Management;

Projects should be conducted by at least two ANSPs to develop a common contingency demonstration environment to demonstrate improved continuity of efficient ATM service provision, in high-level en-route airspace, in the event of a major technical failure at one of Europe's major Air Traffic Control Centres (ACCs). The project will investigate how virtualisation could be used in this regard.

Projects will consider and evaluate the three streams of the virtualisation concept, reporting in detail on each within the scope of the demonstration. The three streams are:

- Business;
- Operational; and

- Technical.

Output from the project should include observations and recommendations for procedural, operational, technological, regulatory and standardisation activities that would be necessary to enable the wider implementation of virtualisation within the ATM domain.

The demonstration activities shall cover the full demonstration lifecycle. This includes development of the concept of the proposed demonstrations, production of all the documentation related to the demonstration (most notably including the demonstration plan and the demonstration report), and results dissemination and communication activities. The demonstrations have to be backed by an appropriate project management structure that is centred on timely delivery, including notably robust quality and risk management.

Expected Impact

ATM service provision can be severely impacted by serious technical failures and increased resilience of this service provision would provide significant economic benefits to aviation stakeholders and the communities they support.

Type of Action

Innovation Action

4.1.6 SESAR-VLD1-06-2016: Increased access to airports for low visibility mixed fleet operations

This demonstration will address the use of advanced on-board equipment and GNSS augmentation through EGNOS or GBAS by business aviation to support safe access to small and medium-size airports to ILS Cat II and Cat III-equivalent minima.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work Area 2.1 topic f).

Specific challenge

Not all airports have advanced landing aids as the ones currently found at larger airports which allow operations in bad weather. Small to medium size airports are located in geographical locations where IFR approaches are difficult or impossible due to their proximity to high terrain or other obstacles. Business Aviation needs to operate, with increased resilience, at such smaller airfields. However, the concepts being demonstrated will be of relevance to all airports where any reduction of landing minima could be implemented, to the benefit of all types of operator.

Scope

The purpose of this demonstration is to demonstrate:

- Use of RNP procedures to enable IFR approaches at airports where landing aids do not currently exist to support landings to ILS Cat II/III equivalent minima; and
- Use of flight-deck vision-support systems which, when combined with other landing aids, enable landings to ILS Cat II/III equivalent minima.

The project will build on previous SESAR research and demonstration work and will help to further develop existing SESAR Solutions, including:

- Solution 55: Precision approaches using GBAS Category II/III;
- Solution 09: Enhanced terminal operations with RNP transition to ILS/GLS;
- Solution 51: Enhanced terminal operations with RNP transition to LPV; and
- Solution 103: Approach procedures with vertical guidance.

The demonstrations will comprise live flights. These flights could be with dedicated trials aircraft or with standard commercial flights, subject to the appropriate regulatory approvals. It is intended that consortia applying for this demonstration will comprise all relevant stakeholders, including AU, ANSP, airport operator and industry, as appropriate. However, where not included directly in the consortium, applicants shall explain in their proposal how their involvement will be assured.

The demonstration should cover as wide a range of GNSS procedures as possible, including SBAS and, if possible GBAS. The demonstration shall include the use of flight-deck vision systems, such as synthetic vision systems (SVS) and enhanced flight vision systems (EFVS) which, when used in combination with augmented GNSS approaches, could further reduce landing minima. Applicants shall demonstrate how the nature and scale of their proposed flying programme will provide the benefits expected to be derived from the project.

It is recognised that demonstrating Cat II and especially Cat III approaches may be problematic in the current regulatory and technological environment. The demonstration shall demonstrate approaches to as low a minimum as possible and, should this not equate to Cat II or Cat III, a detailed analysis shall be performed to highlight issues and create a technological and regulatory roadmap to enabling achievement of full Cat II and Cat III operations.

Applicants for this demonstration must have aircraft that are certified to fly RNP approaches with EGNOS-augmented vertical guidance, that is specifically not BARO VNAV, and, optionally, GBAS approaches. In their proposals they must specify the airframes that they intend to use for the demonstration, detailing their equipage level. The demonstration shall use certified equipment for GNSS approaches and perform demonstrations at locations where the possibility of operational deployment exists on completion of the demonstration.

Applicants shall explain in their proposal which data they will collect and make available for the operational evaluation of the performance of the concepts under demonstration. These data may include, among others, questionnaires or other feedback by flight crews, fuel burn data (potentially including suitably aggregated and de-identified FDR data), and approach efficiency data.

Credit will be given to applicants who include both fixed-wing and rotorcraft stakeholders in their consortium, and who demonstrate a firm agreement with stakeholders regarding location(s) for the demonstration.

The demonstration activities shall cover the full demonstration lifecycle. This includes development of the concept of the demonstrations, production of approach plates, participation in periodic meetings, production of all the documentation related to the demonstration (most notably including the demonstration plan and the demonstration report), and results dissemination and communication activities. The demonstration report shall include a full analysis by each participating stakeholder of the impact of the demonstrated concept on performance within their sphere of operations. Recommendations for standardisation and regulation should be made, and anticipated difficulties should be highlighted.

Expected Impact

This demonstration project will show how access to small, medium and remote airports in bad weather conditions can be improved for business aviation. It will also improve resilience at airports where business aviation operators currently fly, through reducing the impact of bad weather on their operations. Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan.

Type of Action

Innovation Action

4.2 Sub work area 2.2 Global interoperability

4.2.1 SESAR-VLD1-07-2016 Applications for trajectory based and queue management using EPP extended into oceanic/intercontinental operations: Inter-continental trajectory based operations enabled by Satellite based CNS

Aviation is a global industry and interoperability together with global harmonisation are key for its safe and sustained growth, the activities in the scope of this call should address global interoperability demonstrations targeting operational changes that are considered to be on the critical path for ATM modernisation.

The SJU works to promote global interoperability and harmonisation through active engagement in the development and the implementation of the International Civil Aviation Organisation's (ICAO), Global Air Navigation Plan (GANP) and its Aviation System Block Upgrade (ASBUs). To this end, it has entered into cooperation arrangements with a number of international partners.

The awarded project is expected to set up a global demonstration that involves non-European regions and ATM actors. The consortium should show sufficient involvement of the required stakeholders for the success of the project (ANSPs, Airspace Users, Industries, global partners...).

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work Area 2.2 topic a).

Specific Challenge

This topic is about demonstrating that trajectory based operations can be performed with global interoperability using satellite data communication, navigation and surveillance as the enabler for seamless transitions. An essential objective is to demonstrate the feasibility of combining SESAR's Continental initial trajectory sharing concept (i4D EPP) with oceanic and Inter-continental operations. In particular the project is expected to prove that Satellite technology like Satcom can operate as a versatile enabler to global datalink without the need for aircraft to equip with as many avionics configurations as today. Additionally, the project is expected to take advantage of the ongoing initiatives on Satellite based surveillance over the oceanic airspace to demonstrate opportunities to reduce separation and enhance ATM performance.

Projects should ensure that they include content/scope of work leading to specific comments and recommendations relating to ICAO provisions and standardisation as well as towards Standards Making Organisations (SMO´s).

Scope

Trajectory-based operation includes the management of Trajectories focussing on the flight needs in 4 dimensions through the lifecycle of planning, execution and post-flight analysis. The aim of the TBO is as described in SESAR and ICAO to improve performance of air traffic operations and increase the overall predictability of the air traffic system. The 4D Trajectory (4DT) information set encompasses relevant trajectory flight data, including latitude, longitude, altitude, and time. NextGen and SESAR activities on this subject are well under way and have with a number of States and stakeholders agreements of the TBO concepts need of models for exchanging and sharing 4DT information.

The scope of the successful project should include the following elements at minimum:

- A significant number of Inter-continental revenue flights involving aircraft equipped with the required avionics supporting the capabilities for the demos.
- Simultaneous use of satellite Communication, Navigation and Surveillance capability.
- Enhanced ATM operations in continental and oceanic airspace
- Initial trajectory exchange (i4D/EPP)
- Satellite-based Communication, Navigation and Surveillance capability (eg Satcom, SBB)
- Investigation of technical solution for Satcom that seamlessly operates in ATN-B2 and FANS environments
- Investigation of technical solution for gateways accommodating both ATN/OSI and ATN/IPS in the same region.
- Based on a significant number of Inter-continental revenue flights, the demonstration should operate Advanced ATM operations (i4D, PBN, enhanced arrivals/departures, reduced separations, IM…) in the various phases of flight with CNS services being enabled by satellite solutions (Satcom, Satellite-based ADS-B and GNSS).
- Production of public communication material (eg brochures, video, website…)

Applicants should demonstrate how their flying programme will provide the benefits expected to be derived from the project. Due to the complex nature of this project, the awarded consortium should demonstrate and implement strong level of project management and reporting principles (structure, milestones, intermediate steps, documentations, risk management…).

Activities under this topic will focus on demonstrating the performance of SESAR enabled solutions with clear operational applications objective. Interaction with relevant demonstration platforms, in and outside of Europe is within scope, but most of the work should cover the ability of operational stakeholders to communicate, exchange data, and use the information that has been exchanged to improve performance in operational (or close to operational) environments.

The project should take advantage of the SESAR solutions (Full details of the SESAR Solutions can be found on the SESAR web site[6] or in the Solutions Catalogue[7]). In particular:

- Solution #115: Initial Trajectory Information Sharing :
  The airborne trajectory prediction performed by the Flight Management System (FMS) takes into account flight performance data that is updated in real time during the execution phase, such as descent planning information, aircraft weight, and the most updated temperature

[6] http://www.sesarju.eu/solutions

[7] http://www.sesarju.eu/newsroom/all-news/sesar-solutions-catalogue-and-interactive-map

and wind predictions. This solution allows the downlinking of data based on the airborne trajectory prediction using the Extended Projected Profile (EPP), as defined by the Aeronautical Telecommunications Network Baseline 2 (ATN B2). The downlinked data is used by the ground systems to enrich their trajectory prediction.

- Solution #109: Air Traffic Services (ATS) datalink using Iris Precursor:
  The solution offers a viable option for air traffic services (ATS) datalink using existing satellite technology systems to support initial four-dimensional (i4D) datalink capability. The technology can be used to provide end-to-end air–ground communications for i4D operations, connecting aircraft and air traffic management ground systems.

An example of a demonstration covering the requirements could be the following:

- The aircraft uses the SWIM services before departure for weather information and AOC coordination. AMAN/DMAN connectivity could be included as well.
- Advanced departures could be performed in the take-off with for example noise abatement procedure.
- All along the European Airspace, the aircraft is expected to perform ATN B2 initial trajectory sharing with CPDLC and ADS operating over Satcom. When appropriate, oceanic track entry could be optimised using the downlinked information. Over the Ocean, the demonstration could take benefit from the reduced separation enabled by Satellite based ADS-B combined with Communication capability enabled by the Satcom. Advanced Oceanic procedures could also be included.
- When arriving to the destination, the aircraft could demonstrate enhanced queue management techniques and arrival procedures (Extended AMAN, PBN approaches, RNP to XLS transitions using the GNSS). The data communication will be operated over Satcom in the target region.

Expected Impact

The provision of Satellite enabling trajectory based operations will offer a solution for the long-haul carriers the possibility to significantly lower their procurement costs and benefit from versatile enablers to global interoperability without the need for aircraft to equip with as many avionics configurations in the absence of any additional service.

Due to non-radar coverage, the current lateral separation standard in the oceanic airspace is significantly greater than the standard in the continental airspace (approximately 4 times more conservative). Reducing the separation standard over the oceanic airspace, through the use of combined satellite based surveillance and communication will allow for a significant improvement in ATM capacity and performance.

Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan

Type of Action

Innovation Action

4.2.2 SESAR-VLD1-08-2016 Applications for improved flight trajectories using SWIM B2B services

This VLD builds on solution 46, System Wide Information Management.

Aviation is a global industry and interoperability together with global harmonisation are key for its safe and sustained growth, the activities in the scope of this call should address global interoperability demonstrations targeting operational changes that are considered to be on the critical path for ATM modernisation.

The SJU works to promote global interoperability and harmonisation through active engagement in the development and the implementation of the International Civil Aviation Organisation's (ICAO), Global Air Navigation Plan (GANP) and its Aviation System Block Upgrade (ASBUs). To this end, it has entered into cooperation arrangements with a number of international partners.

The awarded project is expected to set up a global demonstration that involves non-European regions and ATM actors. The consortium should show sufficient involvement of the required stakeholders for the success of the project (ANSPs, Airspace Users, Industries, global partners...).

This demonstration involves the Airspace Users (AUs), the DCB (Demand and Capacity Balancing) units and the ANSPs (Air Navigation Service Providers) as well as their supporting manufacturing industries in the pre-operational demonstration for the ICAO FF-ICE (Flight and Flow in a Collaborative Environment) step 1 implementation following available ICAO guidance and material. As such, the focus is on the exchange of pre-departure flight data information and applying distribution mechanisms as defined in the ICAO ATMRPP (draft) provisions.

The demonstration will be conducted in a global context in collaboration with international partners, implying that the established interoperability will have a focus beyond the European boundaries. Data exchanges have to be based on the globally standardized FIXM 4.0 format (Flight Information Exchange Model, see www.fixm.aero) including the 4DT (4-Dimensional Trajectory), the FSPD (Flight Specific Performance Data) and the GUFI (Globally Unique Flight Identifier).

Optional activities include the usage of SWIM B2B services for the exchange of updated route planning during the execution of the flight between AU, DCB and ANSP.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work Area 2.2 topic b).

Consortia applying for this topic must include at least one AU, and may include additional entities provided their role in supporting the demonstration from the AU perspective is adequately justified in the proposal.

Specific Challenge

SESAR will reach out to its existing network of international partners. In addition an active contribution is expected from the participating parties by using their own global network to expand the community of international partners participating to the SESAR FF-ICE/1 global demonstrations. To demonstrate such active contribution, a letter of intent of non-European partners of consortium members for participation to the global demonstration, could be included in project proposals, bearing in mind that the non-European partner's effort is not eligible for funding through this call. This approach is similar to the approach used in the SESAR SWIM Global Demonstration 2016.

This demonstration will not only serve as a demonstration, but also serve as a validation of effectiveness of the global interoperability aspects of the ICAO FF-ICE/1 provisions and the supporting FIXM 4.0 elements.

Scope

The main scenario is to have an AU with or without supporting CFSP (Computer Flight plan Software Provider) submit an eFPL (Extended Flight Plan) as a filing request to the DCB and participating ANSPs and for those ANSPs to respond accordingly, followed, if necessary, by the required update by the AU.

The expected involvement of parties answering to this open call shall be in accordance to the following terms of reference:

- Demonstrations will be conducted using pre-operational systems using operational flight data.
- Providing and/or consuming the 4DT (4-Dimensional Trajectory), the FSPD (Flight Specific Performance Data) and the GUFI (Globally Unique Flight Identifier) is mandatory.
- Optional demonstrations would aim at demonstrating the use of B2B services for post departure route planning update, and providing feedbacks on the management of an updated route along the ATM chain (including Flow Management units, ATC, AOC, pilots)
- Participating AUs shall operate outside Europe to one or more regions of one or more international partners of SESAR, and contribute to the demonstration with these intercontinental flights.

The following potential demonstration activities are presented to assist applicants to scope their proposals. However, the list should not be considered prescriptive or exhaustive, and applicants may expand or reorganise the issues as required to present cost-effective demonstrations:

- Contribute to and review demonstration approach, operational scenario and technical architecture
- Contribute to, review and apply service definitions exchanged through the SWIM registry
- Prepare pre-operational systems to support FF-ICE/1 and FIXM 4.0
- Participate to the various phases of the dry-runs with international partners
  - connectivity testing
  - scenario testing
  - demonstration dress rehearsal
- Conduct and record flights with support of pre-operational systems (in shadow-mode).
- Attend one or more global demonstration events, replaying recorded flights and demonstrating pre-operational systems
- Provide feedback on lessons learned on all aspects of the demonstrations, including on the FF-ICE provisions and supporting FIXM 4.0.

Expected Impact

As the SWIM B2B services for FF-ICE/1 are based on the same SWIM Technical Infrastructure standards (Yellow Profile) as many other services of the European PCP (Pilot Common Project), the demonstration is expected to accelerate the European uptake of SWIM principles in general, and the European implementation of FF-ICE/1 in particular. The global demonstration will also serve as a validation of the ICAO FF-ICE/1 provisions and the supporting FIXM 4.0 elements, and may therefore result in further refinement of these provisions and supporting information exchange model.

Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan

Type of Action

4.3 Sub Work Area 2.3 Safe Integration of all Air Vehicles

4.3.1 SESAR-VLD1-09-2016 Solutions for General Aviation and Rotorcraft

This topic addresses the application of specific SESAR solutions to operations by GA and rotorcraft, using non-certified or GA-specific on-board equipment.

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 2.3 topic a).

Specific challenges

The SESAR programme is geared mostly towards improving ATM for the commercial air transport sector, mostly operating IFR inside controlled airspace. However, the GA and rotorcraft communities should also be able to benefit from the concepts developed in the SESAR programme which, at the same time, should ease integration of GA and rotorcraft into airspace and airports where the SESAR concepts and technologies are implemented. The challenge of this demonstration is to show how GA and rotorcraft can benefit from concepts and technologies developed within the SESAR programme, and to make recommendations for research, regulation, certification and standardisation.

Scope

The scope of this topic is to demonstrate the ability of General Aviation and rotorcraft to use and benefit from Solutions and technology developed within the SESAR programme in the following environments:

- Flight Planning, including SWIM-based information management and exchange;
- Airport/airfield operations, including GNSS procedures and simultaneous non-interfering operations intended to increase access to airports for GA and rotorcraft;
- Airborne situation awareness, traffic avoidance, collision avoidance, and airspace avoidance; and
- Data link communications, including the airborne exchange of information, such as aeronautical information and meteorological information.

Through live-flying trials, the demonstration will build confidence within the aviation community in the ability of GA aircraft and rotorcraft to operate safely and efficiently in the evolving SESAR environment, while also benefiting from new technology and procedures, through the execution of demonstration flights. To achieve this, it is desirable for consortia to include all necessary stakeholders, such as airspace users, including GA owners/operators, airport operators, industry and ANSPs. Where any stakeholder is not included directly in the consortium, applicants shall show how their involvement will be assured.

The scenarios for the demonstration flights may be based on existing SESAR Solutions, and the plan shall clearly state which elements of which solutions each scenario is intended to demonstrate; it is not necessary for a scenario to cover every element of a chosen Solution. Some Solutions will be more suitable for fixed-wing aircraft, others for rotorcraft, and most for both. The demonstration must include flights by both fixed-wing and rotary aircraft, although it is not necessary to demonstrate every scenario for both stakeholder groups. Applicants should demonstrate how the

scale and balance of their proposed flying programme will provide the benefits expected to be derived from the project.

In all cases, the aim is to demonstrate how SESAR Solutions could be applied using actual GA aircraft, fixed-wing and rotary, equipped with non-certified equipment. Simulation can be used to develop the demonstration, but the demonstration itself must be through live flying.

It is not necessary to demonstrate IFR solutions in controlled airspace, but the demonstration must show such operations taking place as if they were able to operate in that environment. For example, where a concept is being demonstrated that would assist IFR operations in controlled airspace, which would normally need certified equipment, the demonstration could occur in Class G airspace under VFR, allowing the concept to be flown safely without the need for special authorisations or certification activity.

The following information is presented to assist applicants to scope their proposals. However, the list should not be considered prescriptive or exhaustive, and applicants may select multiple elements of Solutions as required to deliver useful and cost-effective demonstrations, or create new scenarios aimed at demonstrating the use of non-certified technology to bring benefits to the GA and rotorcraft communities.

Full details of the SESAR Solutions can be found on the SESAR web site[8] or in the Solutions Catalogue[9]. As a guide, it is considered that the following solutions seem to be particularly suited to this demonstration activity:

- Solution 62: P-RNAV in a complex terminal airspace;
- Solution 09: Enhanced terminal operations with RNP transition to ILS/GLS;
- Solution 51: Enhanced terminal operations with RNP transition to LPV;
- Solution 103: Approach procedures with vertical guidance;
- Solution 37: Extended flight plan;
- Solution 34: Digital integrated briefing; and
- Solution 113: Low-level IFR routes.

Note that Solution 113 is under development and is, at the time of writing, not yet published. Its scope is as follows:

> Low-level IFR routes could provide a consistent path for navigation to and away from the departure and approach phases. Design requirements are already defined by ICAO in the PBN Manual (Doc 9613): RNP 1 in general and RNP 0.3 where necessary (constraining environment). New low-level routes are based on RNP 0.3 specification, that is for helicopters and low-speed aircraft only. According to the PBN Manual, the RNP 0.3 Navigation specification has been defined primarily for helicopter applications (e.g low-level routes). Dedicated rotorcraft routes will not only increase airspace capacity, but will improve safety, equity and accessibility in the TMA. Furthermore, the management of particular helicopter characteristics could be done with more efficiency and predictability than before. Routes are totally IFR compliant and guarantee a high degree of safety and flyability in relation to altitudes (decreasing the possibility to encounter icing condition), better

[8] http://www.sesarju.eu/solutions

[9] http://www.sesarju.eu/newsroom/all-news/sesar-solutions-catalogue-and-interactive-map

separation among other rotorcraft or low speed aircraft, and separation and terrain-avoidance by design is assured inside controlled airspace.

In addition, elements of the following solutions could be demonstrated to show applicability of relevant technology to GA:

- Solution 101: Improved hybrid surveillance (ADS-B in for ATSAW);
- Solution 65: User-preferred routing (demonstrating the ability of GA to route plan and fly using non-published waypoints); and
- Solution 110: ADS-B surveillance of aircraft in flight and on the surface (use of ADS-B to provide ANSPs with improved information of GA activity, for example to reduce airspace infringements or to alert in case of runway incursions, etc).

Applicants are also encouraged to propose innovative GA and/or rotorcraft-specific applications of the technologies used in SESAR Solutions.

Conclusions and recommendations concerning safety, regulation and certification shall address what would be necessary for live operations, not simply for one-off demonstrations. Safety conclusions shall include an analysis of human elements, such as distraction or information-overload from the introduction of new technologies and displays into the GA cockpit, and recommendations for addressing such conclusions shall be made.

The demonstration activities shall cover the full demonstration lifecycle. This includes development of the concept of the demonstrations, participation in periodic meetings, production of all the documentation related to the demonstration (most notably including the demonstration plan and the demonstration report), and results dissemination and communication activities. The demonstration report shall include a full analysis by each participating stakeholder of the impact of the demonstrated concept on performance within their sphere of operations.

Participating stakeholders shall make available data from their flights for the operational evaluation of the performance of the concepts under demonstration.

Expected Impact

The demonstration will produce evidence that can be used to support regulation, standardisation and certification. Results of the demonstration should quantify performance improvements resulting from the demonstration flights, using, as a minimum, relevant KPAs from the performance framework defined in the ATM Master Plan. This will support the development of GA and rotorcraft-specific technologies. By doing this, GA and rotorcraft operations should become safer and more efficient, as well as being able to integrate more freely with commercial aviation at a wider range of airports and airspace environments.

Type of Action

Innovation Action

4.3.2 SESAR-VLD1-10-2016 Safe integration of drones

This topic aims at performing demonstration activities for identifying **quick-win** solutions enabling the safe integration of drones, in all kinds of airspace. Overall, these activities pursue a threefold goal:

1. To ascertain the **fitness for purpose of those solutions** in delivering the required services to the user community;

2. To contribute to and support the parallel prototype **regulatory process for drones** placed under the aegis of EASA;

3. To provide inputs to the concurrent **standardisation** processes both in the identification of perceived needs for standards.

Special emphasis is to be allocated to those applications perceived as the largest market segments within a maximum 5-8 year horizon or less, for example long-range surveying, light-load movement and long-endurance surveying, whose scope can be outlined as follows:

- **Long-range surveying** covers the use of drones in the inspection of infrastructure such as oil, power and railway lines, or area surveillance for agricultural applications.

- **Light-load movement** addresses the use of small drones at VLL for logistic services – e.g. the delivery of packages to the door-step.

- **Long-endurance surveying** focuses on surveillance for extended periods of time, using larger drones, operating at low, medium and high altitudes.

This call should also be framed in the context of the recent "Warsaw Declaration" which acknowledged the need for urgent action on the airspace dimension, in particular the development of solutions for low level operations ("U-Space").

With reference to the SJU Annual Work Programme 2016, this topic covers Section 3.5.4, sub Work area 2.3 topic b).

Specific challenges

The breadth of applicability of many types of drone in the marketplace is extensive and it is clear that drones will operate in all classes of airspace with a varying degree of interaction with other airspace users. Reconciling this multiplicity of applications, together with the diversity of their associated service, operational and technical requirements, with the over-arching goal of guaranteeing safety, is a challenge of significant complexity. These demonstrations should be designed to provide a significant contribution to effectively tackle such a challenge in an efficient, cost-effective and timely manner.

Taking into consideration the accelerated pace of evolution of the drone industry, it is imperative to seek for fast-track approaches that rely on available concepts and technologies capable of achieving the objectives in hand. The aim is to reduce the lead-time to market for new solutions in order to avoid that their unavailability could become a major barrier to further development of the drone industry.

New approaches to procedure development, safety management, standardisation and regulation should be explored to enable expeditious deployment of these new technologies. Such approaches must be ultimately compatible with EASA's evolving regulatory framework for drones and relate to on-going standardisation activities.

Scope

The demonstrations should aim at a proof-of-concept for drones traffic management operating within a representative service environment. This concept could combine different applications, with preference being given to those referred to above. This shall be achieved by live flying demonstrations of appropriate drones in an environment permitting the objectives of the project to be met.

It is likely that VLL drone operations will require an entirely new mechanism for managing them, and this is known as Unmanned aerial system Traffic Management (UTM), and such demonstrations shall support its development. VLL demonstrations should cover, in particular, the following core functionality of a UTM implementation:

- E-identification and registration;
- Surveillance and tracking;
- Automatic flight permissions; and
- Flight plan validation.

The aim will be ultimately to subsequently extend such functionalities towards Dynamic Airspace Management which is to be backed by a robust geo-fencing capability. Work contributing to the development of the latter is equally within the scope of this call. Demonstrations related to geo-fencing, shall include notably the following set of functionalities:

- Drone location surveillance and tracking;
- Monitoring of compliance of the drone operation with relevant rules and regulations;
- Generation and management of no-fly zones based on aeronautical information (including NOTAMs) and aviation regulations;
- Generation and management of no-fly zones for non-aeronautical reasons by appropriate agencies;
- Generation and management of no-fly zones that become active while the drone is in flight;
- Prevention of the drone from flying inside the defined no-fly zones, including those that change during flight.

A web-based platform should be considered to implement and manage the service; such platform should enable the connection of remote-pilot stations and the sharing of information with authorised external agencies.

The mix of different service applications that serve as the operational scenarios for these demonstrations should be representative of future drone traffic in a blend of rural, suburban and urban locations. In particular:

- **For long-range surveying** the operational context may be VLL, VFR or IFR, and will primarily be BVLOS. There will be some degree of integration with other airspace users, inside and outside controlled airspace. Particular attention should be given to Detect and Avoid (D&A), communications with Air Traffic Control and any issues associated with separation provision for drones inside controlled airspace due to their dissimilar performance characteristics from manned aircraft.

- **For light-load movement** the operational context will normally be BVLOS, fleet-oriented and potentially including some level of autonomy. Although such drones will operate below the levels of most conventional aerial activity, some degree of integration will be necessary.
- **For long-endurance surveying** the operational context builds upon BVLOS. Although such operations can take place at all levels, including in airspace operated intensively by commercial aviation, the focus of this demonstration should be on the VLL environment.

Where applicable, the demonstration should address the required interfaces with Air Traffic Control. It should also cover the associated organisation concepts, the requirements for the scale-up of the demonstration into commercial products, and the identification of gaps – e.g. regulation, standardisation or additional R&D needs – required to enable wide scale implementations. In all cases, the over-arching emphasis of the work should be directed to the support of routine drone operations, not merely restricted to the conduct of trials and demonstrations.

In addition to the core topics described above, the following list proposes areas requiring study in the context of this demonstration. This list should not be considered prescriptive or exhaustive, and applicants may select from, expand or reorganise the issues as required to derive the maximum benefit from the proposed demonstrations:

- Detectability of the drone;
- Positioning and navigation including European GNSS (Galileo/EGNOS).
- Use/management of autonomy;
- Flight in accordance with appropriate Flight Rules, covering procedures, terrain/obstacle avoidance, weather avoidance etc.;
- Compliance with instructions from ATC and interaction with other ground agencies as appropriate;
- Communication;
- Data link issues, including performance, protection, failure procedures and spectrum management;
- Information management;
- Security issues (including cybersecurity);
- Operation of multiple drones by one operator; and
- Human factors.

The demonstration activities should include:

- the concept of operations that is to underpin the demonstration;
- the high-level system architecture supporting its implementation, including notably potential interfaces with Air Traffic Control to suit operations inside controlled airspace;
- the envelope of functional capabilities and the operational performance of the system set against the requirements associated to selected operational environment; this encompasses specifically information exchange, D&A and data communications, including the Command and Control link;
- the requirements for the scale-up of the demonstration into commercial products;
- the operational risk analysis;

- the associated organisation concepts – e.g. functional role of different stakeholders in the whole value chain, elected business models, staffing including pilot competence issues, governance schemes – that are essential for a well-functioning service market to evolve and reach fruition;
- the identification of gaps - e.g. regulation, standardisation or additional R&D needs – deemed required to enable subsequent fully-fledged commercial implementations.
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The demonstrations have to be backed by an appropriate project management structure that is centred on timely delivery, including notably robust quality and risk management. This together with a sound result dissemination strategy that is fit-for-purpose of ensuring the widest and most effective utilisation of the results obtained.

Expected Impact

The demonstrations will produce evidence to back "**Quick Wins**" solutions for the safe integration of drones in all classes of airspace with a particular emphasis on VLL operations, providing adequate responses to the urgent needs put forward by regulatory authorities and the drone stakeholder community at large.

Type of Action

Innovation Action

5 References

[1] http://www.sesarju.eu/solutions

[2] http://www.sesarju.eu/newsroom/all-news/sesar-solutions-catalogue-and-interactive-map

[3] H2020 Work Programme 2016-2017 General Annexes

[4] Project execution guidelines for SESAR 2020 Very Large Scale Demonstrations activities

[5] Project execution guidelines for SESAR 2020 Exploratory Research activities

[6] SESAR Joint Undertaking, Annual Work Programme 2016, Version 1.1, 3 October 2016.

[7] SESAR Joint Undertaking, SESAR 2020 Multi-Annual Work Programme, Edition 1.0, July 2015.

[8] SESAR Joint Undertaking, VDL Mode 2 Measurement, Analysis and Simulation Campaign Deliverable D11 – Final Report, Issue 1.3, 30 June 2016

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