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## SPACE APPLICATIONS SUPPORTING DIGITAL TRANSFORMATION IN PUBLIC SAFETY (4S)- BATCH 2

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Document Type	
Reference	
Issue/Revision	01 . 01
Date of Issue	14/09/2022
Status	Issued



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## 1. BACKGROUND AND RATIONALE

Digital Transformation is the change of business by altering the business strategy, operations, products and objectives through adopting digital technologies. By implementing digital transformation, public safety stakeholders are able to make better-informed decisions and to create additional opportunities for cross-agency collaboration. This trend has been accelerated by the ongoing COVID-19 pandemic which created unforeseen challenges for public safety stakeholders to find ways to enable their staff to work remotely by providing secure access to sensitive systems. As a result, the ways of working have changed and new technology has a critical role to play in supporting first responders, emergency call centers and post-incident investigations. In addition, taking advantage of recent technological developments in the area of Drones and Robotics, Internet of Things and Data Analytics has allowed opening up new opportunities for the Public Safety sector, leading to the emergence of new concepts and solutions to tackle safety and security challenges with innovative solutions.

In this context, space can play a crucially important role in supporting the digital transformation within the Public Safety domain. To give an example, satellite communication technologies are in a unique position to offer connectivity links to increase network resilience (either as a primary link or as a redundant system) as well as to extend the digitalisation of networks to remote areas. Depending on the application and use case scenario, also the use of other space assets such as Earth observation and satellite navigation can add significant value, either complementing the use of satellite communications or in its own right.

The objective of this Thematic Call therefore is to foster the development and deployment of innovative Space Applications supporting Digital transformation in Public Safety. These activities shall be performed in cooperation with customers and stakeholders and are aimed at:

- raising customers'/users'/stakeholders' awareness of these new applications and benefits brought by space technologies, and getting their buy-in
- consolidating users' needs and requirements for both application elements and space based services
- preparing for the development and roll-out of the operational solutions and associated commercial offer

During the activities, integration with future space-based infrastructures may also be investigated, in view of paving the way for future proof-of-concepts and demonstrations.

This Thematic call is originating from interactions between ESA and public and private stakeholders from the Public safety sector, and a preliminary list of applications areas (c.f. Section 2 of this document) have been identified from these consultations.

The proposals shall focus on the design, development and demonstration of applications enabled by space technologies for the areas identified. Other applications areas may be proposed by Tenderers, if duly justified.

This Thematic Call is part of the ESA ARTES (Advanced Research in Telecommunications Systems) 4.0 programme of ESA in the context of the Strategic Programme Line (SPL) “Space Systems for Safety and Security (4S)” work plan. Scope and objectives of 4S SPL can be found in Annex 1.

Furthermore, as part of the same work plan, ESA has initiated the “Rapid and Resilient crisis Response” (R3) system study, which aims is to provide seeds for the R3 accelerator introduced at the ESA Council in October 2021<sup>1</sup>. As part of one of three ‘Accelerators’ that will drive Europe’s increased use of space, the Rapid and Resilient Crisis Response Accelerator will use intelligent interconnectivity in space to respond to crises on Earth. In addition, ESA have elaborated on a proposal for a European flagship programme for ‘Civil Security from Space’ (CSS)<sup>2</sup> to its Member States at the occasion of the November Council Meeting at Ministerial level ‘CM22’. This programme is proposing a federated solution interconnecting space and ground systems and services, existing, planned and future. Such a solution allows to gather, process and provide information in real time to facilitate decision-making, and enables connectivity between first responders and their control centres. To this end, the initiative is composed of various elements including Earth observation systems, space-based positioning and navigation, enhanced telecommunication system and Internet of Things (IoT) resources. It will make use of secured satellite communications systems and terrestrial networks and aims to leverage on disruptive technologies such as Artificial Intelligence (AI).

This Thematic Call is fully integrated with the above initiatives (R3 accelerator and CCS programme proposal) and serves to support their aims by establishing a range of precursor services within the domain of safety and security for public safety and civil protection.

## 2. SCOPE OF THEMATIC CALL

The objective of this call is to demonstrate the key benefits that space technology can bring to support the Digital transformation in Public Safety. The thematic call purposely addresses a wide spectrum of applications including but not limited to the use cases below.

- **Use Case 1: Broadband communication systems providing on field broadband connectivity**

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<sup>1</sup> <https://vision.esa.int/rapid-and-resilient-crisis-response/>

<sup>2</sup> <https://artes.esa.int/civil-security>

In case of natural or human-caused disaster, first responders need reliable, consistent communications capabilities to assist victims, support operations and keep themselves and others safe. Usually, they rely on terrestrial communication networks that, however, might be impacted by the disasters or limited in terms of capability and functionality. Therefore, Public Safety agencies might adopt satellite communication systems to complement terrestrial networks (e.g. LMR, LTE, etc.) in a situation of emergency.

- **Use Case 2: Secure SatCom supported communication systems connecting frontline responders**

Public Safety organizations often operate in areas where terrestrial connectivity is not available. In fact, during operations in distressed or remote areas, officers might have limited communication coverage. In order to coordinate activities and communicate with the control centre, officers can rely on satellite mobile devices.

As the demand for connectivity increases, officers will require devices that will not only provide voice communication services but also access to applications that can support critical operations in real-time mode. In this context, Smart Satellite Phones will allow to exchange of data and multimedia content and to use apps facilitating coordination activities with the control centre. Future emergency devices are expected to leverage hybrid connectivity (cellular and satellite) and they will automatically switch to the most convenient network by ensuring coverage in every situation.

- **Use Case 3: On demand monitoring of areas of interest based on UAV**

Unmanned Aerial Vehicles (UAV), or drones, have gained a primary role in the activities of both private and public organizations. Thanks to recent technology developments, UAVs have become more effective, more affordable and easier to fly. Public safety organizations rely on them for prevention, monitoring and intervention activities. Drones are typically adopted to achieve an as deep as possible situation awareness about areas impacted by critical situations (i.e. wildfire) as well as areas non easily reachable through other mobility means, and, in general, to support officers in any hazardous operations.

UAVs are currently adopted for multiple applications in public safety agencies worldwide. In addition, UAV technology adoption is increased in recent years due to the COVID-19 pandemic. Law enforcement agencies are adopting UAVs to support incident response, rapid mapping, and scouting to ease informed actions while also ensuring maximal safety for on field officers. Police agencies are using UAVs for search and rescue, traffic collision reconstruction, investigations of active shooter incidents, crime scene analysis, surveillance, and crowd monitoring.

Firefighters are exploiting next-generation aerial tools, ranging from multi-gas detectors to high-resolution thermal and visual cameras, enabling rapid and informed decisions when responding to volatile emergency situations. UAVs' collected data is helpful when locating the epicentre of the fire, deciding the best course of action, and monitoring dangerous situations from above

- **Use Case 4: Internet of Things (IoT) providing connected devices for on field monitoring and connected vehicles**

The Internet of Things (IoT) is an evolving technology with very broad adoption prospects. The increasing availability of sensors and actuators of smaller dimensions and lower power consumption has driven the adoption of IoT technology across a wide range of sectors including Public Safety. In this context, connected devices can be adopted to monitor, alert, and respond. On the one hand, IoT technology is connecting officers, being the enabler of wearables technology. On the other hand, it is empowering the “connected operations” throughout vehicles telematics and smart monitoring sensors (e.g. narrowband sensors, security cameras, etc.).

- **Use case 5 “New normal” ways of secure working including secure remote access for teleworking and creation of new opportunities for cross-agency collaboration**

Like for many other communities, the COVID-19 pandemic created unforeseen challenges for public safety stakeholders which has accelerated the ongoing digital transformation needed to empower staff to work remotely, whenever possible, and to continue operations as safely as possible. This combination of both trends on the other hand has also opened up new possibilities for cross-agency cooperation

- **Use case 6: Monitoring of public safety staff’s health parameters through wearable devices**

The miniaturization of IoT devices is enabling the development of wearables with numerous potential applications. As wearables adoption increases in the commercial markets, more Public Safety agencies are considering applying this technology to improve the safety of first responders and the effectiveness of their interventions. Context awareness, health monitoring, location tracking, as well as the dispatch of information during emergency responses are just a few examples of the benefits that wearables can bring.

However, wearable devices must be adapted to meet Public Safety requirements. Firstly, products designed for public safety must be reliable under extreme conditions. Secondly, the availability of the network is the most important requirement. This means that products must have multiple backups (WiFi, cellular, Bluetooth). Thirdly, the security of these devices is a concern for Public Safety agencies requiring confidentiality and integrity of information.

Public safety personnel are often deployed in remote hazardous environments, that can include extreme temperatures, loud noises, or poor air quality. Wearable technology is being adopted

for a variety of applications, such as physiological status monitors which collect personnel data in the outdoor environment in order to warn about the potential health hazards such as heat stress. Environmental sensors can be used to monitor air quality, including carbon monoxide, hydrogen sulphide, gas leaks, temperature, humidity, and noise.

- **Use case 7: Augmented Reality/Virtual Reality for training and 3D visualisation of search and rescue operations on remote sites**

Public safety stakeholders deployed in the field during an emergency operation could benefit from the use of Augmented Reality/Virtual Reality providing 3D visualisation of the existing situation and involved vehicles, personnel and site conditions.

However, to use these functionalities is beyond the reach of 4G, where they are often more needed, AR/VR systems will require satellite connectivity.

- **Use Case 8: Rapid access to current worldwide Earth observation data enabling mapping, situational awareness, assessments of damages**

Public safety stakeholders operating in crisis events require rapid access to up-to-date geodata on areas of responsibility and for different times scales. To this end, Earth observation data, if available combined with drone/aerial photographs are beneficial for: a) fast mapping - processing situational map - shortly after the disaster, b) maps assessing damages - in short, medium, and long perspective after the crisis, and c) prediction maps of further development of the situation - updating according to the real extent of the crisis situation and modelling of processes and recovery measures.

- **Use Case 9: Navigation and tracking using Satellite navigation/ GNSS**

Public safety stakeholders benefit from the use of GNSS to perform the navigation of rescue forces on-site and of emergency vehicles to the operation site, incl. tracking, monitoring and guidance of people (SatNav - response) as well as tracking and monitoring of assets (SatNav – response), e.g. vehicles, drones, machinery.

In order to achieve such objectives and address the above use cases, the proposed services shall rely on space-based technology already or imminently available. Additional use cases may be proposed by bidders involving the use of other space assets such as satellite communications, Earth observation and/or satellite navigation are encouraged.

### 3. OBJECTIVES

Activities to be presented in response to the Call for Proposals are Demonstration Projects. The “Management Requirements” (MR) document available as Appendix 3 to the Draft Contract (self-

standing document in the tender) provides a set of guidelines regarding the programme of work and management of such projects.

The specific scope of the activities presented in response to this Call for Proposals is to be defined by the Tenderer, but it shall in any case:

1. Be in line with the general objectives set forth in Section 1 of this cover letter and be in line with the programmatic objectives of the ARTES 4.0 4S Strategic Programme Line (SPL) as outlined in Annex 1 hereto;
2. Address one (or more) area(s) described in Section 2 hereto and propose to design, develop and demonstrate via a pilot one (or more) service(s) relevant for this (these) area(s). Other applications areas may be proposed by Tenderers, if identified by representative stakeholders of relevance for their operations.
3. Be customer/user driven: The Tenderer shall involve in the project representatives from users' communities, which shall take part in the pilot. The Tenderer shall include a letter of intent from each involved user as evidence of their commitment and support to the project.
4. Prove the benefit of using space assets including either safe and secure satellite telecommunications systems and/or other space assets (Earth observation, Satellite Navigation) for the proposed service(s).
5. Shall set-up a pilot trial/demonstration to deploy and validate in a pre-operational environment the proposed service(s) with the involvement of the engaged users/customers. This pilot shall aim at collecting feedback from end users, demonstrate the benefits of the satcom-based service(s), consolidate user and system requirements and promote the new service(s).
6. Include the potential service provider as part of the tendering team.



## 3.1. THE VALUE OF SPACE ASSETS

### 3.1.1. *Satellite Telecommunications*

The digital transformation trends (e.g. remote control, real-time monitoring, data analytics) and the adapted ways of working resulting from implementing these new ways are driving the need for secure and reliable connectivity (broadband and narrow band) in the public safety domain.

Satellite communications is in a unique position to answer to these needs, complementing and extending mobile and fixed terrestrial coverages, or as unique telecommunications means. Safe and secure satellite communications can also be used to enhance the resilience of terrestrial networks used for critical communication and guarantee operations continuity in the event of terrestrial networks downtime. It is also expected that the enhanced capabilities of future satellite communications infrastructures, especially reduced latency, terminal size, service price, as well as increased network availability, will be the key features to support Digital Transformation in Public safety.

### 3.1.2. *Earth Observation*

Earth observation data is becoming increasingly available by a multitude of sensors and systems in orbit and the associated data analytic services.

With respect to applications and services addressing the needs of public safety stakeholders, a preliminary and non-exhaustive list is provided below:

- Opportunity to have access to and utilise worldwide available Earth observation data. For example, a rapid access to current satellite-aerial pictures or to existing map data of the operation site as well as for an ad-hoc establishment of communication infrastructures (global operations).
- Mapping, situational awareness, assessments of damages, change detection etc.
- Up to date geodata (maps, aerial pictures etc.). Otherwise, it is difficult for the staff to appraise how relevant this data is for the current operation/situation
- Providing a core set of maps/images on areas of responsibility (SatEO - preparedness)
- Providing ad-hoc maps/images of disasters (SatEO - response, however less for near-real time coverage of events, but rather for events which stretch over several days, like flooding)

### 3.1.3. Satellite Navigation/ GNSS

In the context of public safety applications GNSS is providing a crucial value, on its own or integrated with communications. For instance, GNSS functionality is integrated into TETRA devices using the Location Information Protocol (LIP) to support positioning information which provides the control with enhanced communication and administration of resources. With the use of a geographical mapping system and GNSS information, the control room can track the positions of the TETRA devices on the mapping system displaying the speed of a device or vehicle, the location of a device or user in a certain geographical area and send an immediate positioning to the mapping system upon the activation of the device emergency button.

In addition, the following operational tasks are of importance with regards to navigation and tracking:

- The navigation of rescue forces on-site and of emergency vehicles to the operation site should be possible.
- tracking, monitoring and guidance of people (SatNav - response)
- tracking and monitoring of assets (SatNav – response), e.g. vehicles, drones, machinery

## 4. PROCUREMENT APPROACH

The proposals to be submitted in the context of this call (Batch 2) shall be implemented in accordance with the current tools provided by ARTES GPLs (Generic Programme Lines) and/or SPLs (Specific Programme Lines) in direct negotiation (co-funded) with Industry, depending on their nature and scope, and in coordination with National Delegations.

Existing ARTES mechanisms shall be used without modification. The eligibility criteria shall be in line with the ARTES implementation rules.

The call aims at attracting specifically SMEs, New Space and Spin-In Industry, although open to all Industry in ESA Member States participating in the ARTES programme. To this purpose, an Outline Proposal (OP), based on a template provided by ESA attached here on this website, shall be used as entry point for companies to submit their idea, providing a simplified and single point of access to the ESA ARTES framework.

According to the rules of the ARTES GPL and SPL programmes, the price of activities carried out in a given ESA Member State are charged against the contribution of that State in the programme. Letter(s) of Authorisation of Funding (AoF) from the relevant National Delegation(s) is(are) therefore required as part of the Full Proposal. The Industry is however advised to inform the relevant National Delegation(s)

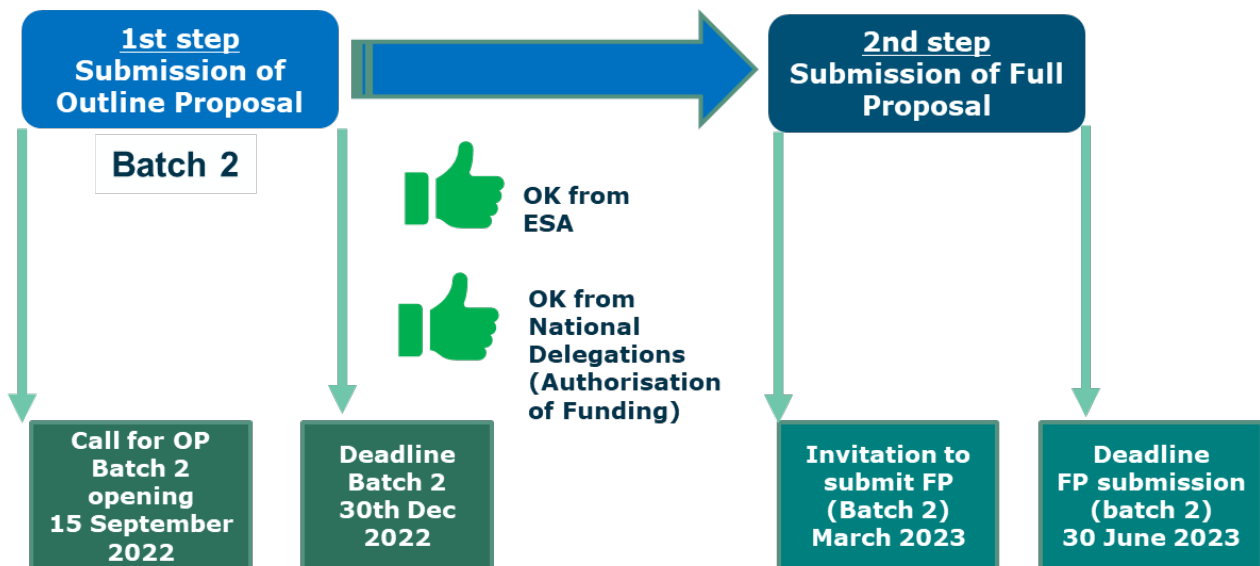
when submitting the Outline Proposal(s). The coordinates of the National Delegates can be found here: <https://artes.esa.int/national-delegations>.

The Proposal(s) by the Industry can cover multiple themes and vertical integration between Technology, Products, Services and Applications. The Proposal(s) can also cover one or multiple phases of the full life cycle of activities including definition, technology and product developments, and demonstration in a pre-operational environment.

## 5. PROCESS AND SCHEDULE

### 5.1. Timeline and Procedure

The Thematic Call opened 2 March 2022 for Industry to respond by submission of Outline Proposals (OP) and closed 12 May 2022 (Batch 1). This Announcement is for **Batch 2** which opens **15 September 2022** and the closure date for Outline Proposal submission in Batch 2 is **30 December 2022**. Outline Proposals received after this date will not be evaluated within this batch of this theme. The timeline of the full process for Batch 2 is illustrated below.



In **Step 1**, following the release of the Thematic Call, the interested Industry partners are invited to submit their Outline proposal(s) (OP) based on a template made available by ESA that can be downloaded from the Thematic Call website.

When completed, the Outline Proposal file shall be saved with name: "**Space Applications supporting Digital transformation in Public Safety (4S)- [Your Activity Name].docx**" in **Word document format (or as PDF)** with the text in red to be replaced with the title of your proposed

activity. It should then be submitted via the online web submission form which is accessible on the call website <https://business.esa.int/funding/invitation-to-tender/space-applications-supporting-digital-transformation-public-safety>

In parallel the interested Industry shall contact the relevant ESA Member States Delegates to verify their interest and their preliminary support.

After the deadline for submission of the OP, ESA will assess the Outline Proposal and provide feedback to the company.

It is recognised that some interactions with the Industry may be required and ESA may therefore consult with the Industry and may offer support in providing further clarifications, aimed at better shaping the Outline Proposal(s). Dialogue sessions may be organised individually with potential partners prior to Step 2.

ESA might also consult, when necessary, with the relevant National Delegation(s) for orientation and will provide key information (e.g. title, cost, price, subcontractor) to the relevant National Delegation(s). In **Step 2**, subject to a positive assessment from ESA and preliminary support from the National Delegations, the Industry will be invited to submit a Full Proposal in accordance with the ARTES programmatic line Business Applications (BASS AO 1-10494), and the applicable procurement process including the template to be used for the Full Proposal generation.

Following this invitation by ESA, the Industry will submit a Full Proposal with the Authorisation of Funding (AoF) from the relevant National Delegation(s) **not later than 30 June 2023**.

Following a positive assessment by ESA the proposed activity will be approved for implementation.

## 5.2. Evaluation Criteria

The evaluation process is non-competitive, as each proposal will be assessed individually on its own merits. For any Outline Proposal to be considered as an adequate basis for further consideration, the following evaluation criteria will be used:

1. Consortium experience in technical and business matters relevant to the proposed product, technology and applications;
2. Proposed management organisation, including management of risks;
3. Adequacy of cost and funding;
4. Potential for future evolution towards a commercial solution on a global market and/or towards European opportunities and associated return on investment;
5. Market potential and credibility of business planning, potential to deliver positive net socio-environmental impact

### 5.3. 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.

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

However, should the Tenderer consider necessary to include Classified Information in the tender, the Tenderer shall inform beforehand the Security Officer.

The Tenderers are informed that Classified Information can be shared with ESA only in compliance with the Project Security Instruction (PSI) duly established by the Agency beforehand and subject to the approval by the ESA Member States.

## **ANNEX 1- Scope of ARTES 4.0 SPACE SYSTEMS FOR SAFETY AND SECURITY (4S)**

Our society, economy, security and sovereignty are increasingly dependent on the digital infrastructure and more specifically on communication networks: any lack of coverage in some areas or loss of availability due to accidental or intentional disruption may have widespread impact and very negative consequences.

Hence, specific governmental attention is granted to those “4S-related” communication services and networks that are required for essential governmental or institutional services (at national, regional or local levels) or support operations that are deemed critical in fields as various as transport, finance, health, energy production and distribution, etc.; security and appropriate control of their design, manufacturing and operations are indeed key requirements in support to resilience and sovereignty.

Governmental actions include setting pro-active public policies, imposing strict regulations on these services and the infrastructure that support them and carefully checking their application through various mechanisms such as service certification or operational oversight by dedicated governmental bodies or agencies. When necessary, they may also include direct procurement of infrastructure responding to their specific requirements, or support for instance through co-investment to public private partnerships in charge of deploying these infrastructures and providing the expected services.

Today, our communications rely mostly on terrestrial network solutions that tend to be more and more integrated (IP, 5G, ...), which may strongly increase the impact of any disruption. At the same time, as the overall presence of Europe and Canada in the design and manufacturing of these terrestrial network solutions tends to decrease, this can only negatively impact our actual level of control of this essential infrastructure and have serious implication on European and Canadian safety, security and sovereignty.

In that context, it is growingly perceived that adding appropriately tailored secure Next Generation SatCom components to our telecommunication infrastructure may greatly help to increase its overall resilience to any kind of disruption, bring additional capacity and ensure its global coverage while providing a stand-alone highly secure space-based capacity to channel the most sensitive and critical communications services.

ESA, through the ARTES Programme, is fully committed to support the European Satcom sector in the effort to put forward competitive solutions in Satcom domain. Importance of responding to institutional and public-regulated needs has been fully recognized: a new Strategic Programme Line for “Space Systems for Safety and Security” (4S) has been launched in 2019. 4S has a double objective:

- To support competitiveness to enable European industry to benefit from the significant economic opportunity and growing world-wide demand for “4S” SatCom solutions.
- To respond to the growing European societal and institutional needs in Safety and Security.

It is also the ambition of 4S to bring ESA support to sectorial public bodies in their SatCom-related endeavours, and to European Commission for more specific initiatives such as to EU GOVSATCOM, to the EU Single European Sky and the EU Quantum Flagship initiatives.

To pursue those goals, 4S covers the full life cycle of secure Satcom and related downstream applications, across the full range of the ARTES programme, from upstream to downstream activities. This includes preparatory work and product development (Future Preparations, Core Competitiveness), Partner Projects and Business Applications, all within one coherent framework in support to 4S.