

ARTES 4.0 Generic Programme Line Business Applications - Space Solutions

“Maritime Decarbonisation – Decarbonisation through Maritime Autonomy”

THEMATIC CALL FOR PROPOSALS

Prepared by	ESA
Reference	ESA-CICA-SOW-2024-2788
Issue/Revision	1.0
Date of Issue	10/10/24
Status	Final



Table of Contents

1. OVERVIEW	4
2. BACKGROUND AND RATIONALE	4
3. OBJECTIVES OF THE CALL	6
4. SPACE ASSETS	7
5. SCOPE OF THE CALL	7
6. PROCUREMENT APPROACH	8
7. PROCESS AND SCHEDULE	9
7.1. TIMELINE AND PROCEDURE	9
7.2. EVALUATION CRITERIA	10
8. GENERAL CONDITIONS	11



Table of Acronyms

AIS	Automatic Identification System
AoF	Authorisation of Funding
APQ	Activity Pitch Questionnaire
ARTES	Advanced Research in Telecommunications Systems
BASS	Business Applications and Space Solutions
CET	Central European Time
ESA	European Space Agency
ETS	Emissions Trading System
EU	European Union
FP	Full Proposal
GHG	Green House Gas
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GT	Gross Tonnage
IMO	International Maritime Organisation
IoT	Internet of Things
MASS	Maritime Autonomous Surface Ships
MEPC	Marine Environment Protection Committee
MPA	Marine Protected Areas
MSC	Maritime Safety Committee
OP	Outline Proposal
OSIP	Open Space Innovation Platform
PSI	Project Security Instruction
ROC	Remote Operations Centre
RTK	Real Time Kinematic
SOLAS	Safety of Life at Sea
VDES	VHF Data Exchange System

1. OVERVIEW

This document presents an overview of the second pillar of the “Maritime Decarbonisation” thematic call for proposals - “Decarbonisation through Maritime Autonomy”.

The call for proposals, issued under the ARTES BASS programme line, is aimed at supporting the development of sustainable space-based services and applications that address challenges related to the decarbonisation of the maritime industry through increased maritime automation and autonomy.

2. BACKGROUND AND RATIONALE

A new paradigm is emerging in the maritime sector driven by the need to mitigate its impact on the environment. The transformation, driven by economic, social, and regulatory pressures will be a decades-long effort but has the potential to revolutionise the impact maritime industry has on the environment.

An important element of maritime sustainability, and the subject of the present call, is the decarbonisation of the maritime industry. Shipping is recognised as the most efficient form of commercial transport in terms of CO₂ emissions per tonne of cargo transported in one mile¹. However, due to the scale of the industry, maritime transport is still a significant contributor to the world’s total greenhouse gas emissions (around 3% of total global CO₂ emissions).



Figure 1: Comparison of typical CO₂ emissions between modes of transport, in grams/tonne-km²

In recent years, there have been significant efforts to enhance fuel efficiency in various fronts, such as route optimisation or hull and propeller design. However, achieving net-zero goals requires a profound transformation of the sector, where space assets are poised to play an integral role.

This transformation is not only prompted by societal and economic pressures, but it is also

¹ <https://www.ics-shipping.org/shipping-fact/environmental-performance-environmental-performance/>

² ICS Fueling the Fourth Propulsion Revolution: Full Report, based on IMO, Second GHG Study, 2009

underpinned by the release of several long-awaited regulatory frameworks from European and International maritime authorities. Notably, in 2023 and 2024, the following key agreements were enacted:

- At the 80th session of the Marine Environment Protection Committee (MEPC80), the International Maritime Organisation (IMO) adopted the 2023 Strategy on Reduction of GHG Emissions from Ships. The revised IMO GHG Strategy includes an enhanced common ambition to reach net-zero GHG emissions from international shipping close to 2050, a commitment to ensure an uptake of alternative zero and near-zero GHG fuels by 2030, as well as indicative check-points for 2030 and 2040.³
- Since January 2024, European shipping (5000 GT and above) is subject to EU's Emissions Trading System (EU ETS). The system covers i) 50% of emissions from voyages starting or ending outside of the EU (allowing the third country to decide on appropriate action for the remaining share of emissions); and ii) 100% of emissions that occur between two EU ports and when ships are within EU ports. The EU ETS covers CO₂ (carbon dioxide), CH₄ (methane) and N₂O (nitrous oxide) emissions, but the latter two only as from 2026.⁴

Maritime decarbonization is a broad subject that requires the involvement of and advancements from various stakeholders. To mirror the multifaceted nature of the required transformations and address the specific needs of different decarbonization approaches, the Call has been organized into four sub-themes: i) Digitalisation and logistics optimisation, ii) Maritime Autonomy, iii) Ports Decarbonization, and iv) Green Propulsion.

The present document addresses the second sub-themes: Decarbonisation through Maritime Autonomy. While autonomous shipping does not directly achieve decarbonisation, maritime autonomous systems offer transformative opportunities to make the sector cleaner, more energy-efficient, and environmentally sustainable. For example, the reduction or removal of onboard life support infrastructure opens the door for more compact vessels being able to utilise cleaner and more sustainable energy sources, and unlocks new alternative routes.

Similar to the decarbonisation frameworks, maritime autonomy is also experiencing regulatory changes, notably with the Non-mandatory Goal-Based MASS Code (accessible in draft mode from [IMODOCS](#)) of the IMO due to take effect in 2025; this piece will, for the first time, establish a pathway to the implementation and adoption of unmanned solutions for SOLAS cargo ships and high-speed craft⁵ and provide invaluable guidance and incentives to Industry at a time when they are expected to make long term investments.

³ <https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MEPC-80.aspx>

⁴ https://climate.ec.europa.eu/eu-action/transport/reducing-emissions-shipping-sector_en

⁵ [https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/Symposium-on-\"Making-headway-on-the-IMO-MASS-Code\"-.aspx](https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/Symposium-on-\)

3. OBJECTIVES OF THE CALL

The objective of the call subtheme is to develop new services that support the decarbonisation of the maritime sector through “maritime autonomy” including but not limited to the following areas.

- **Enhancing the efficiency of autonomous vessels:** This involves innovations that utilise space data and technologies to optimise the performance of autonomous systems, resulting in measurable efficiency gains. For example, improvements on autonomous traffic avoidance systems can directly reduce fuel consumption, emissions, and operational inefficiencies.
- **Navigating and overcoming regulatory barriers:** Maritime autonomous systems face complex regulatory challenges due to fragmented and evolving legal frameworks. This call aims to support the development of solutions that facilitate compliance with international regulations, standards, and insurance policies with space data. These efforts will help enable adoption of autonomous solutions within the maritime industry.
- **Advancing shore-based infrastructure:** The successful implementation of autonomous systems must be regarded holistically and not limited to seagoing vessels. Shore infrastructure, including docking facilities within ports and Remote Operations Centres (ROCs), must be modernised to support autonomous operations. This includes the adaptation of port facilities, communication systems, and operational frameworks to fully integrate digitalisation and autonomy, enabling seamless coordination between shore and sea.
- **Protecting autonomous systems from external threats:** Ensuring the security and resilience of autonomous systems is essential. This objective focuses on the development of safeguards, including protection measures and countermeasures against threats such as intentional or unintentional jamming of communication or GNSS services, cyberattacks, and physical assaults. Effective solutions will ensure the robustness of autonomous operations in both secure and hostile environments.
- **Supporting the next generation of seafarers (at sea and onshore):** Autonomous systems will not replace human workers but will complement and enhance their roles. This call encourages the development of services that leverage space data to facilitate the reskilling of maritime professionals, preparing them for new roles in human-assisted operations. The aim is to place crews in high-value, decision-making positions, both onboard and in shore-based control centres.
- **Increasing autonomy levels:** Maritime autonomy is not a binary state, IMO (MSC100/20 add.1) identifies four degrees of automation, ranging from “degree one - Ship with automated processes and decision support” to “degree four – fully autonomous ship”. The objective here is to utilise space data to enable higher degree of autonomy with a focus on enhancing sustainability, safety, reliability, and scalability of autonomous systems, while ensuring their compliance with international maritime laws.

- **Improving situational awareness for autonomous operations:** Autonomous vessels must have high levels of situational awareness to operate safely and efficiently. This objective involves the development of enhanced sensor systems, radar technologies, fused with satellite data to provide real-time monitoring of a vessel's environment, including nearby ships, weather patterns, and navigational hazards. AI-driven analytics will further improve risk prediction and decision-making.

4. SPACE ASSETS

The development of maritime autonomy solutions relies on ubiquitous connectivity, persistent monitoring, and effective situational awareness. Some of the uses of various space assets is outlined below.

- **Satellite Positioning and Timing:** Like most vessels, autonomous surface ships rely on GNSS for accurate positioning and timing synchronisation. However, in the case of MASS, advanced GNSS (e.g. RTK) may be used for high accuracy applications (e.g. docking, crane positioning). The use of alternative space-based satellite positioning (e.g. VDES R-Mode) can also be used as redundancy or watchdog. Finally, GNSS reflectometry can be used to derive sea state.
- **Satellite Communications:** Ubiquitous, resilient, and timely data is a critical element for maritime autonomy. Satellite communications and 5G allow ubiquitous real-time connectivity securing a ship-to-ROC as well as timely updates on navigational information, weather updates or traffic patterns. In addition to broadband, IoT, and connectivity solutions, satellites also deliver maritime specific services such as the GMDSS, satellite AIS, and VDES.
- **Satellite Earth Observation:** SatEO is routinely used for improving situational awareness on maritime operations including sea state, weather conditions, or hazards such as presence of ice, which can be used as actionable input for autonomous vessels.

5. SCOPE OF THE CALL

The proposals under this Call for Proposal shall contribute to the decarbonisation of the Maritime sector through maritime autonomy with innovative user-driven integrated downstream services that rely on advanced technologies and space data.

The Bidder shall involve in the project representatives from user communities, who shall take part in the pilot.

The service provider shall be identified and be part of the bidding team to ensure the commercial operational roll-out of the proposed service following completion of a demonstration project.

This Call for Proposals covers two types of activities:

1. **Feasibility Studies**, which provide the preparatory framework to identify, analyse and define new potentially sustainable services. The applications and/or services covered by the proposed Feasibility Studies must:
 - Be customer/user driven and present a strong sustainability potential.
 - Propose a service demonstrating the benefits of the utilisation of integrated space assets.
 - Include a viability analysis.
 - Aim to evolve the targeted applications and services to marketability and operational roll-out, potentially through a Demonstration Project after successful completion of the feasibility study.
 - Address maritime decarbonisation through maritime autonomy.
2. **Demonstration Projects**, dedicated to the implementation and demonstration of pre-operational services. The applications and/or services covered by the proposed Demonstration Projects must:
 - Be customer/user driven (including user involvement and active participation in the project).
 - Propose a service demonstrating the benefits from the utilisation of space assets with clear potential to become sustainable.
 - Address maritime decarbonisation through maritime autonomy.
 - Provide a measurable socio-economic impact.
 - The Bidder shall involve in the project representatives from user communities, which shall take part in the pilot.

6. PROCUREMENT APPROACH

The proposals submitted in reply to the call shall be implemented in the context of ESA BASS, 5G and 4S programme lines of ARTES in coordination with National Delegations.

The Bidder shall submit first an Activity Pitch Questionnaire, and following evaluation, may be invited to submit the Outline and Full Proposal. The Activity Pitch Questionnaire (APQ) template provided by ESA shall be used. This is considered as entry point for companies to submit their idea, providing a simplified and single point of access to the ESA ARTES framework.

The price of activities carried out in a given State are charged against the contribution of that State in the programme. A letter of Authorisation of Funding (AoF) from the relevant National Delegation is therefore required as part of the Full Proposal. The Bidder is however advised to inform the relevant National Delegation(s) when submitting the Pitch. The contact information of the National Delegates can be found here:

<https://artes.esa.int/national-delegations>.

The Agency will admit for evaluation only (Outline and Full) proposals from a bidding team composed of a company and/or organisation - be it as Prime or Subcontractor - residing in any of those states that subscribe to the Programme under which you wish to submit your proposal:

- I. **for the ARTES 4.0 BASS Generic Programme Line - Component A:** Business Applications. To date, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Sweden, Switzerland and the United Kingdom have subscribed.
- II. **for the ARTES 4.0 5G Strategic Programme Line:** Austria, Belgium, Finland, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Romania, Spain, Sweden, Switzerland, the United Kingdom and Canada have subscribed.
- III. **for the ARTES 4.0 4S Strategic Programme Line:** Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, Norway, Portugal, Romania, Spain, Switzerland, the United Kingdom and Canada have subscribed.

7. PROCESS AND SCHEDULE

It is planned for the call for proposals to be opened on 31st October 2024 until the 15th January 2025, 13:00 CET.

7.1. Timeline and Procedure

This thematic call's sub-theme is open for a period of 6 weeks, where the Bidders can respond by submission of pitches.

The Call is planned to be implemented according to the following stepwise approach:

In **Step 1**, the interested Bidders are requested to submit their proposal(s) based on a short Activity Pitch Questionnaire (APQ) template made available by ESA that can be downloaded from the Thematic Call website. The pitch should provide the initial idea of what the Bidder would like to propose, elaborated on the basis of the thematic areas and either the use cases proposed by ESA's partners or others selected by the Bidder. If the Bidder has the relevant information available to them, they may consider completing the supplementary questions (AP5) in the APQ template as part of the APQ+, which may allow to skip Step 3 below, at ESA's discretion.

Should the bidder wish to cooperate with any of the listed partners in the annexes, they shall give to the Agency the authorisation to distribute the activity pitch questionnaire to these stakeholders by explicitly stating it in the Activity Pitch Questionnaire. Subject to such authorisation, the Agency will follow up distributing the APQ to the bidder's authorised stakeholder(s) and liaise with them to facilitate interactions with the Bidder.

The completed Activity Pitch Questionnaire (APQ) shall be uploaded using the online web submitter, ESA's open space innovation platform (OSIP) in the channel named [“APQ for ARTES Downstream Business Applications”](#)

Multiple Pitches with different ideas can be submitted.

It is strongly recommended that the interested Bidder liaises from the beginning with the relevant ESA Member States Delegates.

In **Step 2**, following an assessment of the pitch by ESA, ESA will provide feedback to the company, aiming to provide a reply within 10 working days following the deadline for submission of the pitch.

It is recognised that some interactions with the Bidder may be required, and ESA may therefore consult with the Bidder 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 3.

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).

Subject to a positive evaluation of the pitch and the Bidder having informed the National Delegation(s), the Bidder will be notified by ESA and invited to submit an Outline Proposal. Note that the APQ+ can act as a substitute for the Outline Proposal, thus if having adequately answered the additional questions included in the APQ+, the Bidder may be able to skip Step 3.

In **Step 3**, the Bidder will submit the Outline Proposal, based on a template provided by ESA, with letter(s) of interest from users/stakeholders. The Outline Proposal expands upon the pitch with a more extensive level of details. The Bidder will be allowed 3 months from the APQ submission deadline to submission of their Outline Proposal. The outline proposal shall be submitted on the OSIP platform under the channel [“Outline Proposal for ARTES Downstream Business Applications – Feasibility Studies/Demonstration Projects”](#).

In **Step 4**, subject to a positive assessment from ESA and in-principle support from the National Delegations, the Bidder will be invited to submit a Full Proposal on ESA-STAR in accordance with BASS programme line. The Bidder will be allowed 12 months from submission of their Outline Proposal to submit their Full Proposal on ESA-STAR.

In **Step 5**, the Bidder will submit a Full Proposal with the Authorisation of Funding (AoF) from the relevant National Delegation(s). Following a positive assessment by ESA the proposed activity will be approved for implementation.

7.2. Evaluation Criteria



The evaluation process is non-competitive, as each proposal will be assessed individually on its own merits, according to the evaluation criteria applicable for [CALL FOR PROPOSALS FOR DOWNSTREAM APPLICATIONS IN ARTES 4.0](#) (esa star ref.: 1-10494).

More information for the assessment of the APQ and outline proposal stages can be found on the OSIP page [“APQ for ARTES Downstream Business Applications”](#).

More information on the evaluation criteria for the final proposals can be found within the document “Appendix 1 to AO/1-10494/20/NL/CLP (Issue 2.2)” which can be found on ESA-STAR and the [activity webpage](#).

8. 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 pitch, 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 ESA 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.

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.