

AEROSPACE EUROPE



THE FIRST MISSION FOR ORION AND THE EUROPEAN SERVICE MODULE WILL SEND THE SPACECRAFT BEYOND THE MOON AND BACK. THE ESA CONTRIBUTION IS THE EUROPEAN SERVICE MODULE. IT IS FIRST COLLABORATION BETWEEN ESA AND NASA ON A TRANSPORTATION VEHICLE THAT WILL CARRY ASTRONAUTS FARTHER INTO SPACE THAN EVER BEFORE

EDITORIAL



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THE ARTEMIS GENERATION

In the coming weeks from Cape Canaveral, Pad 39-A, the NASA's Space Launch System (SLS), the most powerful rocket in the world, will lift off with on top the NASA's Orion spacecraft including the ESA's Service Module. This will be Artemis I mission, the first of a series of four successive presently programmed missions, so opening for space exploration a new era, the 'Artemis generation'.

Being in Greek tradition the twin sister of Apollo, Artemis was chosen to name the upcoming lunar missions to make reference to the Apollo missions.

The Artemis programme is conceived to land humans on the Moon by 2025 and prepare for the future human missions to Mars.

- Artemis I mission is an uncrewed maiden flight test of the SLS rocket and Orion spacecraft with lunar orbit and Earth return (see pp. 36-40).
- With Artemis II in 2024, the first crewed flight of SLS and Orion will send four astronauts (three Americans and one Canadian) to the Moon fly-by and back again, in a way reminding the 24 December 1968 moment, when Apollo 8 entered orbit around the Moon.
- With Artemis III in 2025, boots on the Moon. Orion and its crew of four will once again travel to the Moon, this time to make history with the first woman and next man to land on Moon and walk on its surface. It will take place 56 years after Apollo 11 mission when on 20 July 1969 Armstrong and Collins landed on the Moon. Everybody remembers the famous Armstrong's declaration: "*one small step for a man, one giant leap for mankind*".
- The Artemis IV mission, programmed in 2027, will launch four astronauts to the Gateway, the modular space station which will have been previously placed on lunar orbit. It will deliver the I-HAB module which connected with the Gateway, will enable astronauts to live in orbit around the Moon. It will probably be the first Artemis mission with a European astronaut onboard.

Then it is foreseen that expanding Gateway's capabilities and gaining high confidence in commercial lunar landers departing from the Gateway, NASA together with its international partners, ESA in particular, will drive towards establishing the infrastructure, system and robotic missions which will later enable a sustained human lunar surface presence. This will be the international Artemis Space Camp, named 'Moon Village' by ESA. The infrastructure at this base will support one- to two-month astronaut missions to learn more about the Moon and Universe at large and to develop new technologies. Let's mention here that ESA is presently preparing the European Large Logistics Lander (EL3), a key capability providing European access to the lunar surface. The Gateway's capabilities will also play an important role in Mars mission simulations at the Moon. For these missions, it is envisioned a four-person crew travelling to the Gateway and then living onboard the outpost for a multi-month stay in order to simulate the outbound trip to Mars. Those missions will be the technical and operational readiness tests for the first human Mars mission in the coming two decades, which will be the "*next giant leap for mankind*".

Yes indeed, the coming soon Artemis I mission opens the Moon-to-Mars fascinating programme. ESA, already well involved in many parts of Artemis, will have the ambition to lead European industry, academia and institutions to play a more and more important role in this epic adventure. Besides it is obvious that Moon-to-Mars will inspire youth offering it ambitious perspectives and will generate new vocations for Space. Definitely the ARTEMIS GENERATION is born.

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SESAR 3 JOINT UNDERTAKING NAMES NEW EXECUTIVE DIRECTOR

On 5 May 2022, the SESAR 3 Joint Undertaking (SESAR 3 JU) announced Andreas Boschen as new Executive Director.



Andreas Boschen

An official of the European Commission, more specifically the Single European Sky, he has been developing and implementing rules, managing the Single European Sky Committee and coordinating relations with EUROCONTROL and third countries. Over the last eight years, he has been

managing EU financial support to the deployment of SESAR solutions via the Connecting Europe facility. The combined knowledge of policy, regulation and sector priorities, as well as programme and project implementation, will be the key as the partnership seeks to accelerate between now and 2030 the delivery of an inclusive, resilient and sustainable Digital European Sky.

Starting his professional career in 1998 as a diplomat in Germany to manage relations between the European Commission, Parliament, Council and other bodies, he then came to DG MOVE.

Since 2014, Andreas Boschen has been leading the Department of the Connecting Europe Facility at the CINEA (Climate, Infrastructure and Environment Executive Agency), where he managed EU financial support to infrastructure projects in the areas of transport and energy.

AMONG CURRENT PROJECTS: DELIVERING AN INTEGRATED COMMUNICATIONS, NAVIGATION AND SURVEILLANCE SYSTEM FOR EUROPE



Simona Pierattelli, Leonardo, is coordinator of I-CNSS, a SESAR research and innovation project dedicated to developing an integrated communications, navigation and surveillance (CNS) infrastructure for Europe.

In this Q&A, she explains how CNS technologies can support to make air and ground operations, including airports, more efficient, while also ensuring global interoperability from an avionics and satellite systems perspective.

Why do we need to address the current communications, navigation and surveillance infrastructure?

European air traffic management makes use of a patchwork of CNS infrastructures with different technologies and networks, which is costly and inefficient. Added to that, traditionally the communications, navigation and surveillance (CNS) domains within each of these infrastructures have been kept separate so one domain could back up another at an operational level. What we see is that this legacy structure fails to take advantage of cross-domain synergies between technologies and space-based solutions enabled by the global navigation satellite system (GNSS).

What is SESAR proposing?

We are working on a more integrated and spectrum efficient CNS concept that takes advantage of ground and satellite-based systems, and advances in digital technology. The aim is to move away from an infrastructure where systems and technologies are prescribed to a performance-based approach, based on the operational requirements and considering CNS as an integrated system. By deploying new CNS systems and rationalising legacy ones, we believe that we can make aviation smarter and more efficient and meet the ambitious performance goals of the European ATM Master Plan.

What are the main objectives of the project that you are leading?

The project aims to develop an integrated suite of CNS solutions meeting the current and future operational requirements of air traffic management in the short, medium and long term. This includes a strengthened security and increased spectrum efficiency. In addition, it aims to ensure their global interoperability, as outlined in the ICAO Global Air Navigation Plan (GANP).

The PJ14-W2 I-CNSS project aims to support European and global harmonisation of CNS between airlines, air navigation service providers (ANSPs) and industry, in addition to interoperability between the civil and military aviation.

What are the main technologies you are working on?

PJ14-W2 I-CNSS is working on a suite of CNS solutions:

Communications bringing together Terrestrial, Satellite and Aerodrome technologies:

- A network infrastructure based on “multilink” supporting both legacy data links and modern network digital technologies;
- A high capacity ground-based line-of-sight data link LDACS;
- The evolution of satellite-based COM system SATCOM ATN/OSI into ATN/IPS;
- Hyper connected ATM, a new solution to use public air-ground links for transferring datalink messages, as a complement to dedicated safety links;
- SWIM TI purple profile for air/ground safety critical information sharing;
- SWIM TI green profile for Ground/ground civil-military information sharing.

Navigation incorporating GNSS technologies and alternatives for robust new systems:

- Highly resilient runway independent GNSS landing systems for low visibility cat II/III using ground based augmentation (GBAS) with multiple satellite constellations including GALILEO, and multiple frequencies, also applicable by complex airports and at extended latitudes;
- Innovative solutions for alternative positioning, navigation and timing system including LDACS (NAV), Multi-DME, Enhanced DME and Terrain Vision in support of more demanding RNP operations;
- Using the aircraft as an AIM/MET sensor and consumer.

Surveillance to monitor both Space Based and Ground Based systems

- Multi-sensor data fusion;
- Future ADS-B communication link, based on phase overlay transmission, to resolve congestion on the safety critical 1090 MHz frequency;
- Multi-tower remote surveillance, including integration of camera surveillance;
- Secured surveillance systems;
- End-to-end surveillance performance monitoring tools.



What are the expected benefits? Who stands to benefit?

The main benefits of performance-based CNS concept implementation are:

- Increased and future proof technical performance for airspace users and operational environment needs while ensuring resilience and contingency;
- Improved spectrum efficiency, knowing that spectrum is an extremely scarce and expensive resource;
- Support innovation in terms of performance, virtualisation and security aspects;
- Enabled synergies across CNS domains;
- Reduced annual operating costs and investment budgets.

Who is involved in the project?

Coordinated by Leonardo, the project brings together 17 beneficiaries from different European countries including industries and ANSPs. It is funded within the framework of the European Union’s Horizon 2020 research and innovation programme under grant agreement No 874478.

GLOSSARY

ADS-B: Automatic Dependent Surveillance – Broadcast

ANSP: Air Navigation Service Provider

ATM: Air Traffic Management

ATN: Aeronautic Telecommunication Network

ATN/IPS: ATN/Internet Protocole Suite

ATN/OSI: ATN/Open Systems Interconnection

CNS: Communications, Navigation and Surveillance

CNSS: Communications, Navigation and Surveillance System

DME: Distance Measuring Equipment

GBAS: Ground-Based Augmentation System

GNAP: Global Air Navigation Plan (ICAO)

GNSS: Global Navigation Satellite System

LDAC: L-band Digital Aeronautical Communication systems

SWIM: System Wide Infrastructure Management

SWIM/TI: SWIM/Technical Infrastructure

Synthesis written by J.-P.S. from information available on SESAR JUWeb.

