DOCUMENT

ESA Secure Satellite Communications Support to ESA Long Term Plan

Announcement

Industrial Opportunity

in the framework of

ESA Secure Satcom for Safety & Security (4S)

APPROVAL

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1 ACRONYMS

AO	Announcement of Opportunity
ARTES	Advanced Research in Telecommunications Systems
ATM	Air Traffic Management
BAp	Business Applications
BC	Business Case
BP	Business Plan
B2B	Business to Business
B2C	Business to Customer
CAPEX	Capital Expenditure
CC	Core Competitiveness
DRA	Direct Radiating Array
EC	European Commission
EDA	European Defence Agency
ESA	European Space Agency
EU	European Union
FOC	Full Operations Capability
FP	Future Preparations
Gbps	Giga bit per second
GEO	Geostationary Earth Orbit
GS	Ground Segment
HAPS	High Altitude Platform Systems
IOC	Initial Operations Capability
IOD	In-Orbit Demonstration
IOT	In-Orbit Test
IoT	Internet of Things
IOVIOD	In-Orbit Validation and Validation
IOCR	In-Orbit Commissioning Results Review
KPI	Key Performance Indicator
LEO	Low Earth Orbit
MOC	Mission Operations Centre
M2M	Machine to Machine
NoI	Notification of Intent
OP	Outline Proposal
OPEX	Operational Expenditure
QKD	Quantum Key Distribution
P/F	Platform
P/L	Payload
PPP	Public-Private Partnership
RF	Radio Frequency
RPAS	Remotely Piloted Aerial System
SCC	Spacecraft Control Centre
S/C	Spacecraft
SEI	Socio-Economic Impact
SLA	Service Level Agreement
SPACE19+	ESA Ministerial Council 2019
TBC	To Be Confirmed
TBD	To Be Defined
TC	Telecommand
TM	Telemetry
TTC	Telemetry, Tracking and Command
4S	Secure Satcom for Safety and Security

2   REFERENCE DOCUMENTATION

Reference documentation will be made available to parties that have submitted a Notification of Intent.

3   SCOPE

This document presents the ESA 4S Announcement including:

- Background and Rationale
- Thematic Approach
- Description of the Opportunity
- Industrial Focus
- Process and Schedule
- Guidelines
- Annex A and B and C.

4   BACKGROUND AND RATIONALE

4.1   Applications

Telecommunication networks are at the heart of an increasingly digitalized world.

The digital economy is experiencing a major increase in cyber-threats. Network interruptions and wider scale breakdowns caused by natural or man-made disasters are more and more frequent. A wide range of applications can be affected, ranging from safety of transport to security of energy supply, finance, industrial and environmental hazards and availability of critical infrastructure. In certain cases this may entail systemic risks.

At the same time, communication networks are a key enabler and provide new opportunities for many safety and security applications from space to the benefit of society, for instance in civil protection, humanitarian aid, maritime surveillance or border control.

Space-based solutions can help to respond to the above opportunities and threats.

4.2   Status

For more than a decade, ESA and European industry have been working in partnership to develop secure Satcom solutions. Examples include the European Data Relay System (EDRS)[1], which today provides operational data relay services to the EU Copernicus Programme, allowing encrypted downlink of earth observation data. The IRIS Project[2] has been validating satellite solutions that can meet the safety and resilience requirements of European Air Traffic Management. Further examples exist such as SAT-AIS[3] for satellite-based automatic identification in support to maritime transport. Similarly, ESA has established partnerships with user communities and key stakeholders operating in safety and security applications, to support European downstream industry in delivering adequate

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[1] https://artes.esa.int/edrs/overview
[2] https://artes.esa.int/iris/overview
[3] https://artes.esa.int/sat-ais

space-based solutions[4].

At the Ministerial Council in Lucerne in 2016, ESA took a further step and initiated the ESA GOVSATCOM Precursor Programme[5]. The Programme has a financial envelope of 85MEuro and its public funds are complemented with an equivalent level of industrial co-funding. At present it comprises six Public-Private-Partnership projects, referred to as "PACIS[6]". A total of eight satellite operators and service providers are leading these projects, covering the period 2017-2021. The initiative includes an agreement with EDA and a joint ESA-EDA team to support synergies with the EDA GOVSATCOM Demonstrations. ESA efforts furthermore are coordinated with the EC and EEAS and related preparations for EU GOVSATCOM. In early 2016 the programme preparations with industry were initiated by an Announcement of Opportunity (AO), along with an ESA-industry Workshop[7].

4.3 The next step

Recognizing the global market opportunity and new societal challenges, ESA proposes an evolution of its existing support to European industrial efforts and to EU initiatives such as: the Govsatcom Precursor programme; the European Data Relay System; Iris; SAT-AIS; Quantum; and other security-related ARTES activities under Core Competitiveness and Business Applications. Specifically, ESA proposes to consolidate and increase its efforts under a new ARTES thematic framework, *"Secure Satcom for Safety & Security (4S)"[8]* to support:

- European satellite operators and manufacturing industry, to ensure new levels of security, robustness and resilience as mandatory requirements of space-based communication solutions globally[9]; and
- European downstream industry and service providers, in delivering relevant space-based solutions and business models for innovative, economically sustainable downstream services.

This AO aims, through industrial dialogue, to support the preparation of 4S proposals for ESA's Space19+ Conference at Ministerial level, as has been done successfully in 2016 for the GOVSATCOM Precursor Programme.

5   THEMATIC APPROACH

"Secure Satcom for Safety & Security (4S)" aims to cover the full life cycle of secure Satcom, across the full range of the ARTES programme, from upstream to downstream activities. This includes preparatory work and product development (Future Preparations[10], Core Competitiveness[11]), Partner Projects[12] and Business Applications[13], all within one coherent

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[4] https://business.esa.int/projects/theme/safety-security
[5] https://artes.esa.int/govsatcom-precursor
[6] http://www.ancientpages.com/2016/04/04/ara-pacis-altar-in-rome-dedicated-to-pax-the-roman-goddess-of-peace/
[7] https://artes.esa.int/news/govsatcom-esa-and-space-industry-supporting-european-solution
[8] https://www.esa.int/esatv/Videos/2018/10/Satcom_for_safety_and_security
[9] Next generation network design will need to consider:
  - solutions where formerly segregated networks increasingly converge into integrated seamless networks based on governmental as well as commercial assets for vertical safety/security critical applications. As one consequence, most of the commercial systems currently operated, including commercial satellite systems, will require an evolution towards higher security levels;
  - solutions for a properly designed satellite component as part of a terrestrial network to greatly increase security, robustness and resilience of the combined space-terrestrial communication infrastructure.
[10] https://artes.esa.int/future-preparations
[11] https://artes.esa.int/core-competitiveness
[12] https://artes.esa.int/private-public-partnerships
[13] https://business.esa.int

framework in support to 4S. It aims at:

- strengthening the coherence of ESA industrial action in the secure Satcom domain and maximizing synergies between the individual ARTES activity areas, to foster the competitiveness of European industry;
- establishing a programmatic framework enabling strategic institutional partnerships between ARTES and relevant national and emerging EU programmes, including the possibility of joint initiatives, in particular for Air Traffic Management, Quantum Communication and Contributing Agreements for EU Govsatcom; and
- supporting the development and operational use of safety and security related space-based downstream services, including but not limited to the utilization of secure satellite communications technologies.

"Secure Satcom for Safety & Security (4S)" is proposed to be implemented in coherence with the Space Safety and Security pillar at ESA level.

The specific objectives of *"Secure Satcom for Safety & Security (4S)"* and related ESA goals are described in Annex A.

6 DESCRIPTION OF THE OPPORTUNITY

6.1 Main principles of the opportunity

This announcement presents an opportunity for both space industry and industry providing space-based services, in either case residing in an ESA Member State or Associate Member State, to enter into a partnership with ESA on development of innovative technologies / systems / services as addressed by 4S.

In such partnership ESA shall typically cover, through co-funding, the technology and market risk associated to innovative developments. Note that the level of co-funding may depend on the lifecycle addressed in the proposed activities.

In return the Partner(s) shall:
- provide the respective private co-funding; and
- develop innovative technologies / systems / services.

6.2 Description

The AO addresses the full life cycle of activities relating to 4S including:
- technology developments up to product phase;
- development of services and applications; and
- full end-to-end space system implementation up to IOV-IOD and pre-operational deployment.

The AO aims to stimulate industrial proposals in any of these activity areas and specifically encourages proposals covering more than one area of the life cycle.

Industrial responses may also address issues which may be of relevance to the theme as a whole, in particular related to cybersecurity as an underlying technical capability that is to be developed to support a wide range of activities and projects of the theme (and in coherence

with cybersecurity in space and the digital economy more generally).

The AO aims to support the preparatory phases for future projects that may be proposed for implementation at a later stage; the creation of new projects; and the set-up of the next phase of existing projects. Therefore, ESA invites industry responses considering the following three levels of maturity:

- Future preparations of next generation solutions for secure Satcom in the 2025-2030 timeframe. These may be subject to preparatory studies (Phase 0/A/B1) without pre-judging the industrial set-up for a possible future implementation phase, e.g. in response to requirements in the Arctic and related to IoT and M2M requirements, or to the future Digital Sky, or the next generation of data relay;
- New Projects with no industrial set-up yet defined. Examples include new PACIS projects under Precursor Phase 2 including a possible Arctic precursor; Pooling & Sharing Hub development for 2021; institutional Quantum Key Distribution precursor for 2025; and national or commercial Satcom assets to support a European secure Satcom Space Component Segment 1, similar to the cooperation being finalized for SpainsatNG[14] and PACIS-3;
- Follow-on Phase of existing Projects, which are already under a defined industrial lead but which may benefit from a wider industrial participation, or which may be extended beyond the currently foreseen scope of the next phase. Examples include existing PACIS Projects extensions; IRIS for ATM deployment; and EDRS for global extension[15]. Note that such responses must be made within the constraints of the existing industrial lead of the projects concerned, although it may include proposals for their evolution, e.g. a new consortium member to join a project. Industry leads of existing projects may be invited to the AO workshop to present the current status and plans of the respective projects.

Industry responses may also include specific 4S supporting activities related to product developments and Business Applications.

Transversal proposals addressing more than one area of the R&D lifecycle are encouraged, e.g. downstream activities together with pooling & sharing Hub development, to support awareness and a demand pull for secure Satcom from the civilian user community.

Furthermore, proposals are encouraged to identify any value that the proposed activity may bring for reducing the dependency of institutional safety & security solutions on non-EU actors or actors outside Europe, such as:

- ownership of asset, location of operations facility (e.g. S/C; SCC; MOC);
- security of technology supply, manufacturing know-how; and
- security certification.

More detail on above projects and possible supporting activities is identified in Annex B.

7   INDUSTRIAL FOCUS

ESA does not intend to prioritize any particular element of the above 4S and expects industry to define its own priorities (for instance in line with its business plans). For the same reason, ESA does not intend to prioritize particular domains of innovation in

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[14] https://www.iai.it/sites/default/files/pma_3.pdf
[15] https://www.esa.int/Our_Activities/Telecommunications_Integrated_Applications/EDRS/EDRS_Global
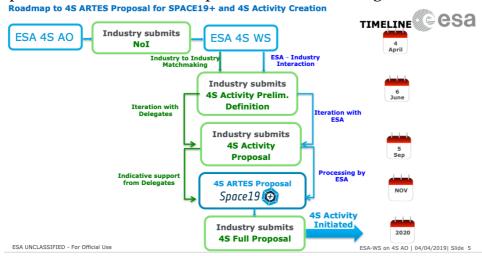
technology and service development. Consequently, the AO provides the opportunity for industry to propose an implementation in response to its own priorities regarding the different activity areas and the theme as a whole. These priorities can be further consolidated during the dialogue phase defined under section 8 below, including during the industry workshop.

The ESA 4S initiative is defined to support a results-oriented dialogue with European industry. It is intended to support European industry's competitiveness in the domain of secure Satcom and to provide industry with the innovative solutions necessary to capture future secure Satcom-enabled business opportunities. The initiative is part of ESA's efforts to support European efforts in cooperation with the EU, the EC and its Agencies as well as with National Space Agencies and Member State bodies. These efforts are aimed at identifying jointly with industry the required technological solutions, systems, infrastructures and services, and ensuring that the necessary development work is supported in a timely manner. 4S aims at contributing to a European cooperation by making use of established practice developed by ESA within the ARTES programme. This notably includes the ARTES programme elements of Core Competitiveness, Business Applications and Public-Private Partnerships with industry. ESA believes that 4S can provide for an effective involvement of European industry, with a positive impact on industrial competitiveness.

8   PROCESS AND SCHEDULE

8.1 Announcement related procedure

The proposal procedure will be in four steps and with the following dates:

Step		Date
0	Issue of Announcement by ESA	01.02.2019
1	Submission to ESA of Notification of Intent by Industry	08.03.2019 (extended to 22.03.209)
2	ESA-Industry Workshop	04.04.2019
3	Submission to ESA of 4S Activity Preliminary Definition	06.06.2019
4	Submission to ESA of 4s Activity Proposal	05.09.2109

A contractual procedure may follow for 4S Activity Proposals that have found support at ESA SPACE19+.

Step 1: Notification of Intent

Following the issuing of this Announcement, interested potential partners are requested to submit a Notification of Intent signed at the level of CTO/CEO and indicating their firm intention to submit one or more Outline Proposals; and providing a first set of information (typically 3-5 pages) as defined below:

- Outline of intended scope of the proposed 4S activity or activities;
- Description of considered innovative elements (technology elements, e.g. S/C, P/L, GS, service elements, generic elements/cybersecurity);
- Indication on the nature of the activity or activities within the development life cycle (e.g. product development, partnership project, service development);
- Indication of any value-add resulting from the fact that activities may **cover more than one activity area** of the life cycle. Examples include an infrastructure implementation project that goes beyond IOT to also include IOV-IOD; a demonstration phase including development of a downstream service; or a product development that includes the actual deployment of the product as part of an infrastructure implementation project.

This information shall be summarized in the table as per Annex C, as a mandatory element of the Notification of Intent.

The notification shall also identify the intended list of participants to the 4S workshop. Note: The workshop will be restricted to the participants identified in the notification.

The completed Notice of Intent shall be submitted by e-mail to

ARTES -4S@esa.int

Step 2: Industry Workshop

Additional information regarding 4S will be provided to the potential partners who have confirmed their interest (by means of the Notification of Intent defined in Step 1). This will include information on the expected scope and content of Outline Proposals.

An Industry workshop is scheduled for 04.04.2019 in Bucharest, Romania. The provisional agenda of the workshop is provided below:

ESA Introduction on ARTES 4.0;
ESA Presentation of 4S including expected Socio-Economic Impact;
Industrial Presentations on selected existing projects (optional); and
Possibility of bi-lateral meetings upon prior request.

ESA Member States representatives, as well as EU representatives as observers, will be invited to the workshop.

It is recognised that some interactions with potential partners may be required and ESA may therefore offer support in providing further clarifications, aimed at better shaping the Outline Proposals.

Dialogue sessions may be organised individually with potential partners prior to and after the workshop. Requests for such sessions should be made to the email provided under

8.1.

At the end of the dialogue phase, the interested potential partners are expected to provide one or more Outline Proposals.

Step 3: 4S Activity Preliminary Definition

The detailed scope expected from the 4S Activity Preliminary Definition will be provided to all parties that have submitted a Notification of Interest. It can be expected to include the following aspects:

- Preliminary Definition of the proposed 4S activity or activities;
- Preliminary Description of innovative technology elements, e.g. S/C, P/L, GS, service element;
- Preliminary Business Perspective on global market and/or European institutional opportunities;
- Expected Industrial Organisation;
- Link to relevant national and/or EU initiatives as applicable;
- Rough estimate of cost, if available.

Step 4: 4s Activity Proposal

The detailed scope expected from the 4S Activity Proposal will be provided to all parties that have submitted a 4S Activity Preliminary Definition. It can be expected to include the following aspects:

- Outline of the proposed 4S activity or activities;
- Detailed Description of innovative technology elements, e.g. S/C, P/L, GS, service element;
- Design & Development Plan, IOT/IOV Approach, Demo Plan as applicable;
- Business Perspective on global market and/or European institutional opportunities;
- Industrial Organisation and Programme of Work;
- Link to relevant national and/or EU initiatives as applicable;
- Funding Plan and cost estimates.

Subsequent Steps

For Proposals supported at ESA SPACE19+, ESA will subsequently enter into contract negotiations. Depending on Member State support and the adequacy of Proposals, contracts may be placed. ESA has no obligation to place any contract.

8.2 **Evaluation Criteria**

The evaluation process is non-competitive, as each proposal will be assessed individually on its own merits.

For any 4S Activity Proposal to be considered as an adequate basis for further consideration

towards SPACE19+, the following evaluation criteria will be used:

1. Consortium experience in 4S-related service and system development;
2. Proposed management organisation, including management of risks;
3. Adequacy of cost and funding;
4. Potential for future evolution towards an operational 4S solution on a global market and/or towards European institutional opportunities; and
5. Level of European non-dependence (where applicable for the European institutional market).

9 ANNOUNCEMENT GUIDELINES

9.1 General conditions

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

Any document submitted in reply to the announcement shall become the property of the Agency. The Agency will treat commercially sensitive or proprietary information confidentially and solely for the purpose of the assessment of the response.

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

The announcement does not bind the Agency in any way to place a contract. The Agency reserves the right to issue amendments to the announcement.

Prior to submitting a 4s Preliminary Activity Definition Proposal, the potential partner is requested to complete and send a Notification of Intent form no later than the date indicated in section 8.1.

ANNEX A

4S Objectives and ESA goals

4S has the following general objectives and institutional as well as commercial objectives:

Vision and General Objectives
- Increased European autonomy by 2025 in using space communications in a safe and secure environment.
- Reliable and secured Satcom for security and safety from space in the coming decade in support to societal needs such as related to crisis management, maritime safety or border control.
- Evolution of European B2B and B2C Satcom solutions in the coming decade, to provide the level of resilience and cybersecurity expected in a commercial market as part of the Digital Economy.

Mission Statements and Institutional Objectives
- A Europe that is technologically ready for a timely start by 2021 of EU Govsatcom Pooling & Sharing, based on a Hub enabling pooling and sharing of existing national and commercial Satcom assets.
- A Europe supporting its Member States in the development of national secure Satcom assets, with new national assets available from 2023 onwards.
- A Europe ensuring technological readiness by 2025 for future additional EU Govsatcom space infrastructure, in particular as could be provided by Arctic and European secure LEO constellations or other next generation Satcom solutions.
- Operational secure data relay services by 2023 in support to earth observation missions, including RPAS and Copernicus, including Asian-Pacific coverage and GEO-GEO links.
- Iris Operational Satcom element in support to European Single Sky Air Traffic Management by 2025 and empowering the Digital Sky by 2030.
- Validated QKD Satcom system in support to the EU Quantum Flagship by 2025, in preparation of a possible future European institutional QKD service.

Commercial Objectives
Work towards a level playing field for the European Satcom sector to compete on the commercial business opportunity of global secure Satcom systems and services, considering imbalances resulting from the significant institutional support in USA and China.

With "Secure Satcom for Safety and Security" ESA will contribute to the joint objectives as defined in the ESA-EC Joint Statement on Shared Vision and Goals for the Future of European Space[16]:
- It will strengthen the competitiveness of the European space sector on the global market, with the development of innovative secure Satcom technologies, systems, services and partnerships in the growing domain of safety and security;
- It will support the integration of space into European economy and society, with the development of secure Satcom services for the safety and security of European user

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[16]
https://www.esa.int/About_Us/Welcome_to_ESA/Joint_statement_on_shared_vision_and_goals_for_the_future_of_Europe_in_space_by_the_EU_and_ESA

communities; and

- It will increase European autonomy in using space, by fostering the development of European solutions to the safety and security challenges.

ANNEX B

Business Applications for 4S

Business Applications for Safety and Security aim at promoting innovative services by new user communities, provided by space technologies to support and enable the growth of the space sector and consequently of the economy in the security domain. Specifically, this will support the development of the global market and applications with a focus on secure Satcom but will also allow the combination and integration with other space assets such as satellite navigation and satellite earth observation. This will involve supporting technical and commercial viability studies, identification and consolidation of user needs, as well as demonstrations in a pre-operational context, e.g. extension of a Precursor Demonstration Phase to a wider user community to support downstream services development.

Space assets are enablers of applications targeting enhanced safety and security in a number of vertical sectors. Their benefits can be demonstrated for instance in the following domains:
- Man-Made and Natural Disasters - Preparedness & Response;
- Water, Agriculture and Food Security;
- Civil Security;
- Safety of Transport;
- Environmental Hazards (Chemical, physical, biological);
- Environmental Crime (Illegal fishing, Waste Disposal, etc);
- Energy Security;
- Industrial and Engineering Hazards;
- Healthcare;
- Protection of critical infrastructure; and
- Supply Chain Disruption.

While new needs are emerging, new and disruptive technologies also find their way into the market. Artificial intelligence, machine learning and blockchain technologies have already started delivering a transformation in a number of sectors, including those above that are relevant to safety & security. High Altitude Platforms (HAPS) and Remote Piloted Aircraft Systems (RAPS) are being used or are planned to be used for applications targeting surveillance and monitoring. The smart integration and utilization of secure satellite communications together with such technologies and data will allow the delivery of innovative services.

Core Competitiveness for 4S

Core Competitiveness for Safety and Security activities aim at ensuring the readiness of industry to respond to short- and long-term commercial or institutional opportunities both in Europe and globally, by focusing on technological innovation in equipment, systems and applications for secure Satcom. The aim is to support space, ground and user segments as well as overall system-related activities. Specifically, this will provide technology solutions and products to support future secure ground and space segment deployments, including the following:

- cybersecurity solutions;
- Direct Radiating Array (DRA) antenna solutions;
- terminals for safety communications (i.e. maritime, land, aeronautical);
- building blocks for future gap-fillers such as elements of a future secure LEO constellation;
- Arctic HEO and other platforms (e.g. RPAS, HAPS); and
- preparation of a European protected waveform and secure solutions for IoT, M2M and 5G.

4S Projects

Two groups of 4S Projects are distinguished:
- Secure Satcom projects, which exist also in absence of EU GOVSATCOM, e.g. based on other specific institutional needs or on an industrial business case in a global market; and
- GOVSATCOM-related, i.e. which respond to national institutional needs or the EU GOVSATCOM High Level User Needs, at least as one source of requirements.

Secure Satcom Projects:

Secure Satcom projects typically will comprise the full implementation phase up to in-orbit validation (e.g. QKD Precursor) and – as required – readiness for operational deployment (e.g. IRIS, EDRS-Global). Three cornerstone missions are presently defined. Further missions may be identified and supported during the programme.

IRIS
Iris is ESA's programme in partnership with Inmarsat to develop a new air-ground communication system for Air Traffic Management (ATM), as the satellite-based communication solution for the Single European Sky ATM Research (SESAR) programme. Following R&D focused developments of IRIS Precursor and IOC as initiated at ESA CM16, the next phase of IRIS will support the transition from R&D phase with SESAR Joint Undertaking (JU), to IRIS operational deployment with the SESAR Deployment Manager (DM). This will be implemented in line with the Memorandum of Cooperation with SESAR JU and SESAR DM. An agreement is anticipated with the relevant EU institutions and under governance of EC DG MOVE.

EDRS Global
EDRS Global is a continuation of ESA's partnership on EDRS with Airbus CIS and consists of enhancing the initial EDRS system towards a global data relay system service platform. This includes enhanced laser terminals resulting from Scylight R&D; an extension of data relay services towards global coverage; Quasi-Real-Time services; and enhanced security features, from which also the already operational EDRS and Service Level Agreement for Copernicus will benefit. It is part of EDRS evolution, which is under the control of the EDRS Joint Steering Committee between ESA, Airbus and the EC DG GROW.

Institutional Quantum Key Distribution Precursor
The QKD Precursor mission is a newly proposed cornerstone project. It aims at developing and validating innovative space and ground segment solutions such as those resulting from ScyLight R&D, for a Quantum Key Distribution (QKD) network in preparation of a possible European institutional QKD service in cooperation with EC DG Connect and DG GROW. Such a future QKD service may provide a backbone service to a number of secure Satcom and possibly also EU GOVSATCOM applications, such as the secure interconnection of EU Embassies; and of critical European infrastructure including securing critical European space assets.

GOVSATCOM related Projects:

GOVSATCOM-related projects may include support to the implementation of national initiatives for the establishment of secure Satcom solutions to be operated under national governance, as well as preparatory actions for future additional space infrastructure. Implementation activities would aim at launch the respective systems during 2021-2025,

while preparatory activities would extend into the 2025-2030 timeframe. While it is not excluded that such preparatory action may include an IOV/IOD Phase prior 2025, they are expected to require future funding decisions for a full implementation phase.

Govsatcom Precursor Phase 2
This is an evolution of the programme initiated at ESA CMIN16 and currently under contract with SES, Airbus, Inmarsat and Avanti (with other operators set to join). It aims at developing innovative and secure satellite telecommunication systems and services. Phase 2 will provide the framework for the evolution of existing and the establishment of future PACIS projects, including increased emphasis on pooling and sharing integration as well as space segment innovation. This will further strengthen the implementing arrangement with the EDA GOVSATCOM Demonstrations and support the transition towards the EU GOVSATCOM operational phase, with the aim to support a timely start by 2021.

Pooling & Sharing Hub Development
This implements a first version of a hub for managing commercial satellite capacities and services for secure Satcom. It will be based on an operator-neutral system architecture and will be available by 2021 for the commercial secure Satcom market. Furthermore, it may interface with national Satcom pooling and sharing and support a timely start of service of EU GOVSATCOM. An evolution of the hub development towards a full operating capability version 2 by 2025 is considered.

Govsatcom Space Component Segment 1
The projects within Segment 1 are a set of new, individual, self-standing PPPs, which may cover e.g. a complete Phase B/C/D/E1 implementation as initiated with Hisdesat for SpainsatNG; an implementation of an initial operations capability as done with Inmarsat for IRIS IOC at CMIN16; or provide for preparatory work, e.g. Phase A/B as done with Airbus for EDRS Global at CMIN16.
This element will also provide the opportunity for industry to propose secure Satcom developments in the 2025-2030 timeframe, which may include elements of a LEO constellation, or a future Arctic Satcom component or secure GEO Satcom assets, e.g. as identified in earlier ESA Govsatcom feasibility studies or as an element of a new over-reaching NG architecture by 2030

Longer Term Preparatory work/ Next-Generation Secure Satcom

A number of initiatives today address secure Satcom solutions at ESA, EU and national level. These include the EU GOVSATCOM programme; the IRIS/Satcom contribution to the future European ATM system; and the consideration of satellite-related projects as part of the EU programme dedicated to Quantum technologies and networks. These are very positive trends for Satcom but in their current mission scope, with their traditional design and limited total capacity delivered to users, they can be labelled "1st generation". This is especially true in comparison to what may be anticipated by 2030, when a 2nd generation secure satellite infrastructure must be deployed to address wider and more bandwidth demanding needs.

Due to the time needed to define, develop and deploy an advanced 2nd generation satellite-based infrastructure, together with the time needed by at least part of the user communities to integrate duly validated solutions within their operational road maps, preparatory studies must start no later than 2020. These studies must identify the most relevant architectures responding to the market needs; the key technologies to be developed; and the innovative programmatic/business frameworks that may enable development and deployment of such an infrastructure in the most efficient and cost-effective way.

4S therefore proposes to conduct from 2020 and in partnership with industry, a secure Satcom mission analysis/architecture design study (Phase 0/A/B1). This would enable a rapid start to technological activities and to a system design phase: a timeframe that seems compatible with a possible full-scale design and development phase (B/C/D/E1) possibly starting as soon as 2023 and thus consistent with the goal of FOC by 2030.

ANNEX C

Notification of Intent template
Activity Areas address by the industrial proposal

Mandatory Information

The Notification of Intent shall identify at least one activity and timeframe. Note: The examples for activities and their respective timeframe indicated in the template are not exhaustive.

4S Theme and activity areas vs. timeframe		Evolution of existing (>2019)	Generation of new (2020-2025)	Preparatory work (2025-2030)
CORE COMPETITIVENESS for 4S (including ScyLight)		e.g. European protected waveform	e.g. ScyLight for institutional QKD	e.g. Technology for NG Secure Satcom
Secure Satcom Projects	IRIS	IRIS for ATM Deployment	e.g. Beyond ATM e,g. Cockpit services	e.g. Digital Sky
	EDRS Global	EDRS-Global Phase C/D/E1	e.g. EDRS for NG Copernicus Sentinels, RPAS	e.g. NG Data Relay
	Institutional QKD	/	Precursor	e.g. Part of NG secure Satcom
	OTHER			
GOVSATCOM-related Projects	Precursor Phase 2	Integration into Pooling & Sharing Hubs; Extension of demonstrations and downstream service developments	e.g. Arctic Precursor	/
	Pooling&Sharing HUB	Phase A/B	Version 1 Hub Implementation	Version 2 Hub Implementation
	Space Component Segment 1	/	New National secure Satcom assets; Security augmented commercial secure satcom assets; IOVIOD	NG Secure Satcom System; Additional space infrastructure
	OTHER			
BUSINESS APPLICATIONS for 4S		e.g. Extension of Precursor PACIS demonstration downstream to create demand pull from civilian user base	e.g. development of new vertical sectors; AI; RPAS/HAPS	
GENERIC			e.g. Cybersecurity	

Optional Information:

The notification, in anticipation of more detailed information in the later stages, may consider first elements related to:

- Considered Business Perspective;
- Risk/cost sharing considerations; and
- Considered Industrial Organisation.

It may also identify if/how the following institutional commitments may affect the phasing and level of available co-funding:

- to procure secure Satcom services (e.g. related to anchor customer SLA) or
- to procure systems (e.g. related to infrastructure implementation)

It may also identify:

- any support from ESA that may be beneficial for the transfer of results, in particular in preparation of a possible subsequent operational phase in an institutional setting;
- any particular areas where specific support from ESA may be required and open points for consolidation during the dialogue phase; and/or
- any request for bi-lateral discussions at the occasion of the Industry Workshop defined under 8.1.