INITIATIVE IN THE FRAMEWORK OF ESA ARTES'S SPACE SYSTEMS FOR SAFETY & SECURITY (4S)

"TECHNOLOGIES & PRODUCTS FOR SECURE AND RESILIENT SATELLITE COMMUNICATIONS"

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1. INTRODUCTION

1.1. Scope of the Document

This document presents a new initiative in the frame of the ESA ARTES Space Systems for Safety and Security (4S) Strategic Programme Line in support to **early development of technologies and products in the area of ground, space and user segments** that are deemed critical to enhance security and resilience of SatCom systems and products or for the development of **infrastructures providing communication services for applications with safety, security and possibly sovereignty requirements**. With this initiative, Industry is invited to submit proposals for Satellite telecommunications Technologies & Products definition, technology, product and/or demonstration phases.

This initiative is implemented in the setting of the already open Standard Call for Proposals 'ARTES 4.0 Technologies and Products for C&G, Optical and Quantum Communication – ScyLight, Space Systems for Safety and Security (4S) and 5G/6G and Sustainable Connectivity (CfP/4-40017)'.

The document is structured as follows:

— Section 2 introduces the initiative background, scope and objectives.
— Section 3 describes the submission process.
— Section 4 presents relevant conditions of the applicable Call for Proposals.
— Annex A describes the applicable development phases and co-funding levels.

1.2. References

ARTES Programme: ESA CSC: Connectivity & Secure Communications

ARTES 4S Strategic Programme Line: Space Systems for Safety and Security (4S) | ESA CSC

ARTES 4.0 Technology and Product development related activities Outline Proposal templates: Documents | ESA CSC

ARTES National Delegations contact points: National Delegations | ESA CSC

1.3. Acronyms

ADS-B	Automatic Dependent Surveillance – Broadcast mode
AIS	Automatic Identification System
ARTES	Advanced Research in Telecommunications Systems
CfP	Call for Proposals
C&G	Competitiveness and Growth
ESA	European Space Agency
EU	European Union
GPL	Generic Programme Line
IoT	Internet of Things
RF	Radio Frequency
Satcom	Satellite Communications
SPL	Strategic Programme Line
TRL	Technology Readiness Level
UHF	Ultra High Frequency
VDES	VHF Data Exchange System
4S	Space Systems for Safety and Security
5G	Fifth-generation technology standard for broadband cellular networks

2. BACKGROUND AND SCOPE

2.1. Space Systems for Safety and Security (4S) Strategic Programme Line

Strategic landscape for more secure, robust and sovereign communications infrastructures:

The prosperity and security of our society are increasingly depending on our digital infrastructure and, more specifically, on our communication networks. Any lack of coverage in some areas or loss of availability due to accidental or intentional disruption may result in strongly negative consequences and widespread impact.

Hence, specific attention is granted to communication services and networks supporting essential governmental or institutional services (at national, regional, or local levels) or operations deemed critical in fields as varied as transport, finance, health, and energy production and distribution, and for which security, continuity of service and guaranteed availability are essential. In this context, at a time of growing geopolitical uncertainties, crises and threats to our critical infrastructures, a careful assessment and then implementation of the required level of control in the design, manufacturing, deployment and operations of such communication services has become necessary to deliver the appropriate level of security, resilience and sovereignty. The need to ensure sufficient independence may furthermore result in a significant impact on the supply chain eligible to contribute to such activities.

Depending on the criticality of the services an architecture actually delivers – from highly critical to critical – and on the existence or not of more than one system satisfying all the criteria and

delivering the targeted service, the infrastructure can be either Government-owned (in particular for the most critical services) or privately-owned by duly accredited stakeholders. As an illustration, it can be noted that, in the context of the Union Secure Connectivity Programme IRIS^2, the EU labelled “hard gov services” encompass the most secured services to be delivered by an EU-owned infrastructure, while the “light gov services” are referring to additional services that can be purchased from a set of accredited providers and systems, or at least abiding to the defined regulations.

Finally, private customers are also increasingly looking for more secured and resilient communication services, that they can procure from private initiatives, or that are delivered by their own infrastructure procured from competent manufacturers.

A specific programme at ESA to cope with these strategic needs and specific market opportunities:

In 2019, ESA Member States decided to create the Strategic Programme Line (SPL) “Space Systems for Safety and Security (4S)” under the ESA programme Advanced Research in Telecommunications Systems (ARTES). The objectives of the ARTES 4S SPL are to support the development of Next-Generation Satcom Systems providing secure and reliable communications solutions for governmental/institutional and public-regulated services (i.e. broadband and narrowband communications, detection and tracking services – maritime, aeronautical, etc…) or contributing to the security and integrity of our communications (Quantum Key Distribution services, RF signal/spectrum surveillance, …), all contributing to the resilience of society’s critical digital infrastructure. Relevant application areas are shown in the (non-exhaustive) figure 1.

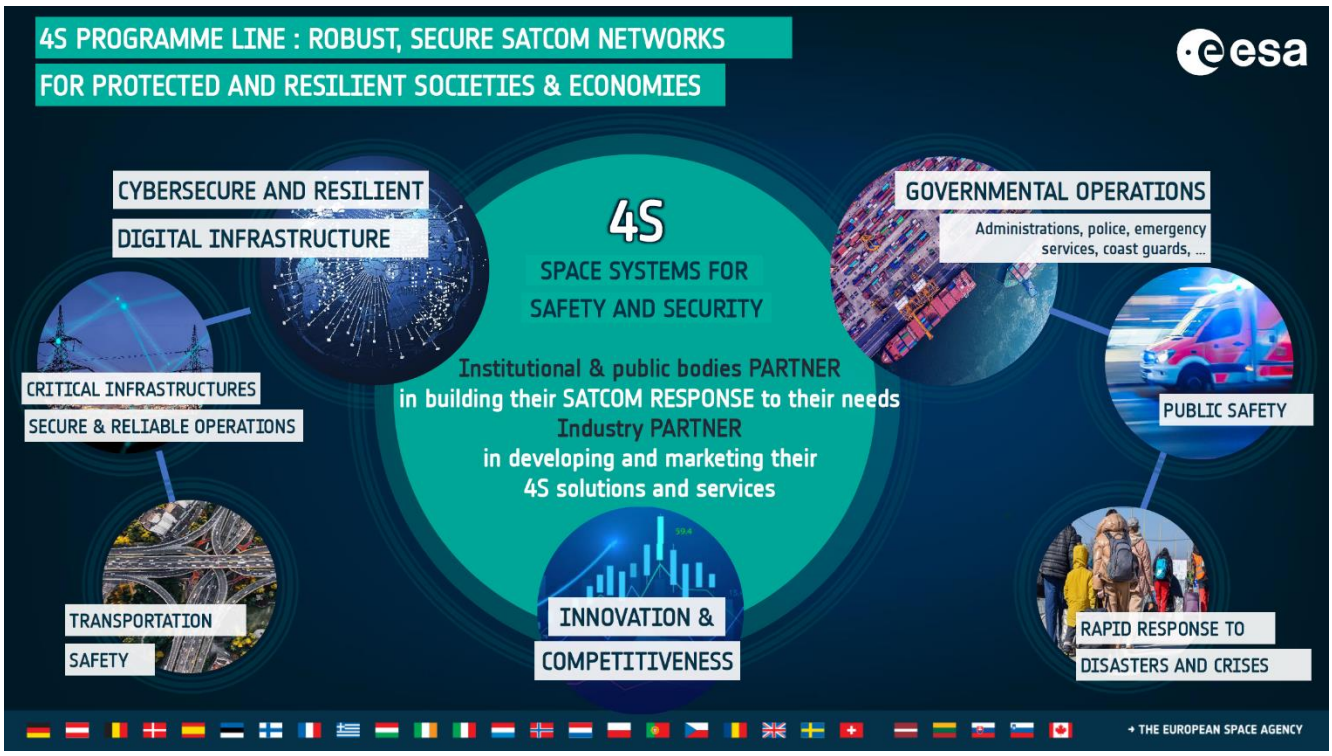

Figure 1. 4S target areas

To this aim, the ARTES 4S SPL supports government and public organisations in defining their needs for such services, and in building and implementing their own infrastructure programmes, when relevant. Furthermore, 4S helps ESA Member States' Industry in the development of next generation secure satellite communications infrastructures, services, critical technologies and products, in order to increase its competitiveness and ability to capture near-term market opportunities, be they governmental or commercial, and ultimately its market share and overall return on investment.

2.2. Background of the initiative

Over the past years, a strong demand for more secure and resilient communication links has emerged, stressing the need to develop the technologies required to address the evolving security threats and vulnerabilities on next generation satcom systems. These security developments are leveraged as a business value by industry and foster commercialization of such technologies.

Examples of targeted systems, technologies and products include (but are not limited to):

- Cybersecurity solutions for SatCom systems,
- Anti-jamming techniques,
- Post-Quantum Cryptography developments for space applications,
- Secure routing for resilient space-based communications,
- Self-Healing Network enablers,
- Zero trust Architecture solutions.

At the same time, private initiatives led by new or established actors and aimed at developing end-to-end communication services addressing specific needs of institutional actors or regulated economic sectors have emerged in Europe and in Canada. In order to satisfy the target customers, these services shall comply with specific security, resilience and/or sovereignty requirements. For some of these initiatives, service early demonstrations or initial developments have been performed.
Examples of targeted missions and systems include (but are not limited to):

- Aero C-band system for aviation regulated (safety) cockpit and command/control communications,
- Aeronautical surveillance mission based on e.g. ADS-B, possibly combined with VHF communications as a key enabler for aviation safety,
- UHF communications system for governmental applications (e.g. public safety, crisis management),
- AIS maritime surveillance/VDES connectivity as a key enabler for maritime safety and maritime domain awareness,
- RF signal/spectrum monitoring services for wireless telecommunications infrastructure protection.
- RF signals (from maritime VHF transceivers, personal transceivers, satellite phones, maritime and airplane radars, GNSS Electromagnetic interferences, emergency beacons, ADS-B signals, etc) detection and characterisation services for maritime and aviation safety, law enforcement, humanitarian/disaster relief, etc.
- TN-NTN connectivity solutions for automotive mobility safety use cases, such as e-call, road safety, safety-related traffic efficiency, advanced safety for automated driving.
- IoT connectivity systems for monitoring critical assets and infrastructure.

These European or Canadian initiatives are facing significant challenges, the major ones being 1) a strong competition from North American or Asian developments and 2) the need for public endorsement and active support. This latter point is justified by the fact that the governments, administrations, or public organisations will be users of the products and services delivered or may at least have a strong interest in having sensitive services provided from European/Canadian designed, deployed and operated infrastructures. By supporting development and validation of these private infrastructure and by acting as anchor customer,

the public side also supports the viability of the business plan that will allow for private funding, deployment and operations of these infrastructures.

As one among other opportunities, the Union Secure Connectivity Programme (IRIS^2) has increased the momentum for the development of such missions. Services provided by some of these missions have been identified as potential light governmental ('light gov') services in the IRIS^2 process, recognising the EU needs. Furthermore, as highlighted in Section 2.1, they should be delivered by private solutions and the services should be purchased by the EU or related agencies or bodies. In this context, the overall timeline for IRIS^2 may result in defining development schedules compatible with a timely service delivery.
However, a wide set of customers, governmental/public or commercial, within or outside Europe, may be the target of these private initiatives, many of them independent of IRIS^2. All may nevertheless benefit of the current momentum in Europe and its possible positive impact on their deployment in front of international competitors.

2.3. Target scope and objectives

This new 4S initiative "**Technologies & Products for Secure and Resilient Satellite Communications**" is aimed at supporting Industry in initiating early development of technologies and products deemed critical to **enhance security and resilience of SatCom** systems and products or for the development of **infrastructures providing communication services for applications with safety, security and possibly sovereignty requirements**. Those products and services include (but are not limited to) the examples provided in Section 2.2, and can address areas such as cybersecurity, anti-jamming, air traffic safety, land transport safety, maritime surveillance and law enforcement, finance, sensitive industrial

processes and factories, energy production plants, and critical assets management, etc. Target markets can be within Europe or outside Europe.

The Industry is invited to submit proposals **for technology and product developments** in the areas of **ground, space, system, end-to-end infrastructures**.

The expected outcome of this initiative is the timely delivery by European suppliers of critical technologies and products (and mitigation of related development risks) for the development of highly secure and resilient infrastructures providing satellite communication services for applications with safety, security and possibly sovereignty.

2.4. Main principles

This initiative is implemented in the frame of the 'ARTES 4.0 Technologies and Products for C&G, Optical and Quantum Communication – ScyLight, Space Systems for Safety and Security (4S) and 5G/6G and Sustainable Connectivity Standard Call for Proposals' (**AO 4-40017**)[1] . Proposed activities shall be consistent with the definition, technology, product and/or demonstration phases as defined in the Call of Proposals (see Annex A for further information).

This initiative is based on a non-competitive process: each proposal is evaluated independently (direct negotiation).

[1] Industry interested in directly submitting a proposal for a Partnership Projects | ESA CSC, is invited to contact ESA at ARTES-4S@esa.int

This initiative is open to Industry residing within ESA Member States participating in the ARTES 4.0 4S Strategic Programme Line, i.e.: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, Netherlands, Norway, Poland, Portugal, Romania, Spain, Switzerland, United Kingdom and Canada.

ESA will co-fund the activity on behalf of its Member States. The maximum amount of co-funding will depend on the type of entities performing the activities (i.e. SMEs, non-SMEs, universities or research institute), the proposed development Phase(s), and the relevant National Delegation's decision. Specific co-funding related information is provided in Annex A.

In addition to co-funding, ESA will bring its own experts along the activity to provide guidance and feedback on the proposed solution, the presented business case, and the performed activities.

ESA commits to a timely review of the submitted proposals. Their submission and review process are described in subsequent sections.

This initiative is independent from other ESA or EC initiatives, in particular related to the Union Secure Connectivity Programme (IRIS^2). It does therefore not bind ESA (or EC) in any way to place a later contract for the development, deployment or procurement of related infrastructures and services.

3. SUBMISSION PROCESS

3.1. Overview

This initiative started in **February 2024** and is **open until February 2026** as a minimum. Proposals can be submitted at any time.
For industry players interested in bidding, the procedure consists of submission of an **Outline Proposal** followed by submission of a **Full Proposal**, as detailed below.

Figure 2. Submission steps

The Industry may contact ESA (at ARTES-4S@esa.int) for further information or questions at any time, including before the Outline Proposal submission.

3.2. Step 1: Outline Proposal

Outline Proposals shall be submitted via the OSIP Platform.

Outline Proposal templates are available at Documents | ESA CSC (from there, use “Templates for Co-Funded Technology and Product Developments”).

ESA will evaluate an Outline Proposal within 10 working days. A dialogue phase between Industry and ESA may follow, if needed.

The evaluation process is non-competitive, i.e., each proposal will be assessed individually on its own merits, based on the criteria mentioned below. For an Outline Proposal, the following evaluation criteria will be used:

1. Consortium technical and commercial experience in related technology, product, system and/or service development.
2. Credibility of the technical solution and relevance wrt. initiative's scope and objectives, quality and completeness of programme of work.
3. Credibility of the business case.
4. Adequacy of deliverables, schedule and risks management.
5. Adequacy of cost and funding, value for money.

If the Outline Proposal is positively assessed, ESA will invite the Industry to proceed to the next step, i.e., to submit the Full Proposal.

3.3. Step 2: Full Proposal

Following the submission of the Outline Proposal, in case of a positive assessment from ESA, the bidder is invited by ESA to submit their Full Proposal along with the **Authorisation of Funding** from the relevant National Delegation(s), via ESA-star, in line with the implementation process described in the 'ARTES 4.0 Technologies and Products for C&G, Optical and Quantum Communication – ScyLight, Space Systems for Safety and Security (4S) and 5G/6G and Sustainable Connectivity Standard Call for Proposals' (AO 4-40017).

Full Proposal templates can be found on ESA-star, as part of the tender documentation of AO 4-40017.

The evaluation process is non-competitive, i.e., each proposal will be assessed individually on its own merits. The standard evaluation criteria defined in AO 4-40017 will be used.

3.4. Authorisation of Funding Letter from National Delegation(s)

Formal authorisation from the National Delegation(s) of the companies involved **is required** for the proposed activity at the time of submission of the Full Proposal. Note that Full Proposals submitted without the Authorisation of Funding will not be admitted for evaluation.

Bidders are advised to initiate discussions with the relevant National Delegate(s) **as early as reasonably possible**. ESA suggests reaching out to the National Delegate(s) before submitting the Outline Proposal and informing ESA about their feedback at the time of Outline Proposal submission.
The address book of the National Delegates can be found here: National Delegations | ESA CSC.

3.5. Process Outcome

Following a positive assessment by ESA and successful negotiations with the Industry, the proposed activity will be approved for implementation and a Contract will be made between the Industry and ESA.

4. GENERAL CONDITIONS

The submissions and all correspondence relating to it shall be in English.

The Tender shall not contain any Classified Information, whether in the Outline Proposal or in the Full Proposal. Nevertheless, should it be considered necessary to share Classified Information with ESA in an Outline Proposal, the Agency should be notified beforehand so that mutual agreement can be reached on how to handle such information.

To avoid any confusion with Classified security markings, the unclassified protective marking used by the Tenderer in the Outline Proposal and Full Proposal shall not contain the terms "Restricted", "Confidential", or "Secret".

ESA is subject to a Personal Data Protection Framework and will process and protect personal data accordingly. Personal data provided in the Outline Proposal will be processed solely for the purposes of evaluating the outline proposal and, should the evaluation be successful, executing subsequent steps of the procurement process. Further information on personal data protection can be found in the Special Conditions of Tender of CfP ‘ARTES 4.0 Technology and Product Developments Activity – Standard Call for Proposals’ (AO 4-40001).

Expenses incurred in the preparation and dispatch of the response to the initiative will **not** be reimbursed. This includes any expense connected with a potential dialogue phase.

This initiative does not bind ESA in any way to place a contract. ESA reserves the right to issue amendments to this initiative.

ESA does not intend to prioritise any element of the 4S areas. ESA expects the industry to define its own priorities (in line with its internal strategy plans). Consequently, this initiative provides the **opportunity for industry to propose an activity in response to its own strategy**.

Annex A: ARTES 4.0 Technologies and Products for C&G, Optical and Quantum Communication – ScyLight, Space Systems for Safety and Security (4S) and 5G/6G and Sustainable Connectivity Standard Call for Proposals (AO 4-40017) - Development Phases and Co-Funding Levels

The following table lists the main activities and outcomes expected for each Development Phase (in line with AO 4-40017).

Development Phase	***Main Activities***	***Outcome***
Definition Phase	Technical studies, preparatory activities	Performance requirements defined, or system analysis completed
Technology Phase	Technical risk mitigation excluding any qualification or industrialisation.	Breadboard, prototype or Engineering Model (EM) Flight hardware for early in orbit test purposes.
Product Phase	Development, qualification, verification, and industrialisation	**Space product**: Engineering/Qualification Model (EQM) or similar
		Ground product: verified product in a non-operational environment, end-to-end infrastructure
Demonstration Phase	**Space system**: in-orbit validation/demonstration	Flight hardware, system demonstrations

	Ground product: validation in operational environment	Product validated in an operational environment, system demonstrations

The following table indicates the maximum co-funding level for each Development Phase (with associated TRLs) for various tenderer categories:

Development Phase	***Targeted TRL***	***ESA maximum Co-Funding Level***		
		Non-SME	SME	Universities or Research Institutes with no commercial interest in the product or system
Definition Phase		50%	80%	50% [up to 30% Development Phase cost]
Technology Phase	up to 4-6, depending on the technical risk	75%	80%	100% [up to 30% Development Phase cost]
Product Phase	up to 7	50%	80%	50% [up to 30% Development Phase cost]
Demonstration Phase	up to 8	50%	80%	50% [up to 30% Development Phase cost]