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ANNEX 3

**ANNEX**

***to the***

**Commission Implementing Decision**

**on the financing of the European Defence Fund and the adoption of the work programme for 2026 and amending Commission Implementing Decision C(2025) 568 final on the financing of the European Defence Fund and the adoption of the work programme for 2025 - Part 2**

**2026 call topic descriptions**

# ANNEX 3

## 2026 call topics description

**Table of contents**

## 1. Content of the document

This document contains the description of all topics to be addressed by the eight EDF 2026 calls for proposals and the invitation-based direct award.

## 2. ACTIONS IMPLEMENTED THROUGH CALLS FOR PROPOSALS

### 2.1. Call EDF-2026-RA

- **Targeted type of actions:** Research actions
- **Form of funding:** Actual costs grants following the call for proposals
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation
- **Indicative budget for the call:** EUR 110 000 000 for seven call topics addressing seven categories of actions.

#### 2.1.1. EDF-2026-RA-MCBRN-DST: CBRN decontamination systems and technologies

- **Indicative budget:** EUR 15 000 000 for this topic under the EDF-2026-RA call.
- **Number of actions to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

CBRN (chemical, biological, radiological, and nuclear) decontamination processes in the military are currently designed to remove or neutralise hazardous substances to minimise the risk to personnel, equipment, the environment and the spread of contaminants or CBRN agents. CBRN decontamination is essential to assure force protection and mobility.

The military definition for decontamination is ‘the process by which the hazard from CBRN substances is reduced or removed’.

For military application of decontamination four levels are distinguished:

- immediate decontamination – decontamination carried out by individuals when they become contaminated, which may include decontamination of clothing and/or equipment.
- operational decontamination – decontamination restricted to specific parts of operationally essential assets and/or working areas. This is carried out to maintain operations.
- thorough decontamination – decontamination carried out to enable the partial or total removal of individual protective equipment, with the aim of restoring operational tempo.

- Clearance decontamination – decontamination of materiel to a sufficient standard to enable its unrestricted transportation, maintenance, use or disposal.

However, current military decontamination processes (MDPs) are manual, time-consuming, centralised and focused on thorough decontamination. This can lead to highly vulnerable troop concentrations in military operations that are easily detected. Although specific procedures can vary among military organisations and based on the type of contamination, the general decontamination process typically consists of:

- an initial assessment by specialists to determine what needs to be decontaminated and which decontamination procedures are the most suitable;
- the application of tailored chemicals or technologies to effectively decontaminate the identified CBRN agent;
- a systematic decontamination of personnel;
- thoroughly cleansing contaminated equipment and vehicles with decontamination agents to make them safe for reuse, repair or storage;
- a process/technology to safely dispose of contaminated materials, including protective gear and decontamination agents, in line with environmental and safety regulations.

For these reasons, new approaches to operational and thorough MDPs are required to minimise the impact of CBRN incidents on military missions. This call seeks new or improved concepts and technology in all stages of current MDPs.

***Specific objective***

An appropriate level of robotic and autonomous systems (RAS) is required in MDPs to improve efficiency, safety, and process checks, and reduce the manual workload. New approaches, based on risk assessment and acceptance are required to balance operational requirements, personnel safety, environmental conditions and the available decontamination resources to keep operational tempo in CBRN conditions. Additionally, it is essential to develop solutions and procedures that allow military operations to continue and maintain combat readiness in CBRN conditions or when the contamination is still present. Moreover, a decision support tool, based on risk assessment, risk acceptance and/or operational needs/priorities as well as environmental conditions is essential to increase the efficient use of decontamination resources. Future solutions must accommodate the decontamination of personnel, infrastructure and critical equipment without significant loss of functionality. This includes vehicle and sensitive devices, such as sensors, communication systems, and computers. Decentralised, scalable approaches in MDPs, depending on distance to the effective enemy range of fire and reconnaissance, are expected- to prevent the concentration of military assets and enable on-site decontamination during complex operations like counter mobility or in areas where manoeuvre is restricted. Developing on-site and easy to use decontamination systems is vital to mitigating the use and impact of CBRN substances, thus boosting the resilience of both military and civilian environments. On-site decontamination solutions should include developing self-decontaminating materials.

Any weaknesses in the fight and supply chain (FSC) of CBRN defences increases the impact of CBRN weapons and therefore the risk of an attack by such weapons. Smart ad hoc solutions are essential for individuals in high-intensity combat situations without air superiority on a transparent battlefield. High throughput MDPs in highly protected air-defence/air superiority areas are important as well. The MDPs need to be gradually adaptable for the different situations.

Key technologies and consumables should ideally be sourced in Europe and have attributes such as low toxicity, minimal corrosiveness, long-term stability for storage, air transportability, and compliance with EU regulations. Their use should be for both personnel and equipment. To minimise their logistic footprint and environmental impact MDPs, should be user-friendly, safe, effective and reliable.

**Scope and types of activities**

***Scope***

Proposals must develop CBRN decontamination solutions for an integrated approach at different levels in different, tactical, operational and strategic situations, including a proof-of-concept (TRL3) and a design of an automated decontamination solution for personnel and equipment including vehicles.

Proposals must therefore address:

- research on the effectiveness of innovative MDPs and technologies against CBRN agents, such as chemical warfare agents, including fourth generation agents and TICs (toxic industrial chemicals), biothreat agents and radioactive substances, in line with internationally accepted standards;

- validating the developed MDPs under controlled lab and living lab conditions (TRL5);

- determining parameters for MDPs, including exposure time (the time taken for the decontamination agents to interact with contaminated surface), and concentration, taking into account temperature, humidity and operational and logistical conditions;

- developing of decision support tool as a functional service for existing CBRN knowledge management systems (KMS) that takes the weather, technical, logistical parameters etc. into account when considering the trade-off between the time requirements of specific MDPs and specific operational needs. The tool must have two modes: (i) an expert mode (default) and (ii) a layperson mode (for emergencies).

Proposals should also address:

- analysing the interactions between various decontamination methods, agents, exposed personnel, equipment and surfaces (skin, wounds, electronic devices, concrete, asphalt, etc.), e.g. regarding corrosion effects, irritations, efficiency;

- determining the dual-use potential of the technological decontamination solutions for civilian scenarios since they could strengthen the resilience of the society;

- analysing, developing and testing unmanned vehicles (UxV) payload capabilities for MDPs and/or determining the effectiveness of MDPs;

- assessing human and animal health risks, along with environmental impacts, associated with the use of nanosorbents in the decontamination of equipment contaminated with CBRN agents.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes (mandatory) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[1] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[2] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[3] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

Proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- <u>Generating knowledge:</u>

    - Investigating real-time pre- and post-decontamination assessment methods for CBRN substances to determine their operational decontamination effectiveness

[1] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[2] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[3] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

and (residual) risk. This should enable prioritisation, triage processes and risk acceptance as part of the decision support tool.

- Application of automated and semi-automated decontamination systems in military operations in line with applicable standards; the planning and assessment process for decontamination should be included in the overall system.

- Investigating surface technologies for self-decontamination to be used in operational decontamination procedures.

- Studies:

  - Feasibility study of the proposed MDPs compared to existing decontamination systems. This should include cost analysis, scalability, the logistic footprint and supply-chain, throughput, detectability and implementation in military operations scenarios taking into account current developments.

  - Analysing requirements integrating the proposed MDPs into existing CBRN decontamination systems (e.g. the use of developed decontamination agents with existing systems and of payload for UxV).

  - Market analysis if systems exist and how they can be integrated into MDPs.

  - Analysing and identifying of relevant factors and needs for the decision support tool for CBRN-advisors, including a scenario based-decision tree to assess the application of appropriate decontamination levels based on operational constraints and residual risk.

  - Analysing the proposed MDPs' logistic footprint and supply chain compared to existing systems.

- Design:

  - Developing new, efficient, and scalable MDPs that are effective against CBRN agents and respond to situational needs for operational decontamination (e.g. decentralisation, effectiveness without compromising functionality, acceptance of residual risk) and for thorough decontamination (e.g. RAS).

  - Assessing residual risks of the MDPs depending on the CBRN agent and representative environments:

    a. laboratory validation of decontamination effectiveness in line with international accepted standards (TRL4);

    b. evaluation of the MDPs under controlled lab and living lab conditions (TRL5);

    c. preliminary assessment of using the MDPs in operational environment (TRL6);

d. development of capability requirements for MDPs and systems for operational and thorough decontamination.

- Designing a decision support tool as functional service of a CBRN KMS.
- Designing the technology demonstrator to meet the required specifications.

In addition, proposals should cover the following tasks:

- Generating knowledge:
  - Assessing improvised, easy to use and widely available solutions for operational decontamination.
  - Using remote decontamination systems and methods in military front line operations.
  - Assessing waste management solution to minimise harmful effects on personnel and the area of operation.
- Studies:
  - Evaluating different decontamination agents' compatibility with UxV delivery systems.
  - Evaluating using UxV systems for operational decontamination:
    a. developing and evaluating concepts for high-throughput automated systems, such as intelligent, collaborative robotics and advanced spraying systems;
    b. implementing contour recognition technology to adapt systems to different vehicle and equipment geometries;
    c. conducting trials with live chemical warfare agents (CWAs) and TICs to ensure robust performance.
- Design
  - Developing surfaces, coatings and materials with properties that enable self-decontamination for the operational decontamination (in line with timeframe, efficacy, operational requirements) of personal protective equipment (PPE) and other equipment.

The proposals may also cover the tasks set out below:

- Integrating knowledge:
  - Developing an integrated CBRN DIM (detection, identification and monitoring) UxV-based system for decontamination assessment.
  - Investigating surface technologies for the self-decontamination of infrastructure.

- Studies:
    - Assessing of the environmental impact of various decontamination methods on different operational conditions.
- Design:
    - Designing modular decontamination systems that can be adapted to different UxV platforms.

The proposals should demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing or completed activities described in the call topics: (i) EDF-2023-DA-MCBRN-FCS on *Federating CBRN systems* and (ii) EDF-2025-RA-MCBRN-ATE on *Autonomous triage and evacuation*.

**Functional requirements**

The proposed products and technologies should meet the functional requirements described below:

- Demonstrate effectiveness against CBRN agents in line with standards for operational and thorough decontamination.
- Provide operational capability in all climate zones categories including extreme temperatures and in non-permissive environments.
- Be usable and available in various operational scenarios: large scale combat operations and remote military operations.
- Provide a new decision support tool on the time consumption of MDPs compared to the endurance gain and the operational needs as:
    - a functional service integrated in existing CBRN KMS for CBRN advisors;
    - an ad hoc decision support solution for non-specialist use.
- Provide a balanced effort of interlocking MDPs, considering rapid deployment, throughput, thoroughness, minimal operator exposure, detectability and logistic impact to best support operational needs based on selected scenarios.
- Enable prioritisation/triage according to contamination, as well as an assessment of decontamination efficacy, and control of decontamination processes at least for thorough decontamination.
- Feature:
    - self-decontaminating surfaces for PPE and other equipment;
    - automation to minimise the need for human resources;

  - UxV platforms to provide decontamination and/or assistance to decontamination.

- Provide modular solutions that can adapt to operational needs and restore the operational tempo in a CBRN environment or in CBRN conditions.

**Expected impact**

The outcome of the effort should contribute to:

- reducing the risk and impact of CBRN attacks by deterrence and preparedness;
- boosting the resilience of European forces and their capability to respond to CBRN agents;
- strengthening interoperability of CBRN defence systems across EU Member States and EDF associated countries;
- strengthening the resilience of European civil society against CBRN events, by taking the dual-use potential of MDPs into account and strengthening the interoperability between military and civilian services;
- improving the security of supply for critical decontamination technologies;
- demonstrating the impact of EU-funded research in defence applications, particularly for CBRN events;
- boosting collaborative efforts across EU Member States and EDF associated countries to address clearance decontamination challenges, influencing the management of contaminated equipment in NATO missions;
- creating new technical solutions that improve safety by mitigating CBRN impact, reducing exposure to hazardous substances, and lowering logistics burdens;
- simplifying decontamination processes, extending equipment lifespan and reducing environmental impacts.

### 2.1.2. EDF-2026-RA-SENS-MSDT-STEP: Multidomain sensors demonstrator and test

- **Indicative budget:** EUR 20 000 000 for this topic under the EDF-2026-RA call.
- **Number of actions to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

The high speed and significant ability to manoeuvre of hypersonic threats, especially hypersonic glide vehicles (HGV), produces difficult conditions for target detection and tracking. This is further complicated when combined with changes in radar cross section

(RCS) characteristics. Radar waveforms and signal processing become fundamental to counter the effects induced by the hypersonic threat dynamics.

In addition, over the last decade, the use of unmanned aerial vehicles (UAV) has increased globally. They have become suitable for battlefield intelligence gathering and reconnaissance. This in turn requires a focus on the development of anti-UAV radars that can identify and track such systems.

Innovative approaches (e.g. artificial intelligence (AI) methods and cognitive) must provide the means to optimally select the waveform-receiver filter combination to maximise radar detection and tracking performance, including by using a feedback loop between the received signal characteristics and the transmitted ones.

***Specific objective***

This call topic aims to continue research to demonstrate an innovative radar system capable of detecting and tracking HGVs and UAVs in a dynamic environment, using adaptive waveform-receiver filter combinations optimised through innovative (AI and cognitive) methods. The system should be able to:

- automatically adjust radar waveforms and signal processing in real-time to counter the effects of changing Radar Cross Section (RCS) characteristics and high-speed manoeuvring of HGVs.
- effectively classify and track UAVs in a cluttered environment, using advanced signal processing such as machine learning algorithms.
- use a feedback loop between received signal characteristics and transmitted waveforms to optimise detection and tracking performance.
- demonstrate improved detection and tracking ranges, as well as enhanced robustness against electronic countermeasures, compared to existing radar systems.

This call topic contributes to the STEP objectives, as defined in the STEP Regulation[4], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

Proposals must develop and field test an engineering development model (EDM). They must investigate the application of innovative approaches, such as cognitive approaches, to the algorithm supporting detection and tracking of targets, classification[5], clutter cancellation, and electronic counter countermeasures (ECCM).

In that sense, proposals should:

- investigate theoretical models to correctly evaluate radar performance;

[4] Regulation (EU) 2024/795

[5] Classification refers to the capability to categorise a detected target into a predefined class, with initial classes including Hypersonic Vehicles (including HGV), Class I UAV, Class II UAV, and fighters, and potentially expanded or refined during the project to meet specific operational requirements.

- Carry out research on data bases supporting cognitive approaches contributing to hypersonic, mini and micro-UAV signatures data preparation and database functionality evaluation;
- generate a roadmap related to specialised AI algorithms and validation databases for cognitive performance and classification;
- study and demonstrate Inverse Synthetic Aperture Radar (ISAR) and micro-doppler signature-based objects classification by novel methods (such as AI-based);
- study and mature innovative machine learning algorithms to improve their reliability and performance for target classification;
- perform a feasibility study on the robustness of the complete system in simulated scenarios;
- define a case study to be examined in detail (risk reduction) contributing to analysis of simulation results and performance assessment;
- demonstrate in a representative environment the ability to detect, track and classify UAVs;
- demonstrate by analysis the ability to detect, track and classify HGVs.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes (mandatory) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such design has been developed, including partial tests for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[6] of a defence product, tangible or intangible component or technology | No |

[6] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[7] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[8] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

Proposals must therefore cover at least the tasks set out below as part of mandatory activities:

- Generating knowledge:
  - research on characteristics of both HGVs and UAVs for the detection, tracking and classification tasks;
  - research on models to adapt radar waveforms and signal processing in real-time to the changing RCS of high-speed manoeuvring HGVs;
  - research on data bases able to support cognitive approaches contributing to the classification of the defined classes' threats and obtention of related signatures;
  - analysing the latency issues to use data bases remotely or through edge processing.
- Integrating knowledge:
  - analysing the interaction and integration between active electronic scanned antenna (AESA) concepts and the cognitive radar module for detection, tracking and classification supported by AI or other novel techniques.
- Studies:
  - studying future sensors as outlined in the scope including cognitive capabilities and classification;
  - completing a set of requirement specifications applicable to the targeted sensor with classification of the EDM to be developed as part of this phase;
  - generating a roadmap related to specialised AI algorithms and validation databases for cognitive performance and classification;

[7] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[8] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- studying the radar sensors characteristics and related signal processing contributing to inverse synthetic aperture radar (ISAR) and micro-doppler signature-based objects classification by AI methods;
- studying AI techniques to improve reliability and performance for target type classification.

- Design:
  - completing the preliminary design review (PDR) including individual modules/components PDRs and system PDR;
  - critical design review (CDR) including:
    - AESA antenna based on digital transmission receive module (TRM) and SWaP-C requirements;
    - signal and data processing based on algorithms exploiting the selected technologies.
  - developing an EDM, with the following features:
    - AESA representative of the final product (rotating and stare mode, antenna calibration, potential reduction in size/number of elements, TX power, cooling requirements, etc.);
    - mounted on a platform and installed in a representative environment;
    - digital beam forming, signal processing and data processing to support basic radar operation (detection and tracking) plus the algorithms based on new technologies (e.g. High-Resolution Range, AI);
    - Capability of injecting target signals for calibration/testing purposes (Test Targets);
    - Data recording capability.
  - to support the design, the antenna must be tested in the near field to characterise transmission /reception (Tx/Rx) patterns as well as auxiliary patterns (e.g. data links);
  - the EDM operation and testing should be accomplished in a representative environment covering at least two domains, for example including ground and sea clutter conditions.

Recorded data must be carefully examined, the evaluation of results must be part of the final report.

A clear and feasible path (including detailed effort, schedule, spending profile, and recurring cost estimation) for the subsequent sensor full development phase should be provided.

Moreover, the proposals may demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topics: (i) EDF-2022-RA-SENS-ART on *Advanced Radar Technologies*, aiming at counteracting challenging emerging threats and hypersonic missiles with increasing sensor resilience and sustainability, which follows on from and complements (ii) EDF-2021-RA-SENS-ART on *Advanced Radar Technologies*, dealing with the study and design a new class of radar to meet future operational needs by means of extensive use of emerging technologies.

**Functional requirements**

The proposed solution should meet the functional requirements described below:

- RF sampling and digitalisation of signals at multiple carrier frequencies;
- modular and scalable approach (i.e. digital TRM);
- thermal management innovative solutions to increase sensors mobility and sensor reliability;
- cognitive radar approach for the design of radar functions;
- software-defined methodology for the implementation of radar functions;
- large bandwidth function for classification purposes;
- algorithms based on AI for specific applications such as classification;
- innovative cyber resilience and network-oriented architecture and design.

**Expected impact**

The outcome of the effort should contribute to:

- developing radar architectures ready to meet challenging requirements with reliable, sustainable, low cost, full digital sensors and networks;
- providing EU Member States and EDF associated countries with the ability to detect, track and classify high challenging targets;
- implementing the cognitive approach where AI-based algorithms are the theoretical basis for the new sensors implementing software-defined architectures for signal and data processing where the wide band data link enables the data mining support;
- showcasing sustainability as one of the goals of the new sensors, which is achievable thanks to the co-existence of different functions to mitigate the congestion of the electromagnetic spectrum, and benefiting from reduced emitted power and the limited power absorption thanks to the use of new materials;
- contributing to reducing or preventing the strategic dependencies of the Union.

### 2.1.3. EDF-2026-RA-CYBER-QSTN-STEP: Quantum secured tactical networks

- **Indicative budget:** EUR 14 000 000 for this topic under the EDF-2026-RA call.
- **Number of actions to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

Current and future military operations strongly rely on information and communication services for command and control, surveillance and reconnaissance, and intelligence gathering and sharing. These services require a strong, reliable, and secure communication and information system (CIS) network infrastructure, protected by cybersecurity controls. Emerging technologies, including artificial intelligence for threat detection, post-quantum cryptography (PQC) for future-proof encryption, edge computing for decentralised processing, and Quantum Key Distribution (QKD), are being used to tackle this issue and to strengthen the security of communications, improving cyber defence capabilities.

The existing networks are somewhat static and rigid and need to be more dynamic and flexible. This objective can be achieved by leveraging software-defined networks (SDNs). SDNs rely on simple key ideas: separation of control and data plane, centralisation of network policies and programmability of the networks. They are more agile, flexible, and easier to manage, meaning that new services and general devices can be deployed much faster than with the traditional networks. They are also easier to re-configure and support interoperation between different networks. However, SDN implementation in the context of defence also poses challenges, for instance when considering tactical networks and especially when sharing sensitive information, due to its dynamical environment. In this sense, it is important to develop an SDN solution that has a high level of logical centralisation combined with a level of integration that allows it to be used whenever and wherever needed. Finally, this SDN architecture should guarantee redundancy and resilience against network element failures and network link loss, including cyberattacks against the network, such as a quick capability to adapt to network topology updates due to insertion of new network elements, improving overall cyber resilience.

QKD and PQC are increasingly being developed throughout the world in several contexts. Europe is in the implementation phase of EuroQCI and IRIS$^2$ with projects ongoing throughout Europe to deploy national testbeds. The first 3 PQC algorithms have been released, with the possibility of developing new ones. Also, plans for deployment of these algorithms are starting to emerge, including a Recommendation on a coordinated implementation roadmap for the transition to PQC by the European Commission. While there are still some challenges associated with adopting PQC algorithms, it is more challenging to adopt QKD in a defence context. Using some of these technologies like QKD in a highly mobile environment is an even greater challenge. Civilian networks have fundamentally different requirements, including a more relaxed security standing. In contrast, defence networks require much stronger isolation and cybersecurity measures, which in turn severely limit their flexibility.

Previous EDIDP and EDF funded projects already provided a quantum-enabled SDN architecture demonstrating that it unites quantum and classical communications under the same management, enabling network optimisation to better use all resources. This architecture supports the existing security mechanisms, taking into account the red-black separation principle of military networks, and can be validated in an operational environment, with different tactical scenarios using software-defined radios (SDRs) that are interoperable with the QKD enabled SDN network where fibre optical infrastructure is present.

Innovative technology should be developed to deliver new secure communication paradigms for the military information environment. This technology should combine QKD in free space

and space-based, physical unclonable functions (PUFs) and PQC, leveraged by SDN, network functions virtualisation (NFV), 5G/6G network slicing and quantum-safe security mechanisms that deliver improved cyberspace security.

***Specific objective***

To achieve the overall objective of having a quantum-secured tactical network for military purposes, the following challenges should be addressed:

- The continuous use of SDN to control a quantum enabled network and to reroute cryptographic keys in tactical scenarios considering the red-black separation of military networks, with minimal interruption, even in the event of link disruption due to cyber-attack or malfunctions.
- The real-time detection of all intrusion and hacking attempts using quantum principles and technologies like Quantum Key Distribution (QKD). This technology should be specifically designed to enable two parties to securely exchange a private key at each end of a communication channel.
- The assessment of integrating mobile QKD nodes based on drones (UAVs) on the network to distribute quantum keys on the field and to have SDRs operating and interoperable with these networks.
- How to exploit 5G/6G network capabilities for delivering tailored secure communication services, when associated to the programmability and flexibility offered by SDN, to facilitate a seamless integration of mobile communications, including QKD, PUFs and PQC to support more frequent and reliable tactical and operational use cases.
- Identifying network policies, quality of service metrics and security standards for multi-domains (integration of heterogeneous secure networks) in coalition scenarios.
- Studying and implementing network node management for communications in a federated environment and defining practical key management services for these scenarios.

This call topic contributes to the STEP objectives, as defined in STEP Regulation[9], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

Proposals must design SDN solutions (including the advance of technologies and systems), for a network architectural framework which provides new capabilities for defence in full mobile operational terms, combining different disruptive technologies such as QKD in free space and space-based, PUFs and PQC combined with terrestrial networks. They should in particular harness the advantages of recent network technologies that include software-based

[9] Regulation (EU) 2024/795

architectures, such as NFV and SDN, quantum-safe security mechanisms, and 5G/6G distinctive features such as network slicing.

Moreover, the proposals should address the use of mobile secure networks for defence, powering them with QKD, PUFs, SDN, 5G/6G, and state of the art quantum resistant cryptographic protocols able to secure communications in tactical and operational scenarios and their connection with transport networks. These may include PQC and other algorithmic techniques that provide security assurances even in the absence of quantum channels. It should continuously bring an advantage to European defence in terms of secure communications in more challenging scenarios, like the full mobile tactical ones and in the case of coalition ones, to be interoperable.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(mandatory) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[10] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[11] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[12] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

Proposals must therefore cover at least the tasks set out below as part of mandatory activities:

[10] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[11] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[12] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- Generating knowledge:
  - developing suitable military scenarios where QKD, SDN and SDR can be applied, based on CONOPS;
  - developing and catalogue specifications and standards for real tactical applications of QKD and SDN where mobility is mandatory, in relation to military operations;
  - cyberattack modelling and catalogue of threats against quantum protected networks;
  - applying security controls and procedures to improve cyber defence posture, including hybrid schemes combining QKD, PQC, and PUFs depending on operational and tactical constraints.
- Integrating knowledge:
  - specifying integrated network security based on QKD, SDN and SDR for tactical networks, including hardening with PUFs and PQC;
  - developing an integrated concept to raise awareness in network situational awareness and cyber situational awareness systems against cyber-attacks at quantum level, improving real-time monitoring and detection;
  - developing a multi-SDN controller able to facilitate the integration and interoperability of all components with end-to-end SDN orchestrators and also enabling the integration of the free space network domain into end-to-end transport networks.
- Studies:
  - feasibility study on new tactical networks with new elements as mobile QKD nodes and optical ground stations for connection with space.
  - feasibility study on satellite-based QKD and its interconnection with terrestrial networks for overcoming the distance limitation of quantum communication systems.
  - feasibility study on the application of 5G/6G slicing, side links and integrated access and backhauls (IABs) for enhancing the concepts of software-defined networking (SDN) and network function virtualisation (NFV) for military tactical networks.
- Design:
  - specifying and designing new capabilities for European Defence based on tactical secure networks, that are also able to integrate IRIS$^2$ and EuroQCI network with a dual use perspective, through stringent security requirements using quantum-safe approaches such as QKD and PQC and considering the need for future flexibility based on a crypto agility concept;

- detailed design of the potential new tactical networks, using QKD, in a multi-domain environment;
- design and proof-of-concept for QKD mobile nodes (based on UAVs, for instance).
- developing demonstrators in tactical edge/deployable scenarios to show the operational benefits and added value of the new technical solutions, integrating QKD, SDR and SDN, enhancing the application of solutions based on PUF and PQC.

In addition, proposals should address:

- Studies and design for:
  - quantum enabled solutions: starting from fibre infrastructure and evolving naturally to free space QKD. A study on satellite based QKD to be used in the future is also recommended;
  - additional physical security with PUFs and allowing hybridisation with PQC;
  - a multi-SDN controller able to facilitate the interaction of the proposed solution with end-to-end SDN orchestrators and enabling the integration of the free space network domain into end-to-end transport networks;
  - exploitation of UAVs as mobile QKD nodes to provide more mobility in the network where there is no direct line of sight between units and ability to deliver keys through QKD to SDRs;
  - mission networks architecture with enhanced security, improved cyber defence related to cyber-attacks on the transport layer, and cryptographic key management;
  - a thorough security analysis of the integrated solution, including QKD, SDN and SDR technologies, and recommendations aligned with red-black separation of military networks;
  - Application of 5G/6G slicing, side links and IABs;
  - Models for transport federated networks and key management service;
  - SDN that can adapt to changing cryptographic needs without affecting the system unnecessarily, taking into consideration crypto agility to be able to adapt to future developments in cryptography.

Proposals must demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topicEDIDP-CSAMN-SDN-2020 related to *Software Defined Network for Defence use including the development of products and technologies*.

**Functional requirements**

The proposed product and technologies should meet the functional requirements described below:

- they should consider hybrid SDN/legacy architecture, highlighting the benefits for mission critical applications in emergency situations and tactical scenarios;
- SDN architecture should guarantee redundancy and resilience against cyberattacks and network elements failures including network link loss and be able to quickly adapt to network topology updates due to insertion of new network elements;
- Selected SDN technologies and the development of SDN based/enabled solutions should be able to integrate a centralised SDN architecture or a distributed architecture, allowing high levels of flexibility and situational awareness.
- quantum safe protocols should be used to physically secure the tactical networks.

In addition, the capability of military networks to be resilient and secure, leveraging the cyber defence posture, includes the following operational requirements, to be taken into account in the proposals:

- Being suitable for tactical environment and mission requirements based on specific operational use cases, grounded on CONOPS coming from the military end users.
- Supporting and protect the new emerging defence technology against cyberattacks as a key enabler not only for the network situational awareness and management, but also for cyber situational awareness and common operational picture.
- Being capable to operate in tactical edge/deployable scenarios by looking at the benefits for the integration with intelligent SDR (e.g. cognitive radio), SDN enabled, that can further improve the success and effectiveness of the mission including efficiently receiving the keys generated by the QKD. The proposals may consider a demonstration of this requirement under the design phase.

**Expected impact**

The outcome of the effort should contribute to:

- scientific and technological improvements for the foundation of a future technology with disruptive applications in the area of defence;
- enhancing innovation capacity of the European defence industry by identifying and exploring ground-breaking concepts and approaches or by applying technologies and concepts previously not applied in the defence sector;
- enhancing competitiveness of the European defence industry and creation of new defence markets;
- enhancing defence research and innovation capacity across Europe by involving actors that can make a difference in the future, such as excellent researchers, ambitious high-tech SMEs and startups, or visionary departments of large companies, universities or research and technology organisations;

- providing harmonised solutions for future military secure tactical networks that can drive the Defence capability needs of EU Member States and EDF associated countries and promoting the dual use of these technologies, also considering the context of the civilian sector and other EU projects based on quantum technologies, like EuroQCI and IRIS$^2$;

- evolving the new secure quantum networks for European defence leveraging the technological sovereignty of Europe.

- contributing to reducing or preventing the strategic dependencies of the Union.

### 2.1.4. EDF-2026-RA-AIR-A4R: Autonomous and automatic air-to-air Refuelling

- **Indicative budget:** EUR 20 000 000 for this topic under the EDF-2026-RA call.
- **Number of actions to be funded:** Several proposals may be funded for this topic.

**Objectives**

***General objective***

Air-to-air refuelling significantly boosts the endurance and efficiency of military aerial operations and enables these operations in remote areas that would otherwise not be possible. Currently, tanker operators and receiver pilots are required to perform air-to-air refuelling manually. Although automatic air-to-air refuelling reduces the workload and improves safety for tanker and receiver crews, autonomous air-to-air refuelling is expected to be crucial for the aerial refuelling of future manned and unmanned aircraft.

***Specific objective***

The objective of this call topic is to explore the development of sensor systems, analyse the progress of relevant technologies and identify possible challenges, in particular hardware and sensor fusion, to enable accurate relative navigation between tanker, receiver(s), and refuelling systems, even in adverse conditions. Improved optical sensors, advanced image processing, flight control algorithms and supervision interfaces are also expected to play a crucial role in improving the docking and refuelling process, leading to increase safety and time efficiency for both manned and unmanned aircraft.

**Scope and types of activities**

***Scope***

Proposals must explore and adapt (up to TRL 6) new and existing technologies to be used to reduce the workload of the crew involved in air-to-air refuelling operations, while maintaining or even increasing the safety. They must in particular address the following:

- receiver autopilot function for autonomous air-to-air refuelling for current and future manned fighter aircraft and unmanned aircraft, including the development of representative simulation models to facilitate future integrations and engineering developments;

- integration of sensor technologies, sensor fusion, and data exchange interfaces that enable precise relative navigation between receiver aircraft (manned or unmanned) and tanker;
- autonomous refuelling concept of operations (A4R CONOPS) for a scenario involving a strategic tanker aircraft refuelling multiple manned and unmanned receivers;
- a standardisation outline proposal for autonomous Air-to-Air refuelling ;
- demonstration of the technology in a flight test, including a dry contact, to ensure data gathering for the different technologies being studied and designed.

Moreover, the proposal should address:

- tanker/receiver communication, data link and telemetry requirements for autonomous air-to-air refuelling, which may be further developed and integrated into current and future manned and unmanned aircraft;
- demonstration of the technology in a flight test, including a wet contact, to get data for verifying the results of the relevant studies and for validating the design of the key technologies involved;
- demonstration of a visual tracking and processing system to enable the receiver to perform autonomous air-to-air refuelling operations as set out in the CONOPS.

In addition, the proposal may address*:*

- navigation sensor fusion for drawing up relative position algorithms.

However, the proposals should not address*:*

- the use of boom technology, as it is not part of this call topic's scope.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(optional) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |

| | **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|---|
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[13] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[14] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[15] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Integrating knowledge:
  - Setting out a CONOPS for autonomous air-to-air refuelling (A4R) to ensure interoperability in international operations.
- Studies:
  - integration of sensor systems (hardware and sensor fusion) that provide adequate information for the relative navigation between tanker, receiver(s) and refuelling system (probe and drogue) including operations in adverse conditions;
  - assessing optical sensor systems (camera, laser) and image processing techniques;
  - developing a standardisation outline proposal for A4R;
  - drawing up a technical and functional evolutional roadmap to implement and improve autonomy of current and future tanker and receiver aircraft;
  - identifying possible challenges (in particular hardware and sensor fusion, to enable accurate relative navigation between tanker, receiver(s), and refuelling systems, in operational environments and even adverse conditions including EMCON[16]).
- Design:

[13] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[14] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[15] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.
[16] Emission Control

- Design of flight control modes/algorithms, crew interfaces/assistance and actively controlled/stabilised refuelling systems (drogue) that facilitate the docking and refuelling procedure for the receiver crew and tanker operator to increase time efficiency and safety;

- for unmanned receivers, design of a higher-level mission management system for full autonomous air-to-air refuelling (including three or more aircraft);

- to develop, integrate and test such A4R technologies, test environments and procedures must be made available (or developed, if not available): laboratory component tests, integrated simulator tests, sub-scale and full-scale flight tests;).

In addition, the proposals should cover the tasks set out below:

- Studies:

    - Integration of artificial intelligence (AI) technologies into the following elements (any AI development should show the potential for certification in line with the state of the art of this technology):

        - search and tracking in air-to-air refuelling operations;

        - flight control modes and algorithms, pilot interfaces and assistance and active control and stabilisation of refuelling systems

        - navigation sensor fusion for defining relative position algorithms.

    - In-flight data links:

        - special requirements for tanker/receiver communication, data link and telemetry for autonomous air-to-air refuelling that may be further developed and integrated into current and future manned and unmanned aircraft.

The proposals may also cover the following tasks:

- Studies:

    - Computing technologies:

        - Identification of computing capabilities needed to integrate autonomous air-to-air refuelling into real operation environment.

The proposals should demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topic EDF-2021-AIR-D-CAC on *European interoperability standard for collaborative air combat*.

**Functional requirements**

The proposed product and technologies should:

- have automatic or autonomous modes;
- be capable of teaming manned and unmanned aircraft for multiple air-to-air refuelling operations;
- be capable of operating reliably within the flight envelope of the receivers (fighter aircraft, and other manned or unmanned assets);
- be compatible with existing systems and ensure integration into current aircraft;
- ensure interoperability and regulatory compliance with applicable standards (e.g. ATP 3.3.4.10) ;
- ensure interoperability between refuelling assets (receivers and tankers);
- have day and night operational capabilities;
- be capable of operating in adverse weather conditions;
- provide monitoring features to ensure safe refuelling operations.

**Expected impact**

The outcome of the effort should contribute to:

- improving reliability and safety of aerial refuelling operations;
- speeding up aerial refuelling operations and making them more efficient;
- improving standardisation and interoperability of aerial refuelling operations;
- reducing the workload for air crew;
- reducing the mission cancellation rate;
- enabling manned-unmanned assets teaming in air operations.

### 2.1.5. EDF-2026-RA-PROTMOB-FMLA: Future multirole light aircraft

- **Indicative budget:** EUR 15.000.000 for this topic under the EDF-2026-RA call.
- **Number of actions to be funded:** Several actions may be funded for this topic.

**Objectives**

***General objective***

There is a need for a new multirole light aircraft that can bridge the gap between today's battlefield and modern technology as most of the EU's fleet in this segment is ageing.

The future multirole light aircraft (FMLA) concept must not duplicate or fragment existing systems of turboprop and tactical military transport aircraft and associated electronic systems. By building on the existing platforms, technologies and innovations in Europe, the results of

this call topic can facilitate the development of FMLA capabilities for air-to-ground operations. The FMLA should also be effective in specific combat roles such as light attack, drone interception, and close air support.

The objective of this topic is therefore to develop a low-cost, turboprop engine aircraft capable of operating in a variety of operational environments, providing: (i) direct air support; (ii) ground targeting; (iii) intelligence, surveillance and reconnaissance (ISR) with combat elements; and (iv) air strike coordination and reconnaissance with air traffic control support in a forward position in hostile environments during counter-terrorism missions.

***Specific objective***

FMLA is expected to become increasingly valuable due to its versatility, lower operating costs, and adaptability to emerging mission needs, i.e. light attack and armed reconnaissance, Armed with precision-guided munitions for counterinsurgency and low-intensity conflict. It is a cheaper alternative to jets for asymmetric warfare and well-suited for operations in austere environments with limited infrastructure.

Most light multirole aircrafts are now 30-40 years old and there is a need for a new FMLA that can bridge the gap between today's battlefield and modern technology. Beyond its core military role, the light multirole aircraft has to offer a platform that can be easily converted to meet civil security and EU internal needs, typically SAR, border surveillance and natural disaster relief missions.

This call topic therefore addresses this emerging strategic gap within the European light multirole area. It involves a cooperative analysis of the light multirole aircraft replacement needs on the 2035-2040 horizon and seeks to European development opportunities, among the EDF supporting Member States and EDF associated countries.

**Scope and types of activities**

***Scope***

Proposals must study and design a FMLA in one or two aircraft configurations, depending on the convergence on the requirements by the supporting Member States and EDF associated countries.

Moreover, the proposals should address modern technologies and materials that minimise the aircraft's visibility to radars and other detection systems to increase its survivability (radiation-absorbing paints, coatings etc). This is particularly important in combat scenarios, where undetectability is crucial.

The proposals should also put forward solutions to protect aircraft electronic systems against interference and potential damage caused by external electromagnetic fields with various characteristics (EMP weapons[17], etc.). Systems such as electromagnetic radiation shields are

[17] EMP is an electromagnetic warfare weapons that generates high-power microwaves intended to destroy or disable sensitive electronic components -- such as the navigation, guidance, and sensor systems of UAVs.

critical to maintaining the functionality of onboard communications systems and equipment in different environments.

In addition, the proposals may address coating materials that improve the durability of components in extreme conditions, as well as materials and technologies for manufacturing the FMLA, including high temperature materials and coatings.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(optional) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[18] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[19] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[20] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- <u>Studies:</u>
    - Creating an aircraft architecture concept;

[18] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[19] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[20] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- Feasibility studies on aircraft configurations identified in the proposal, to identify costs and benefits, assessment of the feasibility of possible functionalities and cooperation with the existing aircraft;

- Validation of the estimated budget (life cycle costs, including later maintenance costs) and assessment of the duration for the development. Final validation of the feasibility of the functional requirements;

- Exploring different technologies for technical and economic feasibility, and proposal of pre-development plans;

- Aircraft requirement analysis detailing the needs based on the functional requirements, including analysis of end-user needs and existing procedures;

- Analysing mature technologies and product architecture enabling flexible and quick aircraft reconfiguration for multi-mission capabilities and operation in GNSS denied areas;

- Exploring trends in autonomy technologies for cockpit (for one pilot) and pilot assistance applications;

- Assessing applicability of material technologies such as metal, composite and light materials, that meet sustainability and affordability criteria, including an impact analysis based on full life cycle environment, ;

- Feasibility studies on aircraft survivability capabilities;

- Feasibility studies on manned-unmanned teaming (MUM-T) collaborative missions.

- Performing the preliminary requirements review (PRR) approved by the supporting Member States and EDF associated countries, to confirm the technical, programmatic, industrial and market feasibility of the analysed solutions, giving supporting Member States and EDF associated countries all necessary elements to select the aircraft configuration, and allowing to move forward through a development and industrialisation phase;

- Conducting research and innovation activities in the field of structures, technologies, approaches, materials tests and studies of end-user needs and requirement specifications including relevant NATO standards and other applicable standards[21];

- Carrying out a cooperative analysis of replacement needs for the light multirole aircraft on the 2035-2040 horizon and identifying European development opportunities, among the supporting Member States and EDF associated countries.

- <u>Design:</u>

[21] See standards indicated under the “Specific Objective” paragraph

- Preliminary identification and assessment of the candidate aircraft solutions;
- Setting out the reference, future configurations and equipment of the aircraft.

In addition, the proposals may also cover the following tasks:

- Drawing up the preliminary programme management and system engineering plans;
- Drawing up the overall programme schedule/roadmap;
- Conducting a costing evaluation exercise;
- Conducting a market assessment review;
- Conducting an environmental impact analysis;
- Identifying risks and constraints related to implementation, costs, schedule, organisation, operations, maintenance, production and disposal.

**Functional requirements**

The proposed FMLA should meet the functional requirements described below:

- It should be a small turboprop aircraft designed, manufactured and tested so that it can be certified in accordance with EMAR 21, featuring:
  - Maximum take-off weight (MTOW) up to 7500 kg;
  - Short take-off and landing (STOL) capabilities;
  - cargo compartment (rear, side cargo door, ramp).
- It should be designed using the most relevant applicable standards as set out below:
  - Development: ARP-4754A
  - Safety: ARP-4761
  - Environmental: MIL-STD-810H
  - Electromagnetic interference (EMI) and electromagnetic compatibility (EMC): MIL-STD-461G
  - Electric power: MIL-STD-704
  - Software: DO-178C
  - Complex hardware: DO-254
  - Cyber security: DO-326A and DO-356A

  Any deviation from these standards should be justified and an evaluation of the gaps between the suggested applicable standards and those used should be provided.

- It should be able to fly:
  - in relatively permissive conditions including flight into known icing (FIKI);
  - in harsh weather conditions that have significantly impacts performance, ranging from sandy, dusty, salty, stormy, hot and humid to extremely cold environments including high-winds, gusts, extreme rain and mountainous terrain.
- It should be environmentally friendly providing air superiority and operational capabilities under suppressed opponent's air defence in missions below the threshold of open conflict.
- It should be capable of operating using either existing communications and remote control solutions or advanced coastal/littoral communications networks. It should be able to detect, localise and engage a target, in teamed or collaborative manner, under human operator's supervision.
- It should provide a cost-effective alternative solution for those countries that cannot afford to operate expensive modern air assets. It should be designed using as many novel materials and clean propulsion as possible, and, where possible, provide a platform for a range of kinetic and non-kinetic weapons. It should be equipped with cutting-edge radar applications and adaptive camouflage to extend its survivability.
- It should (intangible requirements):
  - involve feedback and strong cooperation with EU aviation industry;
  - involve aerospace companies and small to medium-sized enterprises (SMEs);
  - provide export opportunities and be custom-made to fit EU Member States' and EDF associated countries' requirements, and with an open architecture to address worldwide opportunities;
  - be based on operational scenarios & threat environment relevant for 2030 and beyond (i.e. multi-domain connectivity).
- It should (tangible requirements):
  - be affordability, in terms of acquisition and life-cycle costs. Operating costs should be below similar available solutions in the market;
  - include intelligence, surveillance and reconnaissance (ISR) capabilities with possible combat elements, in particular the use of modern missiles;
  - include modern avionics systems, encrypted data transmission and communication that are suitable for the cost of this type of aircraft;
  - be able to operate in irregular environments, including unprepared runways;
  - be able to take part in natural disaster relief operations.

**Expected impact**

The outcome of the effort should contribute to:

- making an affordable final product available to the smaller countries;
- developing an innovative and cost-effective aircraft for dual-use applications;
- improving cooperation between relevant European security and defence actors, leading to increased security of the EU Member States and EDF associated countries;
- strengthening the European Future Multirole Light Aircraft area;
- boosting support to crisis response and crisis management and disaster relief (developing rescEU capabilities for EU disaster relief);
- promoting and protecting the European technological and industrial ecosystem by using innovative European solutions;
- creating potential for future market opportunities for SMEs, particularly by facilitating their access to defence markets and supply chains;
- developing European research and technology ecosystems and strengthening European defence supply chains.

### 2.1.6. EDF-2026-RA-UWW-FUWN: Development and validation of models predicting flow-related underwater noise

- **Indicative budget:** EUR 10 000 000 for this topic under the EDF-2026-RA call.
- **Number of actions to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

The design and operation of underwater platforms, including uncrewed underwater systems (UUS) and manned underwater vehicles, are significantly affected by the flow-related underwater noise generated by these platforms. This noise can compromise the performance of onboard sonars and underwater communication systems and contribute to the overall radiated noise signature of the platform. Therefore, accurate modelling and prediction of flow-related underwater noise are crucial for the optimal design of underwater platforms and the effective integration of sonar systems.

***Specific objective***

The specific objective of this topic is to develop and validate advanced models for predicting flow-related underwater noise, including the generation of high-quality verification data. These models are expected to support the design of underwater platforms, the placement and design of sonars, and the simulation of radiated noise from underwater platforms.

**Scope and types of activities**

***Scope***

The proposals must address the development and validation of models for predicting flow-related underwater noise, with a focus on the following aspects:

- developing advanced numerical models for simulating flow-related underwater noise, including computational fluid dynamics (CFD) and acoustic simulations;
- developing and validating of state-of-the-art methods in the parameter range relevant for silent underwater platforms;
- using a buoyant body experiment to allow for a highly controlled data set to be generated, where fundamental physical processes can be isolated. The study must cover self-noise in both flush-mounted and integrated hydrophones, as well as sonars measuring the radiated sound;
- generating high-quality experimental data for validating the numerical models, including measurements of flow-related noise from various underwater platforms and sonar systems;
- developing tools and methods for predicting the performance of sonars in the presence of flow-related noise, including the effects of noise on sonar detection and classification capabilities;
- investigating the impact of platform design and operational parameters on flow-related underwater noise, including the effects of hull shape, propulsion systems, and manoeuvring.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(mandatory) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(optional) |

| | Types of activities<br>(Art 10(3) of the EDF Regulation) | Eligible? |
|---|---|---|
| (e) | **System prototyping**[22] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[23] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[24] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Generating Knowledge:
  - generating experimental data from a buoyant body experiment to study self-noise in flush-mounted and integrated hydrophones, as well as sonars measuring the radiated sound;
  - generating high-quality reference data sets for prediction of flow-related radiated noise;
  - generating new insights into the fundamental physical processes governing flow-related underwater noise.
- Integrating Knowledge:
  - developing advanced numerical models for simulating flow-related underwater noise, incorporating existing knowledge on computational fluid dynamics (CFD) and acoustic simulations;
  - integrating experimental data and numerical models to validate and improve the accuracy of flow-related underwater noise predictions.
- Studies:
  - planning and conducting buoyant body experiments to generate high-quality data for verification of modelling and simulation methods for flow-related underwater noise, including both self-noise and radiated noise;
  - evaluating existing modelling tools against the experimental data to assess their accuracy and limitations, and identify areas for improvement;

[22] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[23] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[24] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- developing new or improved modelling tools and methods, as needed, to enhance the prediction of flow-related underwater noise, including self-noise and radiated noise.

Moreover, the proposals should:

- involve collaboration with experts in the field to leverage the latest research and developments in flow-related underwater noise;
- investigate the impact of platform design and operational parameters on flow-related underwater noise, using the developed modelling tools and experimental data, including the effects of hull shape, propulsion systems, and manoeuvring;
- develop tools and methods for predicting the performance of sonars in the presence of flow-related noise, including the effects of noise on sonar detection and classification capabilities, and evaluate their effectiveness using the experimental data and modelling tools.

**Functional requirements**

The proposed models and tools should meet the functional requirements described below:

- ability to simulate various types of underwater platforms, including UUS, manned underwater vehicles, USS and surface ships;
- ability to account for different environmental conditions, such as (but not limited to) water depth, temperature, and salinity;
- ability to predict the performance of sonars in the presence of flow-related noise, including the effects of noise on sonar detection and classification capabilities;
- ability to investigate the impact of platform design and operational parameters on flow-related underwater noise, including the effects of hull shape, propulsion systems, and manoeuvring;
- ability to generate high-quality verification data for validating numerical models and simulating sonar performance;
- user-friendly software tools for predicting flow-related underwater noise and simulating sonar performance in the presence of noise.

**Expected impacts**

The outcome of the effort should contribute to:

- reducing dependencies on non-European suppliers by boosting the EDTIB and promoting the development of a European solution;
- strategic autonomy of EDTIB in the area of underwater technologies;
- interoperability of EU Member States' and EDF associated countries' naval forces;
- improving protocols and standardisation of underwater technologies;

- improving command-and-control systems for underwater technologies;
- improving the safety and security of underwater technologies;
- supporting the design of underwater platforms and the placement and design of sonars.

### 2.1.7. EDF-2026-RA-SIMTRAIN-MSAI-STEP: Modelling & simulation-supported AI framework for military decision- making and training

- **Indicative budget:** EUR 16.000.000 for this topic under the EDF-2026-RA call.
- **Number of actions to be funded:** Several actions may be funded for this topic.
- **Range of EU financial contribution per proposal:** The requested funding should match the ambition of the proposed action and be duly justified. In any case, the requested funding cannot exceed EUR 8 000 000.

**Objectives**

***General objective***

In a defence modelling and simulation (M&S) context, artificial intelligence (AI) can provide tactical intelligence in (near) real time through enhanced situational awareness and planning and decision-making support.

An AI framework for defence is a robust and adaptive system designed to facilitate the creation of artificial intelligence concepts in military operations. It enhances decision-making, situational awareness, and operational efficiency while ensuring security, interoperability, and real-time responsiveness.

The objective of this call topic is to assess the feasibility of creating an AI framework for defence applications, to serve as a springboard for the development of future tactical intelligence concepts by providing military simulation capabilities, historical data sets, a rich scenario and benchmark database, access to doctrinal models and output from previously developed AI services. It would also enable a common simulation framework for wargames and combat simulations with the potential to similarly facilitate improved learning support in mission planning and execution, including through AI-enabled battlespace simulation.

***Specific objective***

The goal of this call topic is to create an AI-system framework that enables EU countries to develop and accelerate the innovation of military M&S systems.

This call topic concerns a unified framework for tactical intelligence and decision-making. It includes connecting the framework to C2 systems and synthetic training environments, managing historical data sets, and utilising doctrine. All such data are collected, combined, cleaned, and contextualised for AI solutions to learn from, gain insights into, and provide guidance on.

The models that can be developed using the framework are expected to be able to support the users of C2 applications and to provide instructor support of training systems. This can further include testing future human-machine interaction concepts for military users. By closing the loop to the end user, the AI system framework enables new possibilities, for example, to easily test and validate novel tactical intelligence solutions in a concept, development and

experimentation setting. This makes it possible to measure the effectiveness of future tactical intelligence solutions hands-on.

While there are many efforts in the development of AI technology in different areas, the maturity of standards varies across the different domains across EU Member States and EDF associated countries and industries.

There is a need to investigate how to develop a continuous, scalable, reusable and flexible AI development environment that integrates capabilities seamlessly for a persistent military environment (training, exercises, and rehearsal) in a cost-effective way.

This call topic contributes to the STEP objectives, as defined in the STEP Regulation[25], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

Proposals must investigate solutions in the simulation area, cover two or more use cases in forces readiness, support operations and capability development.

Proposals must identify current challenges regarding preconditions in AI use in a multi-national defence context, and more specifically identify state of the art technologies, research gaps, needs and requirements.

Proposals must further research a subset of challenges in at least two chosen specific use case(s)[26] by achieving an increment in the maturity of applying AI in a defence context.

In addition, proposals must ensure compliance with NATO standards and other possible coalition situations to allow for extended interaction between a variety of collaborative assets used in different operational domains.

Finally, proposals should demonstrate capabilities in integrating AI for simulation purposes.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes (optional) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |

[25] Regulation (EU) 2024/795
[26] See example cases later in the text

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[27] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[28] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[29] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:
  - identifying research gaps, needs and requirements of the AI development principals in a multi-national context, including:
    - identifying gaps in training technologies, technological enablers, and standardisation;
    - identifying and analysing the state of the art system architectures in the different domains across EU Member States and EDF associated countries;
    - a survey on impact of disruptive technologies on the AI development principles;
    - considering the brittleness of AI systems and address the identification, monitoring, and mitigation of biases both in AI outputs and in human decision-making influenced by AI;
    - identifying the specific interoperability challenges in live systems integration;
    - an overall study on new and early concepts for AI use.
  - covering several AI core components, including:

[27] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[28] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[29] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- pre-conditional activities on data ingestion & processing: collecting and processing intelligence from various sources. Identifying and converging on common defence ontologies;
- machine learning and analytics engine: predictive modelling, threat analysis, and autonomous decision support;
- human-AI collaboration interface: providing real-time insights for commanders and decision makers, allowing for human oversight and intervention;
- cybersecurity and resilience: ensuring protection against adversarial AI attacks and cyber threats, including dataset poisoning resilience, to ensure robust human-AI team performance, with graceful degradation, adaptive role reallocation, and resilient behaviour in response to degraded information, adversarial actions, and rapidly changing battlefield conditions;
- simulation and training module: using AI for Advanced support to trainees and simulation result analysis;
- identifying and analysing how an AI framework contributes to military training scenarios and operational support, including preparation, execution and management, and evaluation;
- Operational needs and requirements, operational scenarios and use cases
- Methods for measurement and evaluation of training and performance of the models created with the AI framework.

- identifying data sources that AI models can use to learn (simulation, real-world or synthetic data streams, historical data, benchmark data sets, doctrinal models, human performance data);
- supporting (re)playing data streams to test AI solutions as if they are used in a real-world setting;
- research on military data models, ontologies and standards for interoperability between AI services;
- facilitating the reuse, interoperability, and integration of datasets and AI components to quick start the development and implementation of new solutions;
- standards for exporting the output of AI solutions in such a manner that they are easily consumable by end-user C2 and simulation systems or new human-machine interface concepts.

- Design:

- designing and demonstrating technological novelties aiming at improving the realism and efficiency of the AI framework in military application;
- designing and demonstrating examples of customised solutions using the AI Framework to enhance the current capabilities considering the operational needs and the outcome of above activities;
- demonstrating and evaluating a representative simulation combat scenario in a multi-national context;
- addressing at least two of the four use cases set out below:
    - Case 1: end-to-end performance assessment of an MDO (Multi-Domain Operations) system of systems functional chains including real C2 systems, M&S based AI providing synthetic force on force engagement and legacy Human in the loop simulation enhanced with AI. This use-case must highlight the use of AI to support experimentation process along the stages set out below:
        i. preparation stage: AI to generate automatically (i) synthetic imaginary terrain both for virtual simulation and constructive simulation, (ii) scenario or operation order regarding initial situation, mission and execution, (iii) sequence of experiments with role players and individual expected actions, and (iv) technical and cognitive metrics to measure according to key performance indicators;
        ii. execution stage: M&S fully AI-based as a disruptive technology deals with physics and behaviour models produced via different AI technics suitable to address the MDO problem space and more particularly to execute the scenario. These latter models must be enriched with specific military procedures to adapt the dynamic with operational rules of engagement. The VV&A (verification, validation, and accreditation) of AI models is a critical concern for the fair fight confidence. During execution, AI by monitoring the scenario situation awareness provides guidance for the role players and/or influence behaviours to keep the mission objective;
        iii. analysis stage: AI to provide automatically graphics based on data recorded including metrics and highlighting the functional chain performance. AI must also pinpoint inconsistent situations and must generate the rationales and proposals to avoid reproducing the same critical situation in the future.
    - Case 2: Human Machine teaming: Proposals must address adaptive levels of automation, allowing flexible, situation-dependent transitions between human and AI control, as well as issues related to changes in roles and authority changes.

iv. Explore how to achieve and sustain effective human-AI collaboration, including adaptable role allocation, dynamic interaction, human authority retention, and decision-making under uncertainty. AI agents should be designed as team members, not merely tools.

v. Solutions should enable and maintain joint human-AI understanding of operational contexts, goals, threats, and plans, with rapid updates in complex environments.

vi. Solutions must address management of cognitive workload. Simulation-based training should not only cover taskwork (individual task performance) but also teamwork skills essential for effective human-AI teaming. Training should include exposure to unpredictable AI behaviours, AI system failure modes, and adversarial actions.

vii. Proposals must define clear, practical metrics for evaluating human-AI team performance. Metrics should assess aspects such as situation awareness, trust, workload, communication quality, decision quality, resilience, and overall team effectiveness. Additionally, proposals should describe how they will systematically evaluate usability and team performance during simulation-based exercises.

viii. Proposals should integrate human factors considerations into risk assessment frameworks. This includes evaluating how cognitive load, stress, fatigue, trust calibration, and human-AI interaction patterns influence system vulnerabilities and overall mission risk.

- Case 3: course of actions (COA) development and comparison is part of the operational planning process and is currently developed by both the intel cell and the planning cell regarding possible friendly and enemy future military options. To support the military decision-making process, the use of AI must help to generate automatically several course of actions in monitoring the common operational picture during a real operation. Using reinforcement-learning agents, the solution must be an integrated system able to automatically generate military options filled in a specific situation and geographical area and based on available relevant online data maximising the situational awareness. The simulation solution must provide the capabilities to assess such course of action based of AI models and for the chosen COA to automatically generates the corresponding orders. It is assumed that AI must reduce the time and increase the effectiveness dedicated to developing, analysing and providing the most suitable COA for the next sequence of operations.

- Case 4: Simulation to support AI by generating data depicting the real world is a critical concern when it is not possible to capture data during experimentations, fielded tests & evaluations or during real operations. Mainly for example weather conditions, danger of death, environment protection and systems security prevent to capture data in such situations. However, for reinforcement-learning it is mandatory to maximise the scope and therefore not to limit the data to what it is possible to collect in real. Hence, M&S must be a solution to generate multiple situations to educate AI algorithms. The expected solution assumes a fundamental technical value for the benefit of AI. A sample use-case must be an AI automatic recognition of an over the sea. Asymmetric threat capture via optronic sensors whatever the distance, the weather, the daylight and the height of the waves.

The proposals should demonstrate how they can harness synergies and complementarity with other activities, including planned, ongoing or completed activities in the field of simulation, notably NATO and EDF simulation activities.

**Functional requirements**

The proposed AI framework must meet the requirements described below:

- Interoperability between heterogeneous systems. The AI framework should ensure seamless integration across diverse, multi-domain platforms (air, land, sea, cyber, and space), legacy systems, and multinational coalition infrastructures using open standards and modular architectures.

- The military AI framework should lead to services that are reusable, interoperable, and can be integrated into mission-critical end-user C2 systems. Develop AI components as modular, reusable services within a flexible and scalable framework, enabling efficient integration into command & control (C2) environments and mission systems with minimal customisation.

- Collaboration and sharing information appropriate for military data that can be classified. Ensure controlled, policy-compliant information sharing of classified and sensitive military data through multi-level security (MLS), differential privacy, and homomorphic encryption technologies. Enable secure federated learning and decentralised AI training across different defence nodes.

- Ensure security, while still enabling sharing the AI solutions developed. Implement continuous AI risk assessment, adversarial robustness techniques, secure model deployment (e.g. confidential computing, zero-trust architectures), and secure model update pipelines (MLOps for defence) to mitigate adversarial threats and maintain system integrity.

- Facilitate the creation of AI solutions by democratising[30] AI development and usage. Facilitate AI adoption by providing user-friendly platforms, AutoML capabilities,

[30] Making AI technology accessible to everyone", allowing people with different knowledge and skills to benefit from the advantages of AI.

visual programming tools, and guided workflows, empowering non-technical users (e.g. military analysts, planners) to build, customise, and deploy AI solutions without deep coding or data science expertise

- Usability by non-technical military users in AI solutions and model development, to include those people who don't necessarily possess a deep understanding of AI algorithms, data sets, and computer science. Proposals must address key human factors (HF) and human-AI teaming aspects to ensure that AI-supported frameworks for military decision-making, training, and wargaming are usable, adaptable, resilient, and mission-relevant.

- Ensure that AI tools are intuitive, transparent, and accessible for non-expert users through simplified interfaces, natural language interaction, scenario-based training, and guided decision support tools, while maintaining mission effectiveness and safety.

- Provide a testbed of (fast executing) simulation environments from a particular domain (battlespace simulations for wargames). Provide high-fidelity, fast-executing simulation environments tailored for military domains to test, evaluate, and train AI models, enabling realistic operational scenarios, digital twins, and synthetic training environments.

- Be usable for various types of AI (Supervised, Unsupervised, reinforcement learning) and use pre-existing foundation models.

The proposed application of the AI framework in the use cases must meet the following functional requirements:

- Include a baseline of RL-agents for a chosen domain. Provide a library of pre-trained, reinforcement learning-based general-purpose agents capable of adapting to varying mission requirements within the simulated environment, supporting transfer learning and continual learning paradigms.

- Propose a generic interface between agents and simulation environments. Specify and adopt a generic, extensible API/interface specification for connecting agents with diverse simulation environments to support plug-and-play AI experimentation and development.

- Explainable AI (XAI) to ensure transparency in AI-driven decisions. Systems must provide explainable AI behaviours to support trust calibration, including real-time explanations that help users predict, understand, and confidently interact with AI systems. Integrate explainability-by-design features such as visual model introspection, decision rationale reports, and human-readable model logic to promote trust, accountability, and auditability in AI-assisted decisions

- Compliance with international laws and military engagement rules.

- Human-in-the-loop (HITL) systems for critical decision-making scenarios. Mandate human oversight in high-risk and ethically sensitive operations by embedding

configurable HITL/ human-on-the-loop **(**HOTL) control layers, ensuring that final decision authority remains with human operators.

- Employed paradigms and technologies adaptable to identified hardware solutions based on tactical readiness, energy consumption, heat dissipation, and available computing power.

**Expected impact**

The outcome of the effort should contribute to:

- Significantly reducing the time and costs associated with the of COA development and wargaming scenarios by:
    - leveraging adaptive AI models, reinforcement learning, AI-driven automation, optimisation algorithms and generative simulation techniques to automate scenario creation, optimise decision and accelerate operational readiness;
    - improving resource allocation through data-informed decision-making processes powered by predictive modelling and machine learning.
- Developing AI solutions tailored for military M&S systems, enhancing tactical intelligence, mission planning, and autonomous decision-making capabilities and increasing responsiveness in real-time operations. These solutions are expected to incorporate state of the art methods in machine learning including reinforcement learning and graph neural networks, multi-agent systems for dynamic and adaptive simulation models, and real-time data fusion to support commanders with actionable insights and scenario forecasting.
- Identifying and address specific interoperability challenges and gaps to establish a cost-efficient AI training capability in a multi-national context.
- Promoting convergence on training standards across EU Member States and EDF associated countries to foster interoperability by promoting common AI ethics frameworks, testing methodologies, and validation protocols .
- Structuring and developing a European ecosystem to support simulation technology for military usages.
- Ensuring the interoperability, security, and trustworthiness of AI components in joint training and operational environments.
- Establishing a modular testbed of high-performance, domain-specific simulation environments (e.g., battlespace simulations) to serve as a proving ground for AI integration.
- Providing a library of general-purpose, pre-trained reinforcement learning agents to accelerate experimentation and benchmarking.
- Developing a standardised interface between AI agents and simulation platforms to ensure interoperability, scalability, and reproducibility across systems and nations.

- Supporting the development of a resilient and scalable European simulation ecosystem dedicated to military applications. This ecosystem is expected to integrate academia, industry, and defence stakeholders to promote innovation in AI-driven simulation tools, digital twins, and synthetic environments, in alignment with the EU's digital and defence strategies.

- Encouraging public-private and civil-military synergies to accelerate the adoption and evolution of AI solutions across defence applications.

- Contributing to reducing or preventing the strategic dependencies of the Union.

## 2.2. Call EDF-2026-LS-RA-SI

- **Targeted type of actions:** Research actions
- **Form of funding:** Lump sum grants following the call for proposals
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation.
- **Specific provisions for the call:** The proposals need to build upon or integrate results that have been achieved within one or several projects that had been funded under an EU programme call with a focus on civil applications. This previous project(s) may be completed or may still be active. The submitting consortium does not need to be constituted or even to include a participant or result owner of the previous project(s). However, applicants must provide a confirmation that they have or will have the necessary rights to use and commercialise the results of the previous project(s).
- **Indicative budget for the call:** EUR 50 000 000 for two call topics addressing two categories of actions.

### 2.2.1. EDF-2026-LS-RA-SI-ENERENV-NTFE: New turbofan engine

- **Indicative budget:** EUR 20 000 000 for this topic under the EDF-2026-RA-SI call.
- **Indicative number of proposals to be funded:** Several proposals may be funded for this topic.

**Objectives**

***General objective***

An unmanned aerial vehicle (UAV) used as loyal wingman/unmanned combat aerial vehicle (UCAV) requires specific performance capabilities for a variety of mission profiles to meet storage, deployment and operational requirements. A key factor in meeting these requirements is an engine providing optimum thrust and electrical power capabilities.

The aim of this call topic therefore is to investigate the possibility to further develop a new turbofan engine in the range of approximately 25-35 kN, which meets all military requirements and is capable of operating on kerosene and sustainable aviation fuel (SAF).

The proposals may build on or integrate results from one or more projects funded following an EU-funded projects for which the applicants have the rights to use and commercialise the results.

***Specific objective***

There are no suitable European and International Traffic in Arms Regulations (ITAR) free engine available for loyal wingman applications.

Recent research has shown that an engine in the 25-35 kN class can meet all necessary performance requirements for thrust and electric power.

Loyal wingman drones should not be expendable but rather attritable[31] and have a potentially higher acceptable rate of loss when used in combat conditions. This means, the engine needs to be sufficiently reliable and cost-effective compared to the number of units produced. Other civil, military and commercial applications should be evaluated, including those requiring hydrogen combustion or hybrid power plants.

The engine should have sufficient power to support growth and additional power off-takes, including bleed air. It should also be capable of meeting the needs for additional electric power offtakes.

**Scope and types of activities**

***Scope***

Proposals must carry out a concept study for a new 25-35 kN class turbofan engine or engine family to be adaptative with iteration technologies for more flexibility.

The proposals must address the development of a low-cost turbofan engine for loyal wingman applications in the power range of ≈ 25-35 kN, with the features set out below:

- improved long-term storage capabilities (not only by technical measures), including corrosion resistance and avoidance of rotor bow (e.g. by the use of materials, coatings, preservation, protection against environmental influences);
- low-cost manufacturing (e.g. by using standardised parts, novel manufacturing processes);
- the engine must be compatible with a range of fuels, including (i) conventional fuels, (ii) SAF and (iii) combustible fuels of lower qualities (e.g. with higher sulphur content, impurities) in different regions of the world with anomalous specifications (e.g. Jet A, JP, SAF, Avgas, Mogas);
- maximisation of operational usability by reducing the need for inspections and periodic maintenance while increasing the times between such servicing requirements.

In addition, the proposals may address:

- the use of green technologies aiming to lower $CO_2$ emissions throughout the engine's lifecycle, improving sustainability and recyclability (only where feasible and without a significant impact on performance or costs).

***Types of activities***

[31] A design trade-off where reliability and maintainability are sacrificed for lower cost and the ability to be used in situations where loss is acceptable.

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| | **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(mandatory) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[32] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[33] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[34] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

Proposals must therefore cover at least the tasks set out below as part of mandatory activities:

- Generating knowledge:

  - setting out potential user cases, scenario and applications and key requirements for the 25-35 kN loyal wingman engine in line with high-level operational requirements;

  - providing a list of key parameters that identify and configuring a baseline engine and configuration for the purposes of this research action;

  - providing a brief overview/summary of civil and military European engines within the 25-35 kN range that are available or in development. This must include (i) any potential synergies or opportunities that these existing engines have to meet the

[32] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[33] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[34] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

loyal wingman needs, and (ii) any known ITAR restriction, deficiencies, risks or issues including security of supply that may occur in the engine's life cycle;

- Strategies for security of supply for the complete life cycle, including ensuring that only ITAR free, EU-sourced and EU-supported components, hardware and software are used while reducing/avoiding the use of non-European sources/rare earth materials;

- Strategies for supporting long-term storage and availability, reduced maintenance and support costs and efforts with on condition availability, field serviceability and module repair or replacement and decentralised depot support;

- Strategies for reducing production costs, supporting prioritised and decentralised production needs.

- Integrating knowledge:

  - preparing technological and integration solutions for propulsion systems for fixed wing platforms for military applications. These should be produced, developed, and manufactured to ensure EU sovereignty and provide optimal performance and reliability for the targeted application;

  - exploring possibilities to integrate technological advancements developed in other civil and military projects.

- Studies:

  - studying and maturing technologies to achieve specific performance (e.g. potential hybridisation, electrification, etc.) at an affordable cost and that are easy to maintain;

  - exploring ways for scalability and dissemination of the results in other military, civil or commercial aircraft, platforms or products;

  - studying a new or adapted engine design for loyal wingman platforms(e.g. adaption of an existing core engine);

  - cost-benefit analysis and forecast of challenges on maintenance-effort for each technology;

  - studies on low cost and time effective design, qualification and certification processes to be able to improve first phases of development and/or adaption for the engine;

  - studies on low-cost and novel manufacturing processes, including additive manufacturing (AM) for high-volume production and innovative repair solutions;

  - studies on new certification strategies of the engine, considering its use in an unmanned platform with potentially lowered certification requirements and their application during peace, crisis and war.

  - studies on technologies (e.g. embedded electrical generator/stator, distributed architecture) to meet the increasing electrical power demand while optimising the engine compartment space.

  - cost-benefit analysis including the civil market and the trade-off between increased certification effort for civil applications and decreased engine costs due to higher production volumes.

- Design:

  - design or adaption of a propulsion system for loyal wingman platforms that meets the requirements set out in this call topic;

  - the design must be based on standardised architecture and interfaces with significant reduction of parts, devices, and modules.

In addition, the proposals should cover the following tasks:

- Studies:

  - study of the technologies developed as part of this call, and the benefits and opportunities for other military, civil and commercial propulsion solutions, including those requiring hydrogen combustion or hybrid power plants.

  - studies with scorecards on costs/performance of different nozzle solutions (in terms of geometry).

The proposals should demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities as described in the EDF-2025-DA-ENERENV-APEM call topic related to *Aircraft propulsion and energy management systems*.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- Thrust: deliver around 25-35 kN dry (without afterburner) over the entire of majority of the flight envelope (with integration capacity on a platform that can achieve Mach 0.95 over a major part of the flight envelop).

- Fuel: operate on kerosene, SAF (SAF as defined in ASTM D7566 Annex, regarding 100% SAF, drop-in and non-drop-in).

- Dimensions should be comparable to or smaller than the baseline engine. Specific fuel consumption and thrust to weight ratio better than the baseline engine.

- Achieve cost per unit significantly less than comparable certified civil and/or military engines of the same thrust family. This includes:

  - Lower development, modification and qualification time and costs thanks to new processes and means, innovative development, modification and qualification concepts.

  - Lower production and operational costs compared to existing engines and those in development through new manufacturing processes, innovative maintenance concepts and a high level of reliability/availability of engine components.

- Certifiable for military applications including air-ot-air refuelling and, if advantageous (to reduce costs, ensure long-term availability and high production levels), it should also be directly certifiable for civil applications.

- Reduction of maintenance effort by a reduced number of parts with modularity strategy to perform quick dis-/assembly (access to any module within 2 h), a design to support quick and easy de-/installation as well as the capability of long-term storage (e.g. in container).

- Development of the technological system should comply with specifications referable to the standardisation procedures deducible from the ’European Defence Standards Reference System’ (EDSTAR) database and implementable to this type of engines.

- Include safety critical features, including an automated restart capability over the main part of the flight envelope at least during critical phases such as landing, take-off and flying below 5000ft.

- Support reduced detectability and increased survivability (i.e. very low infrared (IR) and noise signature).

- Align with the Green Defence initiative, through an acceptable low environmental impact and low levels of engine noise and emissions.

- Support future integrated system health management and live data transmission by using appropriate sensors and data connections, e.g. to support real time engine health monitoring on ground. (as far as cost effective)

- Innovative integrated sensors, engine management and health monitoring, condition, and health monitoring.

- Use as many EU parts (especially for Complex Electronic Hardware (CEH)) and Software (SW) as possible.

- Be resistant against Armament Gas Ingestion (AGI), especially fired from Internal Weapons Bays (IWB).

**Expected impact**

The outcome of the effort should contribute to:

- a versatile European 25-35 kN propulsion system to meet the growing electrical power demand of unmanned aerial systems, including loyal wingmen;

- a low-cost propulsion system, cost competitive for the whole life cycle;

- boosting the EU's sovereignty and independence on these strategic platforms by strengthening the EU supply chain, integrating EU Member States' and EDF associated countries' capabilities and ensuring a product free from export controls from non-EU or non-EDF associated countries;

- developing an autonomous EU industrial sector and strengthening cross-border cooperation (from large industrial groups to SMEs).;

- advancing European technological sovereignty and strategic autonomy to anticipate future competition from beyond Europe;

- improving deployment and sustainment capabilities for European forces on a global scale;

- improving how civil & defence technologies and solutions in this area complement each other and stimulating cross-fertilisation.

### 2.2.2. EDF-2026-LS-RA-SI-UWW-CSBI-STEP: Layered critical seabed infrastructure protection

- **Indicative budget:** EUR 30 000 000 for this topic under the EDF-2026-RA-SI call.
- **Number of actions to be funded:** Several proposals may be funded for this topic.
- **Range of EU financial contribution per proposal:** The requested funding cannot exceed EUR 15 000 000.

**Objectives**

***General objective***

Critical underwater infrastructure (CUI, i.e. pipelines, cables and totally submerged subsea installations and associated infrastructure) and critical seabed infrastructure protection (CSIP) are also affected by maritime installations which are structurally both above and below water. The latter includes oil/gas platforms, wind farms, harbours, etc. The inclusion of harbours is important given that they are where a significant number of critical underwater infrastructure lands and the fact that many civilian harbours are crucial to ensure sea lines of communication (SLoC), not only for trade but also as point of embarkation/disembarkation of allied forces in a crisis, which therefore need to be secured as landing points.

Timely and robust detection and monitoring of threats (e.g. submarines, swimmer delivery vehicles (SDV), combat divers, unmanned systems (UxS)) in open sea and coastal waters is critical for maintaining sea control, ensuring freedom of manoeuvre, anti-access/area denial (A2AD) operations, force protection, harbour protection and protection of CUI.

In particular, CUI are extremely exposed to threats that are expected to evolve in number and complexity. This calls for urgent action by the EU, its Member States (MS) and EDF associated countries, also by mean of EDF. This has also been underlined by the European Defence Agency (EDA) following the review of the Capability Development Plan (CDP), with the underwater and seabed warfare and maritime domain awareness being identified as priorities as regards capabilities development.

CSIP necessitates a holistic approach, requiring a system-of-systems (SoS) and cross-domain approach capable of customisation and scalability across range, domains, and functionality to address new and rapidly evolving threats effectively. This involves interoperability and interchangeability of multiple assets and payloads, emphasising manned-unmanned teaming (MUM-T). The SoS should enable simultaneous execution of multiple missions, including monitoring, detection, response, neutralisation, deterrence, and maintenance support. Additionally, its development must consider diverse stakeholders such as governments and private companies, aligning with Member State and EDF associated countries naval forces' interests while leveraging potential technological contributions, knowledge, and doctrines.

***Specific objective***

The specific objective of this call topic is to integrate knowledge, study and design, with focus on the underwater domain and on a real environment using a layered and scalable SoS capable to accomplish the CSIP missions. This aims to provide Member State and EDF associated countries naval forces with a cutting-edge technological solution fostering interoperability, survivability and strategic autonomy. In the meantime, it is expected to enhance capabilities in key emerging technologies used to defend CUI.

The SoS must provide a full Underwater Situational Awareness (UMSA, including integration of dedicated algorithms and protocols exploiting Artificial Intelligence (AI) for Data Fusion and effective Big Data management**)** to be integrated in an all-domain Situational Awareness (SA from seabed to space), linking a multitude of resident and non-resident sensors (relevant stationary and mobile) interoperating at least up to sea-basin-level.

The SoS should deal with the challenges posed for great-depth technologies, long time deployment/persistent platforms and sensors, energy-saving/low-power solutions and in general for long, medium and short-range distance between collaborative assets to complete layered defence from prevention to alarm, to emergency.

This call topic also aims to:

- promote interoperability and collaboration among different stakeholders, including government agencies, private sector entities, and international partners, to enhance the effectiveness of CSIP efforts in line with merging initiative of Submarine Cable Infrastructure Expert Group (e.g. Joint Communication to strengthen the security and resilience of submarine cables) and other relevant initiative from EU and NATO;

- promote collaborative efforts between governmental agencies, private companies, research institutions, and non-profit organisations creating partnerships that facilitate data, expertise, and technology sharing, enabling a more holistic approach to underwater monitoring that will reduce downtime caused by incidents and disruptions, increase the ability of attribution and ultimately contribute to deterrence.

This call topic contributes to the STEP objectives, as defined in STEP Regulation35, in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

[35] Regulation (EU) 2024/795

Proposals must study and design a technological cutting-edge SoS, capable of addressing current and possible future CSIP missions and activities. They also must identify critical shortfalls in current technologies to develop such a solution.

**Types of activities**

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| | **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(optional) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[36] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[37] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[38] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

Proposals must therefore cover at least the tasks set out below as part of mandatory activities:

- Studies:

  - performing a threat assessment, considering the modern battlefield, lessons learned from current hybrid threats, and deployed or about to be deployed advanced technologies;

  - studying a modular, scalable L-CSIP (layered – CSIP) SoS able to support all the needed operations from detection to deterrence, capable of integrating data from

[36] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[37] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[38] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

seabed to space, including long-range, high-depth and shallow water assets, aiming to achieve a comprehensive protection strategy based on a sea-basin approach. The overall architecture must be open, allowing smooth and efficient integration with further component systems, leveraging, as much as possible, existing technologies and their future development, to ensure the follow-on (i.e. to protect all CUI);

- studying an early warning system to detect and alert operators of any anomalies or potential security breaches, allowing for timely responses against emerging threats at sea-basin level. The system should consider a proper number of protection layers considering the different scenarios for which the SoS is designed;
- studying energy harvesting/low consumption solutions for persistent autonomous systems and passive sensors (e.g. acoustics and non-acoustics, such as magnetic) able to switch to networked nodes of complex detection chain (at least but not limited to multi-static and distributed technologies) and providing automated target detection and identification;
- studying and setting out maturity and performances in terms of reliability, mission effectiveness, safety and security, and scalability/adaptability of L-CSIP operations, able to join operations centres, multi mission oriented (from special forces to ASW operations) and by means of different T&ECs (test & evaluation capabilities);
- performing state-of-the-art assessment of CSIP technologies (including priority capability gaps) by identifying key maturing technologies, innovative technologies and technologies to be developed to address rapid evolving threat. In particular:
    - maturing identified technologies such as energy harvesting/low consumption solutions for persistent autonomous systems and passive sensors and providing automated target detection and identification;
    - studying underwater communications with optimised communication protocols, developing robust and secure networking infrastructure and strategies in accordance with operational needs, fostering adaptability in diverse environments and mission profile. In particular, an underwater internet of things (UIoT) approach including all characteristic layers (perception, network and application) must be studied to solve the challenge of detection of underwater threats at long distance.

- <u>Design:</u>
    - using the NATO Architecture Framework methodology and digital twin approach to design a European interoperable ASW (Anti-Submarine Warfare), MCM (mine countermeasure), SBW (seabed warfare) and L-CSIP SoS integrated with civilian operations (technologies with dual-use potential):
        - designing a modular, scalable L-CSIP;
        - designing an early warning system;

- designing UMSA capable of incorporating all domain sensor data from seabed to space threats at sea-basin level, enabling efficient management at a strategic level;
- designing solutions that must be operational in conditions representative of CSIP including, but not limited to, isolated CSIP (e.g. great depth underwater cable or pipeline) and complex CSIP up to the interface to the coastal zone (e.g. offshore platforms close to land with choke points and open sea front, port or other multi-faceted coastal infrastructure).

In addition, the proposals should cover the tasks set out below:

- considering, evaluating and potentially proposing innovative approaches and solutions to accomplish CSIP missions;
- setting out potential use cases, scenarios and applications in a wide range of operations, in particular in terms of natural environment, type of targets, levels of autonomy, rules of engagement with other cooperative and non-cooperative platforms, allocation of roles, interoperability and cyber protection.

In any case, the proposals should demonstrate how they can harness synergies and complementarity with other activities, including planned, ongoing or completed activities in the field of critical seabed infrastructure protection.

**Functional requirements**

Depending on each configuration to be explored, the proposed L-CSIP SoS solution should meet the functional requirements set out below:

- be compliant with relevant EU and NATO interoperability and interchangeability standards (e.g. EDSTAR) including emerging ones at the state of the art of their development;
- Threat detection and tracking: the system should improve and speed up the detection, identification and tracking of the relevant stationary and mobile underwater threats approaching defended infrastructures in challenging conditions of isolated and complex CSIP, including:
    - coastal areas;
    - shallow water with high reverberation;
    - congested maritime traffic zones;
    - rough seas;
    - deep seabed environments;
    - environmental noise.

  To support this, it should involve improved or new generation of sensors (active / passive sonar, magnetic anomaly detectors (MAD), hydrophones, active and passive sonobuoys, distributed acoustic sensing (DAS), etc.).

- Localisation accuracy: The system should detect and localise threats, enabling effective response actions.

- Sensor integration and data fusion: The system should primarily consider all the possible integration of data from the underwater domain. The system should be designed for an integration of data from various relevant sensor technologies from seabed to space based on sea-basin approach.

- Data connectivity: The system should maintain reliable data connectivity with relevant nodes, including tactical systems (e.g. deployed distributed autonomous nodes, national, ad-hoc underwater communication networks), and multiple sensor-data fusion setups, even in environments susceptible to cyber interference. The system should be designed to be integrated and interoperable with C4I standards systems, maritime operation centres (MOC) and UxS from other domains up to space.

- Alerting and response:

    - The system should provide early warnings and classify underwater detected threats to the seabed infrastructure with the aim of reducing false alarms and minimising unnecessary responses.

    - Then, the system should automatically generate timely alerts upon threat detection, specifying the nature, location, and estimated severity of the threat.

- System Characteristics:

    - Interoperability: the system should comply with relevant naval/underwater (UW) existing standards (e.g. for ASW and MCM activities), including those set by NATO;

    - Scalability: the system should be designed with a modular and flexible architecture to facilitate the integration of new components (i.e. UxS, sensors, effectors) and integration at least up to sea-basin-level;

    - Cybersecurity: the system should incorporate robust cybersecurity measures by design, protecting against unauthorised access or manipulation to guarantee the requested confidentiality, integrity and availability (CIA) level, according to existing cyber security standards (e.g. EDSTAR);

    - Operational Availability: the system should maintain high availability for 24/7/365 operation in European sea-basins.

    - Include cooperative autonomy, swarming and MUM-T allowing operator to take control in an efficient way, whenever needed, while reaching the overall mission objectives;

    - Include connectivity/interoperability management principles to set up secure, resilient, agile communication infrastructure and architecture and to provide connectivity services.

**Expected impacts**

The outcome of the effort should contribute to:

- creating synergies among stakeholders to create a civil-military collaboration (Cimic) capable of extending CSIP capabilities;
- reducing dependencies on non-European suppliers by boosting the EDTIB, promoting the development of a European solution and Europe's position as a global leader in underwater and, in the following phases, maritime surveillance technology;
- empowering European industries to compete effectively in the international market. This technological leap forward enhances Europe's strategic autonomy, allowing for independent and efficient responses to underwater threats;
- interoperability of EU Member States' and EDF associated countries' naval forces;
- improving protocols and standardisation of underwater technologies;
- enhancing underwater threat-monitoring capabilities, improve detection and response to incident, significantly reduce downtime caused by incidents and disruptions, increase the ability of attribution of misconducts/attacks that resulted in CUI disruption and ultimately contribute to deterrence. This translates to robust economic activity, with smoother international trade, uninterrupted energy flow, and secure raw material supply chains and contributing to EU strategic autonomy;
- extending its positive impact beyond security. By mitigating the risks of accidents and pollution incidents, CSIP should become a champion for a cleaner and more sustainable marine environment. This holistic approach ensures the long-term health of our underwater ecosystems while safeguarding Europe's economic and security interests.

### 2.3. Call EDF-2026-LS-RA-CHALLENGE

- **Targeted type of actions:** Research actions (technological challenge)
- **Form of funding:** Lump sum grants following the call for proposals
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation
- **Indicative budget for the call:** EUR 30 000 000 for two call topics addressing one category of actions.

This call aims to advance the targeted technologies by organising a technological challenge, where different research teams work towards a technological objective using a common testing environment set up for that purpose.

The aim of this technological challenge is to measure the performances of systems using artificial intelligence (AI) and machine learning in an objective and comparative way, by using independent third parties and on the basis of the two processes set out below:

- For each AI-based information processing task, common evaluation protocols are set and agreed on by all stakeholders. This enables the organiser to produce a test dataset while the participating teams develop their systems, which will be run on the basis of

this dataset. The system outputs are then scored using the agreed evaluation metrics. To drive progress, the data should remain available to the participating teams for a full analysis of the results, and a debriefing workshop is organised to share this analysis.

- For robotic and autonomous systems, in addition to the data-based tests, field tests are organised to evaluate the complete systems. These field tests aim at giving the opportunity to collect sensor data that can feed into other data-based tests. This should create a virtuous cycle where improved information processing modules lead to more realistic behaviours during field tests and collection of more representative data that can be used to develop better processing modules.

The evaluation campaigns typically last about a year. They are generally repeated over several years to compare results, which enables measuring progress between successive campaigns.

Organising the technological challenge requires careful planning and a tight coordination among stakeholders, but this effort is instrumental in steering R&D and fostering progress on AI-based technologies.

This call addresses an EDF technological challenge on **AI-based tactical situational awareness using swarms of small robots and drones (AISA)**. It aims to advance progress on technologies that automatically detect threats in a given area.

Technological challenges involve creating a database and carrying out technology evaluation activities that require specific support. This leads to two call topics per technological challenge: (i) one to support the research teams participating in the challenge (EDF-2026-LS-RA-CHALLENGE-DIGIT-AISAP-STEP); and (ii) one to support the challenge organiser (EDF-2026-LS-RA-CHALLENGE-DIGIT-AISAO-STEP).

A preliminary evaluation plan common to the two topics is provided (cf. Appendix 1), which is an integral part of the topic description for both call topics.

Proposals can address only one call topic. However, **it is highly recommended that applicants read both call topics and the preliminary evaluation plan before preparing their application** in order to fully understand the overall set-up.

The two topics of a technological challenge are linked. Actions selected for participation in a challenge will be linked to the action selected for its organisation, through the 'linked action' mechanism described in the model grant agreement.

#### 2.3.1. EDF-2026-LS-RA-CHALLENGE-DIGIT-AISAP-STEP: AI-based tactical situational awareness using swarms of small robots and drones – Participation in a technological challenge

- **Indicative budget:** EUR 23 000 000 for this topic under the EDF-2026-LS-RA-CHALLENGE call.
- **Number of actions to be funded:** Several actions may be funded for this topic.
- **Range of EU financial contribution per proposal:** The requested funding should match the ambition of the proposed action and be duly justified. In any case, the requested funding cannot exceed EUR 4 600 000.

**Objectives**

***General objective***

Helping soldiers through the use of robots and drones that can provide an accurate tactical situational awareness by using artificial intelligence (AI) is becoming essential for soldier protection. This call topic aims to follow up and complement previous activities in the field of hidden threat detection and to explore solutions that combine intelligent robots, drones and sensing technologies for advanced detection and classification of threats, so that these threats can be avoided or neutralised.

These solutions should be tested under realistic conditions in a quantitative, objective and comparable manner. For that purpose, each consortium supported through this call topic will benefit from a common test environment set up as part of a technological challenge and will have to participate in the evaluation campaigns organised under this call topic.

***Specific objective***

The goal of this call topic is to assess how well AI can support tactical situational awareness in complex, dynamic environments. This will be done by testing the integration of cutting-edge technologies into unmanned collaborative platforms in realistic scenarios, providing real-time insights to support informed decision-making. The components described below will be addressed:

- Autonomous deployment. Deploying swarms of small robots and drones to gather data in a coordinated and efficient manner.

- Real-time data fusion. Fusing data from various sensors and sources, including visual, radar, acoustic, and environmental sensors, to create a unified, real-time situational awareness picture.

- AI-driven analysis. Applying advanced AI and machine learning algorithms to analyse the fused data, detect patterns, and identify and prioritise potential threats or areas of interest.

- Dynamic adaptation. Adapting to changing environmental conditions, such as weather, lighting, or obstacles, to maintain optimal system performance.

- Human-machine interface. Providing an intuitive and user-friendly interface for human operators to interact with the system, receive alerts and make informed decisions, even automatically suggest actions and plans to be validated by the operator. This is expected to improve the operator's experience when interacting with advanced systems.

This call topic contributes to the STEP objectives, as defined in the STEP Regulation[39], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

Proposals must address technological solutions to automatically detect and characterise threats in complex environments of ground applications. These solutions must use a

[39] Regulation (EU) 2024/795

combination of advanced sensors, information fusion from these sensors, and unmanned ground and aerial systems to extend detection capabilities. These solutions must also be integrated and managed by operators in an easy and user-friendly manner to facilitate interaction with advanced systems. It must be possible to measure and evaluate the solutions in the test environment set up in the framework of the technological challenge.

Proposals should include clear descriptions of criteria for assessing the completion of work packages. These criteria should include: (i) the participation in the test campaigns organised in the framework of the technological challenge; (ii) the delivery of sensor data collected during the field tests; and (iii) the delivery of descriptions of the systems submitted for testing.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(mandatory) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(optional) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(optional) |
| (e) | **System prototyping**[40] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[41] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[42] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

[40] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[41] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[42] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

Proposals must therefore cover at least the tasks set out below as part of mandatory activities:

- Generating knowledge:

    - Research on new approaches for advanced detection and classification of threats, implementing a combination of AI and traditional techniques to map the environment and identify potential threats (see list of threats in appendix 1, point 9).

    - Research on swarming techniques and planning for surveillance and tactical situation awareness, including collaborative coverage planning algorithms for heterogeneous swarms. This should enable the coordination of joint actions of unmanned aerial vehicles (UAVs) and unmanned ground vehicles (UGVs) in dynamic and contested scenarios.

    - Participation in the evaluation campaigns organised in the framework of the technological challenge, including:

        - contribution to the discussions with the other stakeholders for drawing up the evaluation plans;

        - participation of the UAVs and software modules in experimental field and data-based test campaigns managed by the challenge organisers, where performance measurements are conducted to assess navigation capabilities;

        - collection and sharing of sensor data;

        - Participation in debriefing workshops.

The proposals should demonstrate how they can harness synergies and complementarity with other activities that are planned, ongoing or completed in the field of autonomous drone navigation.

**Functional requirements**

The proposed technologies should meet the functional requirements set out below:

- The system should be able to accurately detect and recognise threats in a given area, focusing on classes of threats that are known beforehand. Furthermore, systems may be able to detect unexpected new threats or unpredictable conditions that may change their standard behaviour and reactions, using novel detection mechanisms.

- The system should be capable of using various navigation and localisation methods, both with and without relying on global navigation satellite systems (GNSS).

- The system's performances should be measured in the test campaigns conducted in the framework of the technological challenge, using protocols and metrics based on those described in the preliminary evaluation plan (see Appendix 1). Details about how the proposed approaches and systems will address the tasks outlined in the preliminary evaluation plan should be described in the proposals. Any relevant system performances measured in the context of previous technological challenges should be mentioned in the proposals.

- Systems should be able to record the data acquired through their sensors, enabling full replay of flights and reproduction of experiments in a software environment. Proposals should describe the classes of data that can be shared with other teams.
- The proposed approaches should be relevant for future integration and operational missions, especially in terms of SWaP-C (size, weight, and power – cost). Moreover, the solution should focus on ensuring distributed computing capabilities among swarm members, allowing the mix of low-cost platforms with more powerful ones.

In addition,

- The system may use jamming-resistant intra-swarm communication methods to maintain communications in compromised environments.
- The system may be capable of operating with known domain data, comparing the information stored in its memory with the data it detects. This is expected to enable resolving any detection conflicts or accounting for missing detections and raising alerts when unexpected conditions are detected.
- The system may include algorithms to optimise tasks performed by each member of the swarm, allocating resources according to each drone's capacity and position, which helps maximising their autonomy and endurance capabilities.

**Expected impact**

The outcome of the effort should contribute to:

- enhancing tactical situational awareness capabilities for EU Member States' and EDF associated countries' armed forces;
- boosting the competitiveness, efficiency and innovation capacity of the European defence technological and industrial base, and enhancing the EU's strategic autonomy;
- creating databases to further develop and test equipment;
- making AI techniques for situational awareness easier to understand and more transparent;
- strengthening soldier protection and increased survivability, by minimising risks from lethal or damaging incidents;
- contributing to reducing or preventing the strategic dependencies of the Union.

### 2.3.2. EDF-2026-LS-RA-CHALLENGE-DIGIT-AISAO: AI-based tactical situational awareness using swarms of small robots and drones – Organisation of a technological challenge

- **Indicative budget:** EUR 7 000 000 for this topic under the EDF-2026-LS-RA-CHALLENGE call.
- **Number of actions to be funded:** One proposal may be funded for this topic.

**Objectives**

***General objective***

The automatic analysis of tactical situations using fleets of robots and drones and artificial intelligence (AI) is a crucial research topic that currently lacks standardised benchmarks and objective evaluation campaigns.

***Specific objective***

This call topic aims to organise a technological challenge and set up a test environment, in which research teams will participate, supported through the call topic EDF-2024-LS-RA-CHALLENGE-DIGIT-AISAP-STEP. The test environment should enable objective comparisons between different approaches. Data should be collected, annotated and shared during field tests. This will enable the system performances to be validated, on the basis of precise evaluation criteria and an evaluation plan (see Appendix 1).

**Scope and types of activities**

***Scope***

Proposals must address the organisation of a technological challenge on automatic threat detection and classification in ground environments based on the preliminary evaluation plan provided in Appendix 1. The challenge must include collecting data recorded by the participating teams during field tests, annotating this data, and sharing the resulting databases.

Proposals should include a clear description of the criteria to assess the completion of work packages. Criteria should include: (i) producing detailed evaluation plans agreed on by all stakeholders; (ii) producing the annotated databases needed for the evaluations; (iii) producing measurements for all systems submitted to the tests by the participating teams following these plans; and (iv) organising the required events.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(optional) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(optional) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(optional) |

| | Types of activities<br>(Art 10(3) of the EDF Regulation) | Eligible? |
|---|---|---|
| (e) | **System prototyping**[43] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[44] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[45] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

Proposals must therefore cover at least the tasks set out below as part of mandatory activities:

- Integrating knowledge:
    - Setting up the hardware and software infrastructures for testing threat detection and classification in the framework of the technological challenge;
    - Collecting sensor data from the participating teams; labelling/annotating the data with the expected outputs against which the system outputs should be evaluated ('ground truth') or drawing up the expected outputs as needed; and distributing and curating the databases and assessing their quality;
    - Organising the evaluation campaigns, including:
        - coordinating the exchanges with the other stakeholders on the evaluation plans and drawing up these plans;
        - managing the field and data-based test campaigns;
        - managing the objective measurements of the performances of the systems submitted to the tests by the participating teams according to the protocols and metrics described in the evaluation plans;
        - organising the debriefing workshops.

The proposals should demonstrate how they can harness synergies and complementarity with planned, ongoing or completed activities for the objective and comparative evaluation of autonomous navigation technologies' performance.

**Functional requirements**

[43] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[44] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[45] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

The proposed solutions should enable the performances of the tested systems to be measured according to detailed evaluation plans based on the preliminary evaluation plan (see Appendix 1). The proposals must describe the key aspects of the detailed evaluation plans to be prepared and their associated data management. The proposals should also describe:

- the scenarios, nature and size of test ranges, and environmental conditions;
- how the reference coordinate system for comparing system outputs and ground truth will be determined;
- the nature and volume of data to be annotated;
- quality control of the annotations;
- the framework for trusted data sharing;
- the detailed schedule of the data-based and field test campaigns;
- evaluation procedures (rules and tools to implement the metrics) and significance tests performed on measurements.

The proposed scenarios should strike a balance between several aspects: (i) the scenarios should reflect real situations encountered in military operations but be technically challenging; and (ii) the scenarios should clearly set out the evaluation processes but be technically feasible.

Proposals should ensure the quality of the data annotation. Part of the data should be subject to double annotation by two independent annotators, followed by an analysis of the inter-annotator agreement. The statistical significance of the results measured should also be estimated.

The detailed programme of the field test campaigns should be based on the assumption that at least four teams will participate. The possibility to accommodate for additional participants beyond this baseline and its impact on the field test programme should be described in the proposals.

During the challenge, drafts of the detailed evaluation plans should be submitted for discussion to the participating teams and to any stakeholder designated by the funding authority. These drafts should be submitted early enough to allow for feedback on the actual evaluation campaigns. Any changes to the evaluation plans should consider several factors: (i) technical possibilities and cost; (ii) scientific relevance of the measurement; and (iii) representativeness of the metrics and protocols with respect to military needs. Where changes are made without consensus, a clear justification should be documented.

**Expected impact**

The outcome of the effort should contribute to:

- collaboration, knowledge sharing, and new partnerships that drive collective progress in AI-based tactical situational awareness at EU level;

- improved knowledge and understanding on the capabilities of European industry in that domain
- improved technologies for automatic threat detection for tactical ground applications;
- certification of those technologies;
- improved tactical situational awareness capabilities of EU Member States' and EDF associated countries' armed forces;
- improved clarity of system performances for all stakeholders, including system developers, funders and users.

### 2.4. Call EDF-2026-LS-RA-SMERO

- **Targeted type of actions:** Research actions (dedicated to SMEs and research organisations).
- **Form of funding:** lump sum grants following the call for proposals.
- **Targeted type of applicants:** any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation. Members of the consortium need to be SMEs (as self-declared according to Commission Recommendation 2003/361/EC) or research organisations (as self-declared according to European Commission Rules for Legal Entity Validation[46]). However, the coordinator of the consortium must be an SME. The budget allocated to research organisations cannot exceed 40% of the total requested grant amount.
- **Indicative budget for the call:** EUR 35 000 000 to support one call topic:

#### 2.4.1. EDF-2026-LS-RA-SMERO-NT-STEP: Non-thematic research actions by SMEs and research organisations

- **Number of proposals to be funded:** several proposals may be funded for this topic.
- **Range of EU financial contribution per proposal:** The requested funding cannot exceed EUR 5 000 000.

**Objectives**

This call topic encourages the driving role of innovative SMEs and Research Organisations (RO) in bringing forward innovation defence research, possibly by adapting technologies from civil applications or addressing hybrid warfare.

This call topic contributes to the STEP objectives, as set out in the STEP Regulation[47], in any of the target investment areas.

**Scope and types of activities**

***Scope***

The proposals must address innovative technologies and solutions for defence, including those that can improve readiness, deployability, reliability, safety and sustainability of forces

[46] European Commission, *Rules for Legal Entity Validation, LEAR Appointment and Financial Capacity Assessment*, rules-lev-lear-fca_en.pdf (europa.eu)

[47] Regulation (EU) 2024/795

in defence tasks and missions, for example in terms of operations, equipment, infrastructure, energy solutions, surveillance systems or digital solutions.

The proposals must address target investment areas as set out in the STEP Regulation, and reach at least TRL4[48].

In addition, to best complement R&D efforts already targeting civil applications and to encourage the efficient spinning-in of knowledge, innovation and technological development to the defence sector, this topic also welcomes proposals for add-on research actions to adapt solutions originally developed for civilian applications and previously not applied in defence.

***Types of activities***

The following table lists the types of activities and whether they are eligible or ineligible:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes |
| (e) | **System prototyping**[49] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[50] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[51] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

Proposals that include studies must also address at least one additional eligible activity.

[48] The definition of TRLs is shared with other EU programmes, such as Horizon Europe. A reference to this definition is publicly available at https://horizoneuropencpportal.eu/sites/default/files/2022-12/trl-assessment-tool-guide-final.pdf.

[49] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[50] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[51] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

The proposals must describe a clear work breakdown structure and link the proposed tasks to eligible activities.

The proposals should include clear descriptions of the proposed criteria to assess work package completion.

**Functional requirements**

This call topic is open to technology research for defence in line with STEP target investment areas. The proposals should describe the targeted functionalities and the planned means to measure progress toward the achievements of these functionalities.

**Expected impact**

The outcome of the effort should contribute to:

- developing innovative and cost-effective solutions for defence applications;
- drawing up ground-breaking or novel concepts and approaches, new promising future technological improvements or the application of technologies or concepts previously not applied in the defence sector;
- improving innovation capacity across Europe by involvement of SMEs that can make a difference in the future;
- creating potential future market opportunities for SMEs, especially by facilitating access of SMEs to defence markets and supply chains;
- developing European research and technology ecosystems and strengthening EU Member States' and EDF associated countries' defence supply chains.

### 2.5. Call EDF-2026-DA

- **Targeted type of actions:** Development actions
- **Form of funding:** Actual costs grants following the call for proposals
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation
- **Indicative budget for the call:** EUR 562 000 000 for 13 topics addressing 10 categories of actions.

#### 2.5.1. EDF-2026-DA-SENS-CEW-STEP: Enhanced cognitive electronic warfare system with intelligent signal analysis

- **Indicative budget:** EUR 24 000 000 for this topic under the EDF-2026-DA call.
- **Number of actions to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

The rapid evolution of technologies – such as radiofrequency electronics, digital technology, and machine learning – is driving the development of next generation electronic warfare (EW) systems. By integrating these technologies, EW systems can transition from a multiple sensor approach to a multi-sensor netted approach, enhancing their capabilities and providing improved situational awareness.

In the increasingly contested maritime domain, advanced naval capabilities and interoperability are essential for protecting EU interests. To counter emerging and current threats, next-generation EW systems must be designed with scalability, adaptability, and the capability to integrate and be deployed with unmanned vehicles (UxV) to enhance situational awareness.

The incorporation of artificial intelligence (AI) and massive data processing will introduce a cognitive layer, enabling faster decision-making and accelerated response times. This will potentially automate certain threat responses, requiring a re-evaluation of human-machine control and existing rules of engagement. The widespread adoption of AI will potentially also enhance the performance, operability, and maintainability of EW systems.

***Specific objective***

This call topic aims to demonstrate the potential of AI and other advanced technologies in enhancing radar electronic support measures (RESM) and communications electronic support measures (CESM) systems within an EW demonstrator. By leveraging AI and advanced technologies, EU platforms can maintain technological superiority, maximise interoperability, and increase the EU strategic autonomy. The aim is to develop next-generation EW systems that can effectively counter emerging threats and support EU interests in the maritime domain without third country dependencies.

This call topic is aligned with ongoing initiatives at EU level and tries to enhance coherence of the capability landscape in the maritime domain. The topic should act as a real enabler for both the naval industry and the Navies of the EU Member States and EDF associated countries. The topic aims to attract interest and involvement of most of, if not all, the EU and EDF associated countries naval actors.

This call topic contributes to the STEP objectives, as defined in the STEP Regulation[52], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

Proposals must develop a technology integration demonstrator, laying the foundation for a future cognitive electronic warfare system integrated with the platform's self-defence and combat management system (CMS). This enhanced cognitive EW demonstrator should prove the enhanced capabilities of the multiband mode of operation and combine software and hardware. The cognitive model is to be implemented in software and integrated with reference multiband RF[53] modules to demonstrate key functions.

[52] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).

[53] Radio Frequency.

The assessment of the operational, technical and programmatic feasibility of the baseline concepts depends critically on the availability of the necessary data. This is expected to be achieved by indicating for each concept what classified data it requires, assessing whether it can be obtained in time and cost, and, where this is not feasible, defining mitigations not to compromise the viability of the system.

**Types of activities**

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[54] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (optional) |
| (g) | **Qualification**[55] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (h) | **Certification**[56] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Integrating knowledge:
    - reviewing state-of-the-art of employment of AI in EW and identify necessary developments and improvements for military naval applications;

[54] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[55] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[56] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- identifying the emerging technologies and the most promising ones that have the potential to address the operational challenges of integrating AI and machine learning (ML) into electronic support measures (ESM) systems;

- drawing up a roadmap, identifying the priorities on technologies to be further developed during follow-on phases, as well as the level of maturity target TRLs[57] to be achieved for the associated elements; a specific section will be included for AI in EW.

- Studies:

  - developing a comprehensive set of challenging and realistic scenarios considering multidomain threats (sea, land, air and space), electronic interference and jamming in special environment conditions;

  - using the developed scenarios, creating an operational concept definition that outlines how the system can operate effectively in these demanding conditions, and identify key performance metrics to assess its capabilities;

  - specifying the minimum requirements for AI-driven ESM signal analysis systems and define operational requirements including threat analysis and assumptions, deriving use-cases as a common foundation for the project;

  - identifying and prioritising the system protection measures to ensure spectrum management in the face of interference, jamming, and interception attempts;

  - exploring the feasibility of integration into different naval platforms and the expected performance in naval operative applications;

  - conducting feasibility studies of technologies aimed at minimising the system's SWaP-C (size, weight, power consumption and cost), for their implementation in the demonstrator model;

  - carrying out simulations to improve the data management including fusion of the information using different sources;

  - setting out and modelling tasks to determine operation of the system;

  - setting out performance indicators and measures of effectiveness (MoEs) to characterise and assess the ESM systems;

- Design:

  - setting an interoperable and scalable concept design to support an open architecture that standardises technology interfaces from different industry actors;

  - designing specific algorithms that optimise the spectrum management and perform capability tests for the demonstrator and take advantage of the capabilities in

[57] Technology Readiness Level.

different scenarios, including the use of AI in the interpretation of signals to improve detections and jamming;

- drawing up a modular, interoperable, scalable, and flexible concept design to integrate the proposed solutions into the future enhanced cognitive electronic warfare systems;
- conceptual design of a future cognitive EW suite for naval platforms, empowered by AI, to enhance situational awareness and the decision-making process;
- detailed description of the hardware applied to support enhanced cognitive EW System operation;
- designing the software to support enhanced cognitive EW system in the optimisation of the spectrum management in congested scenarios (interferences and jamming) and complex environments;
- creating a conceptual model of the system to simulate performance and assess capabilities;
- designing algorithms to optimise performance based on the enhanced cognitive EW system capabilities;
- designing and modelling an enhanced cognitive EW system that integrates the selected technologies and demonstrate interoperability between them;
- developing an enhanced cognitive EW demonstrator that features an integrated AI model for RESM/CESM signals analysis, enabling signal detection, characterisation and response capabilities;
- conducting functional testing of the enhanced cognitive EW demonstrator with RESM/CESM Signals analysis in a controlled laboratory environment, supported by simulation, to validate its capabilities and demonstrate smart spectrum management using the AI EW model;
- analysing the results in terms of the defined performance indicators and MoEs;
- extrapolating results using the developed system model to practical scenarios applying algorithms to increase performance based on the multiband capability.

The proposals may demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities as described in the call topics PADR-EMS-03-2019 on *Combined radar, communications, and electronic warfare functions based on European Active Electronically Scanned Arrays for military applications*, EDF-2021-NAVAL-R-DSSDA on *Digital ship and ship digital architecture*, EDF-2021-DIGIT-D-MDOC on *Military multi-domain operations cloud*, EDF-2021-SENS-R-RADAR on *Advanced Radar Technologies*, EDF-2022-RA-SENS-ART on *Advanced Radar Technologies*, and EDF-2022-RA-SENS-CSENS on *Covert Sensing* and EDF-2025-DA-SENS-MB4DR-STEP on *Multi-Band 4D Radar*.

The proposals should aim at ensuring consistency with the activities to be carried out under the call topics (i) EDF-2022-DA-NAVAL-NCS related to *Naval Collaborative Surveillance*, which is expected to set out the European standard for naval collaborative surveillance operations, (ii) EDF-2024-DA-NAVAL-FNP related to *Functional Smart System-of-Systems under an integral survivability approach for Future Naval Platforms*, and (iii) EDF-2025-DA-NAVAL-DSNCC-STEP *Digital Ship and Naval Combat Cloud*.

**Functional requirements**

The solution should provide a scalable enhanced cognitive EW demonstrator with RESM/CESM signal analysis, which should be based on an AI system design to be used in multiple naval platforms. The demonstrator should be scalable to cover different types of platforms and future frequency bands, and should meet the requirements set out below:

- Operation concept definition focused on challenging scenarios considering threats in sea, land, air and space, interference and jamming and special environment situations.
- Conceptual design of the enhanced cognitive EW System, including not only the target requirements architecture but also a definition of the interface standards between the different technologies applied.
- Ability to identify relevant or high-value data using AI for sharing with the force/command.
- Ability to read and integrate data from various sources, including the EW system, onboard ship systems (e.g. communications, navigation, radar), and other EW systems from external sources such as ground units, intelligence centres, and allied forces.
- Smart management of the spectrum.
- Minimisation of the requirements in terms of size, weight, and power (SWaP) and minimisation of the emissions, reducing the number of antennas on ship decks.
- Ability to generate and maintain emitter and platform signatures by combining real captures, physical simulations and controlled synthetic samples validated by experts, so that the training set is robust and continuously updated to retrain the AI for new threats or changes in the environment.

The demonstrator should include collaborative capabilities, such as:

- Collaboration with remote assets.
- Fusion and improvement of detections based on the reception of information from other sensors.
- Precise multiplatform geolocation based on time difference of arrival (TDOA).
- Generation of countermeasures based on distributed sensors for self-protection and electronic attack.

The demonstrator should involve AI to:

- Analyse the importance of parameter patterns using studies in supervised AI for threat classification and recognition. These studies will provide a ranking of parameters and patterns according to their intrinsic information.

- Analyse each signal in real time using predefined parameter weightings and pattern recognition that emphasise the highest-performing features, identifying the signal and linking it to the most likely platform or threat in the library.

- Analyse local and distributed computing systems to filter at sensor level and reduce data amounts and processing latencies.

- Automate real-time database updates using measured ESM signals, enabling dynamic updates of unit or force tasks.

- Establish a real-time spectrum map covering time, frequency, and angle-of-arrival/position.

The AI automation process can operate at various levels, including spectrum knowledge, emitter knowledge, situation knowledge, mission knowledge and decision-making, with each level offering increasingly valuable and powerful benefits. The system should cover all these levels.

The proposed solutions should also include the following features:

- establishing next generation (AI-based) algorithms for interception and different kinds of jamming, including frequency jumps for frequency hopping spread spectrum (FHSS) and partial correlation sequences for direct sequence spread spectrum (DSSS);

- extending AI for EW response actions and comms/radar low probability of intercept (LPI) and low probability of detection (LPD) waveform adaptation actions. This should ensure responsive actions depending on the situational awareness;

- using AI in two ways: fully or semiautomatic modes. The algorithms restrictions are different in full AI mode as additional requirements for safety, traceability and human control will apply.

The demonstrator should prove essential elements for future European EW systems, covering the following four main areas:

- intelligent electromagnetic spectrum management using multiple bands adapted to the operation and functionality required in a condensed jammed electromagnetic spectrum of operation;

- managing communication links for multiple up/down link to remote assets;

- combat management system full integration, with enhanced multiple platforms collaboration;

- smart autonomous operation based on cognitive capabilities to adapt to multiple scenarios by supporting the human decision-making process.

The enhanced cognitive EW demonstrator should prove the future readiness for the following performance capabilities:

- generation and improvement of libraries for existing emitters and algorithms for identification of new threats;
- estimation of the potential danger of threats based on their behaviour and the effectiveness of respective countermeasures against them. The catalogue of MoEs will be defined during the design phase;
- improvement of analysis algorithms for characterisation of low probability of exploitation (LPE) radars using new parameters for their characterisation;
- selection or partial development of modelling & simulation, verification, test and evaluation tools based on the identified needs. To verify and assess the real effectiveness of the system in representative situations, three essential elements should be modelled:
    - the hostile electromagnetic environment (e.g. emitters, jamming, noise);
    - the EW chain of the system itself (e.g. antennas, processing, countermeasures);
    - the mission scenarios with their MoEs.
- Operation in multiple frequency bands simultaneously;
- Accurate synchronisation with remote signals as illuminators/receivers. The system should ensure multi-static RF coherence by ensuring a common time and frequency reference between the main platform and all remote signals acting as illuminators and/or receivers, with sufficient accuracy to fuse their signals as a single distributed sensor, allowing targets to be located and countermeasures to be applied with greater range and accuracy;
- Minimising the impact of the usage of AI on the overall system's SWaP-C by integrating the most suitable technologies.

The demonstrator should be designed to operate with existing CMSs, with the most commonly applicable standardised data formats (e.g. STANAG[58] 4559[59]) for data sharing with other units or command centres. The success of the AI system is anticipated to depend on the availability of large amounts of representative data to support AI system development and training.

The proposed methodology should incorporate agreements for utilising national repositories and the most commonly applicable standardised formats (e.g. STANAG), balancing data sharing for AI training with secure custody of sensitive information and exploring alternative solutions such as simulated or sanitised data, if necessary.

[58] NATO Standardisation Agreement.
[59] NATO Standard ISR Library Interface.

**Expected impact**

The outcome should contribute to:

- developing solutions to mature capabilities that integrate technologies developed by EU industries;
- improving the autonomy of European naval systems by reducing reliance on external navigation signal sources;
- increasing commonality, interoperability and interchangeability among European defence naval industries and EU Member States and EDF associated countries;
- promoting the EU's strategic autonomy in the naval sector and configuring an EU naval force that responds to national and European strategic needs and trends;
- developing innovative systems that are more efficient, scalable, and adaptable to different platforms;
- reducing the cost of the future systems development and their maintenance throughout their life cycle;
- providing the European industry and European armed forces with new EW solutions to maintain their independence and a technical and operational superiority.

### 2.5.2. EDF-2026-DA-SPACE-PRS-STEP: Effective Galileo Public Regulated Service for effectors in Navigation Warfare environment

- **Indicative budget:** EUR 50 000 000 for this topic under the EDF-2026-DA call.
- **Number of actions to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

The general objective of this topic is to develop GNSS[60] modules for PRS[61], with NAVWAR[62] capabilities for integration into EU Member States and EDF Associated Countries' defence systems, and to demonstrate their effectiveness under NAVWAR conditions.

***Specific objective***

The specific objective of this call topic is to develop GNSS modules for PRS with NAVWAR capabilities that are compatible, in terms of size, weight and power (SWaP), environmental and kinematic requirements, with their integration into missiles or guided munitions, and to demonstrate their effectiveness under NAVWAR conditions, in particular under blue force electronic attack (BFEA).

[60] Global Navigation Satellite System.
[61] Public Related Service.
[62] Navigation Warfare.

SWaP requirements should consider small-sized guided munitions. A common interface control document (ICD) covering, but not limited to, common form-factors, must be developed for guided munitions and/or for missiles.

This call topic contributes to the STEP objectives, as defined in the STEP Regulation[63], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

The proposals must address the development of GNSS module[64] prototypes for PRS with NAVWAR capabilities and with PNT[65] performance compatible with the use case, which could be integrated into missiles and/or guided munitions (SWaP, environmental and kinematic requirements), and their testing in a representative NAVWAR environment (in particular in presence of BFEA).

Moreover, the proposals should address the demonstration of the effectiveness of the GNSS module prototypes under such NAVWAR conditions through a real firing test.

However, the proposals must not address:

- non-defence civilian applications[66];
- purely theoretical frameworks[67];
- non-related technological domains[68].

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (optional) |

[63] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).
[64] The GNSS module can take the form of a card.
[65] Positioning, navigation, and timing.
[66] The focus should remain strictly on military applications and NAVWAR-related functionality.
[67] The proposals should emphasise practical, deployable technologies rather than overly theoretical models that don't offer tangible solutions.
[68] The proposals should avoid delving into unrelated areas, such as PRS signal processing for purely commercial use, which are not related to NAVWAR-specific challenges.

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[69] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (g) | **Qualification**[70] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (h) | **Certification**[71] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Design:
  - developing GNSS modules for PRS, including miniaturised security modules[72], for missiles and guided munitions, identifying the specific requirements of their integration environments such as restriction in power consumption, weight, shock and vibration, size and hybridisation with other sensors (especially inertial ones);
  - consolidating the NAVWAR capability that covers robustness to interferences and a common definition of BFEA masks to support protective and offensive measures addressing common operational scenarios provided by the supporting EU Member States and EDF associated countries (sMS)[73];
  - incorporating the NAVWAR capability into the technical requirements and standardisation process of the GNSS modules for PRS, which will integrate operational needs with equipment characteristics at the form-factor level, interfaces and messages/protocols (also including the ancillaries required for critical information loading);
  - including commonly agreed interfaces approved by the sMS (and defined in the ICDs) in order to enable integration into various weapon systems (e.g. missile or

[69] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[70] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[71] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.
[72] Implementing the PRS key management or supporting the PRS Spreading Code Transmission.
[73] Supporting Member States and EDF associated countries refers to those countries having jointly agreed on harmonised defence capability requirements and technical specifications on which the action is based and are to co-finance the action or that intend to jointly procure the final product or to jointly use the technology.

guided munition) in terms of electrical interfaces, communication protocols, and payload capacity;

- further developing the architectures of the GNSS modules for PRS, along with the miniaturisation and modularity concepts, by including the consultation with crypto approval authorities (CAA) on technologies ready to provide the necessary tamper protection in the crypto device evaluation (CDE) laid down by the Council Decision 2013/488;

- for the integration into the targeted platforms 'missiles and guided munitions', identifying the priorities of the different PNT sensors on the platform(s) and optimisation of the priorities, integrity and coupling for the identified NAVWAR capability (BFEA), including features such as multi-frequency reception, high-power filtering, fusion of on-board sensors, cooperation between the anti-jamming antenna and the GNSS modules for PRS, exploitation of precise and secure positioning services (such as the trusted high accuracy service considered for Galileo 2nd generation, pending an implementation decision);

- duly analysing the likelihood and impact of an unsuccessful wafer-run in the fabrication of the ASIC and including proportionate mitigating actions to be implemented in the relevant design or prototyping activities, including the management of possible programme delays allowing for additional wafer-run.

- System prototyping:

  - continuing the design activities listed above up to level of prototypes (TRL 6).

- Testing:

  - defining test plans that address various interference types (e.g. continuous wave interference, extreme noise, unmodulated and power amplified carrier wave, spoofing signals) and measuring GNSS modules performance under these conditions;

  - proof-of-concept demonstration (TRL[74] 5) of the GNSS modules for PRS for missiles and guided munition into a NAVWAR environment. As a minimum, the proof of concept must be demonstrated into a congested simulated environment (intentional GNSS radiofrequency interference to test BFEA scenario and interferences affecting the PRS signals);

  - at least two beneficiaries of the consortium from two different sMS must demonstrate the interchangeability of their prototypes of GNSS modules for PRS into common platform environments (preferable three common platforms from three different sMS for the same PRS item).

- Qualification:

[74] Technology Readiness Level,

- qualification of the GNSS modules for PRS in the integration environments against identified NAVWAR scenarios involving various interference types (including performances for protection, support and offensive operations), with a focus on BFEA scenarios under a commonly agreed qualification process;

- the qualification process must ensure that the prototypes meet the relevant military standards applied by sMS, as well as that they comply with the specific requirements of the defence sector and the international legal requirements related to secure, robust navigation systems under adversarial conditions.

Moreover, the proposals should cover the following tasks:

- Design:

  - identifying EU-based supply-chains on critical technology (e.g. ASICs and electronical components).

- Testing:

  - demonstrating the effectiveness of the GNSS modules for PRS (TRL 6) with NAVWAR capability through a real firing test of the targeted missile(s) or guided munition(s) under NAVWAR conditions (BFEA), characterised by GNSS radiofrequency interference affecting the PRS signals. The demonstration should include the measurement of the effectiveness of anti-jamming and anti-spoofing technologies, ensuring the receiver's robustness against interference in various military scenarios (e.g., Electronic Warfare environments);

  - the demonstration should comply with operational planning process provided by sMS covering the monitoring of the interferences and a process to optimise the execution of the operation by providing optimised trajectories for the guided missiles and guided munitions;

  - the demonstration should take into account environmental requirements, such as adequate resistance to shock and thermal stress.

In addition, the proposals may address the following task:

- System prototyping:

  - prototyping activities may use a pilot line from the European Chip-Act that supports secure and defence ASIC applications.

The proposals must demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topics: (i) EDIDP-PNTSCC-PNT-2019 related to the *Development of European standardised and sovereign Galileo PRS navigation receiver capabilities compatible with GPS/PRS solution for military purposes*[75]; and (ii) EDF-2021-SPACE-D-SGNS related to

[75] EU Funding & Tenders Portal - EDIDP-PNTSCC-PNT-2019

*Space and ground-based NAVWAR surveillance*[76]. Proposals should also substantiate their synergies with ongoing related initiatives at EU level.

Synergies with the prototypes of civilian PRS applications being developed under Horizon Europe's Galileo public regulated service use cases[77] are also encouraged.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- The developed GNSS modules for PRS must be compliant with the Galileo PRS protection profile CMS[78] to use all Galileo PRS operational modes;
- The GNSS modules for PRS with NAVWAR capabilities should build on a common ICD and should be interchangeable for a given platform;
- The customised GNSS modules for PRS should meet the specific SWaP requirements for their integration into missiles and/or guided munitions systems, minimising the impact and changes of the hosting platforms;
- The GNSS modules for PRS should have the capability to continue providing (receiving) accurate PNT data even in contested or degraded signal environments. In particular, they should:
    - be hardened to GNSS jamming and spoofing, with NAVWAR capabilities, including advanced signal processing algorithms, such as robustness to radiofrequency interference (RFI) and secure resilient signal acquisition techniques;
    - adequately comply with predefined BFEA scenarios requirements coming from sMS;
    - quickly adapt to changing conditions in the NAVWAR environment, for instance by allowing software upgrades and field reprogramming to ensure the system can adapt to new threats and vulnerabilities over time.

**Expected impact**

The outcome of the effort should contribute to:

- promoting the development of miniaturised GNSS modules for PRS;
- demonstrating effectiveness of GNSS modules for PRS with NAVWAR capabilities in representative NAVWAR environments with the focus on RFI and BFEA;
- strengthening EU NAVWAR common understanding and GNSS resilience;
- ensuring the uptake of Galileo PRS.

[76] EU Funding & Tenders Portal - EDF-2021-SPACE-D-SGNS
[77] HORIZON-EUSPA-2023-SPACE-01-44
[78] Common Minimum Standards.

### 2.5.3. EDF-2026-DA-ENERENV-HPES-STEP: High-performance energy systems

- **Indicative budget:** EUR 20 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

Greening of the next generation of multi-energy systems in military applications inevitably requires more advanced and customised communication and data-based capabilities – including cloud-edge, 5G/6G/SatCom/fibre-optics and Artificial Intelligence (AI) – able to support optimisation and improve resilience of energy operations. It also requires system-wide and standards-based modularity and interoperability on energy, communication, data and application layers to enable adaptive and customisable energy generation meeting specific consumption requirements. Experience from industry and critical infrastructures is expected to provide key inputs in this respect, but the military application must undergo significant Europe-based development and customisation of commercial technologies to meet the strict safety, security and resilience requirements. To preserve European sovereignty and further stimulate the strengthening of the European defence industry, it is critical to accelerate the development of European smart energy technologies and systems, by benefiting from the maturation of such solutions in the civilian sector.

To preserve energy security, it is critical to accelerate the study and development of a European energy system, by benefiting from the contextual maturation in the civilian energy sector. The future battlefield will need more energy than today and requires more flexible energy solutions. New systems increase the demand for energy from mobile and/or stationary systems. To meet this increased demand for adaptable and flexible energy solutions, it is necessary to develop functional models for energy production, storage, management, refuelling and logistics technologies for military applications on mobile and/or stationary solutions. The technological solutions need to be adapted to specific use cases.

Developing innovative energy systems adapted for military operations, without compromising with current defence capabilities, is challenging. The specific military environment can limit the transfer of civilian technologies, in light of performance, safety and security, interoperability, maintenance, cost and supply issues.

***Specific objective***

This call topic aims to follow up and complement previous activities in the field of high-performance energy systems, (production, storage, management and distribution). Strategic autonomy and securing the capacity for European armed forces to develop and deploy critical technologies are overarching drivers that apply across key strategic orientations: ensuring more secure and competitive energy supply should be achieved through solutions for smart energy systems. It is therefore required to tackle unaddressed capabilities and use cases of multi-energy systems, such as smart system-wide interoperability, modularity and

connectedness, enhanced security, resilience, as well as to apply advanced optimisation to production on the consumption side. Therefore, use cases for stationary military applications will have to be identified and characterised, while innovative building blocks (BB) and functional modules (FM) will be developed and evaluated.

Demonstrators' power and energy targets are expected to be assessed, alongside the other key performance indicators, including operational efficiency, interoperability, availability, security, and life cycle assessment of the operability and the connectivity to the energy grid of operational bases, while taking into account coexistence with legacy power generation systems. This requires data to be collected from relevant sensors.

By assessing the maturity of key performance, recommendations could be developed for creating, revising or consolidating military products and processes for energy generation, distribution and storage, as well as for standardising data exchange on management and control (such as MIL STD 3071[79]) and security levels.

The proposed fossil-free energy systems should account for challenging future climate conditions. They have to be robust and able to operate in a variety of climate zones, including northern winter climates and high summer heat.

The objective is to upgrade and complement already achieved activities in the field of high-performance energy systems that have developed highly responsive energy storage systems. In addition to achieve the required performance, this call topic aims to complement the system with (a) alternative means of storage, such as hydrogen and alternative synthetic fuels, (b) advanced communication and digitisation, (c) monitoring, control and prediction (d) robust cyber protection, (e) exploring standards for energy systems interoperability, and (f) operational interconnection towards smart users, such as weapon systems and UxV.

This call topic contributes to the STEP objectives, as defined in the STEP Regulation[80], in the target investment area of clean and resource-efficient technologies.

**Scope and types of activities**

***Scope***

The proposals must identify, design and develop technologies (from production, storage, and consumption) into a multi energy system able to respond to new power consumption needs of different smart end user application, such as soldier systems, weapon systems, UxV (unmanned vehicle) and AI.

Moreover, the proposals should address the adoption of COTS (Commercial off-the-shelf) components and solutions from the civilian domain, as well as a solution for integration and standardisation of smart charging / refuelling solution for multi-parallel charging / refuelling for soldier systems, swarms of UxV, manned and unmanned forward operating base (FOB) material handling equipment.

[79] Tactical Microgrid Communications and Control.

[80] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).

In addition, beyond the non-stationary solutions, the proposals may address stationary applications, such as for air bases or garrisons, and modular block for the production, storage and distribution of alternative energies, such as hydrogen and synthetic fuels.

However, the proposals should not address the propulsion of vehicles.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[81] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (g) | **Qualification**[82] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (h) | **Certification**[83] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- <u>Studies:</u>

[81] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[82] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[83] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- studying advanced multi and parallel smart charging systems for rapid recharging of electrical UxVs operating in large numbers (swarms of drones) and integration into the smart energy grid of the FOB;

- studying demand-side energy management targets and constraints for the application of communication, cloud/edge computing, internet of battles things (IoBT) (UxVs, Weapon Systems, Soldier Systems, etc.) and AI capabilities in FOBs and main operating base (MOBs). This also includes a study of possibilities and limitations of energy supply systems for smart consumers;

- assessing solutions for deployable FOBs, considering technologies already used in already achieved activities and civil applications (high TRL[84]), as well as promising technologies at lower TRL. Energy system of systems and all the necessary technologies require to be considered to design the technology demonstrators;

- investigating, developing and validating, based on evidence, interoperable pre-defined FOB/MOB energy load profiles for improved energy demand management (with battery buffering connected to common –preferably 800V – DC bus), including:

    - UxV charging station and UxVs swarm charging solutions;

    - vehicle charging station;

    - DC/AC[85] conversion unit;

    - integrated AI resources and applications for energy production, management and control

- Design:

    - designing an energy system of systems to follow up and complement previous activities in the field of high-performance energy systems, with a particular focus on unexplored technologies, such as hydrogen (conversion, storage, and logistics), and unaddressed capabilities and use cases of multi-energy systems, such as smart system-wide interoperability, modularity and connectedness, enhanced security and resilience, and advanced optimisation applications on production and consumption sides;

    - designing active and passive cyber security capabilities;

    - designing the demonstrators involving BBs and FMs interoperability at hardware level, energy grid level, data network level and software level;

    - designing and demonstrating (i) interoperable units (interoperability on all levels) which include generation, storage and distribution (level 1: unit to unit, level 2:

[84] Technology Readiness Level.
[85] Direct Current/Alternating Current.

unit to consumers) of electric energy, (ii) advanced management of units and energy management on tactical edge with edge-based optimisation, and (iii) fully secure communication on all levels.

- System prototyping:
  - prototyping functional modules for production, storage, refuelling and logistics for military applications with a focus on mobile solutions. The solutions need to be designed as functional building blocks;
  - prototyping functional modules of tactical edge and cloud, resilient communications and cyber protection capabilities;
  - prototyping interoperable units (interoperability on all levels) which include generation (including renewables and legacy power generation), storage and distribution (level 1: unit to unit, level 2: unit to consumers) of electric energy;
  - prototyping functional modules for energy supply, data exchange for rapid charging / refuelling of smart consumers, and rapid data exchange for grid stability;
  - prototyping tactical microgrid management according to the most commonly applicable standards (e.g. MIL STD 3071).
- Testing:
  - testing and demonstrating products and processes for standardised data interchange at the level of EMSs, IoBT platforms, cybersecurity mechanisms;
  - testing and demonstrating BBs and FMs interoperability at hardware level, energy grid level, data network level and software level.

The proposals must take into account the operational conditions such as environmental conditions and the diversity of potential geographical locations, as described in the most commonly applicable standards (e.g. STANAG 4370[86]).

The proposals should demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topic EDF-2021-ENERENV-D-NGES related to *Next generation electrical energy storage for military forward operation bases*.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- be capable of using greener sources of energy;

[86] Environmental testing.

- improve the energy and power generation to serve the increasing energy demand of auxiliary energy production for onboard systems and unmanned aerial and naval vehicles;
- improve energy storage density without compromising on safety;
- be adapted for retrofitting typical defence solutions currently present in the EU armed forces or for future solutions, to meet Green Deal requirements;
- be compatible with NATO/EU logistics, by which it should lead to a common solution that allows for refuelling, among other things;
- include improved communication and cloud/edge architectures exploiting wireless 5G/6G/SatCom/fibre-optics technologies considering performance targets for energy management applications, resilience, security and seamless deployment and operation, as well as energy efficient and adaptive operation for different military applications;
- comply with relevant national, European and global regulations and standards;
- be tested in a representative military environment;
- improve the digitalisation and integration of traditional and legacy solutions and equipment into a common IoBT platforms, EMSs;
- improve the standardisation of interoperability at IT (information technologies) and OT level (operational technologies);
- ensure the deployment of cybersecurity mechanisms at all levels of equipment/solutions;
- be able to be used also in civil applications with minor modifications;
- involve interoperability concept development and piloting, considering interoperable and standardised communication between units and between units and edge energy controllers, as well as interoperability of data structures and equipment profiles;
- be able to be transported in military standard 20-feet containers and comply with general, logistics, deployment and operational conditions;
- reduce noise and electromagnetic signatures, in particular as regards modular blocks and charging/refuelling stations;
- implement plug and play solutions;
- have fast recovery and self-healing;
- comply with the most commonly applicable standards (e.g. MIL STD 3071);
- include advanced energy and energy management technologies, such as:
    - common (preferably 800V) DC bus for energy exchange between modules, with full interoperability at DC bus level;

- demand response management of loads.

**Expected impact**

The outcome of the effort should contribute to:

- supporting the EU's aims to be climate-neutral by 2050;
- supporting the spin-in of civilian European R&D into the defence sector;
- enabling EU and EDF associated countries armed forces to meet EU Green Deal targets with only minimal loss of military and joint operational capabilities;
- facilitating the introduction of new propulsion and energy integrated systems technologies by reducing their evaluation time and cost, thus providing a cutting-edge tactical advantage in operations, while contributing to energy transformation in Europe;
- developing an EU autonomous industrial sector and enhance cross-border cooperation (from large industrial groups to SMEs) in a high-tech niche sector;
- strengthening the European technological sovereignty and strategic autonomy in advance of future extra-European competitors;
- strengthening the security of European energy supply;
- enhancing complementarity and stimulating cross-fertilisation between civilian and defence technologies and solutions in this area;
- improving European deployment and sustainment capabilities on a global scale;
- developing cross border cooperation between large industrial group to private enterprises (SME), research institutes and universities;
- adapting civilian sustainable energy technology to military requirements (and contributing to the development of new standards);
- enhancing competitiveness and innovation capacity of the EU defence industry;
- boosting dual-use technology and solutions integration and transformation towards military standards;
- integrating and transforming COTS equipment towards military standards;
- improving SMEs cooperation and aggregation of crucial mass of knowledge and production capacities in one point;
- reinforcing communication and data level resilience of the managing systems and platforms;
- deploying private 5G in military camps;

- implementing standardised interconnectivity on energy grid and data management level.

### 2.5.4. EDF-2026-DA-ENERENV-AWC-STEP: Ammunition waste collection and disposal unmanned platform

- **Indicative budget:** EUR 10 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

Military exercises and combat operations have a significant impact on the environment. The removal of shells, residues and unexploded ordnance (UXO) should always be included in military exercises and after combat action. During times of conflict, the exact timing of cleanup will depend on operational circumstances.

By collecting non-natural waste and sorting it for easier recycling, fewer resources are used. Training field preparation time is shorter, which enables more frequent training sessions. In civilian areas, faster and more efficient cleanup of military waste makes it possible to begin rebuilding and restoring nature and farmland in affected areas sooner.

Finding ways to reduce human involvement in such cleanup operations is highly important, considering safety aspects and the potential magnitude of the problem. For instance, conventional artillery grenades can have a dud rate of 10-30 %. A high intensity conflict may leave a very high number of unexploded artillery grenades – possibly a million or more.

The general aim of this call topic is to develop and demonstrate improved methods and equipment for the autonomous or semi-autonomous detection and removal of residues and waste from military weapons in training areas and battlefields, including surface and underground UXOs but excluding emplaced weapons, like mines and improvised explosive devices (IEDs). It is important to note that there are several initiatives in (i) autonomous platform solutions and (ii) detection and neutralisation of explosive hazards within the military domain.

The goal is to significantly reduce the risks associated with human involvement, ultimately contributing to a cleaner environment. This approach is in line with the concept of ‘Green Military’, where sustainability in the defence sector is increased through environmental responsibility and the protection of human lives.

***Specific objective***

In areas where there have been military operations or training activities, there are residues from the use of weapons. These residues can be harmful to wildlife, farming, nature and humans and may include the following:

- inert casings from smoke and light grenades;

- motors or motor parts from anti-tank rockets and anti-tank guided missiles;
- crashed drones caused by failure or an attack from anti-aircraft systems;
- components and/or warheads from duds (missiles, drones, heavy projectiles);
- explosive residues from impact damaged or deflagrated warheads;
- other chemical substances such as white phosphor;
- buried UXOs such as mortar bombs and artillery grenades;
- poisonous shrapnel and fragments from exploding warheads (e.g. copper, zinc).

Emplaced weapons, such as mines and IEDs, are not in this call topic's scope, as well as sharp steel fragments from exploding warheads (harmful to wildlife and livestock) and small arms projectiles (which may contain toxic materials such as copper and lead).

The specific purpose of this call topic is to develop and demonstrate a self-learning and scalable system for detecting, identifying, destroying or removing, transporting and preparing for recycling objects similar,, but not limited to the residues listed above. The system will include both a remote management system and unmanned aerial and land platforms with suitable sensors, tools, and protected loading space or other means of transport.

This call topic aims to harness and advance existing technology to a high Technology Readiness Level (TRL) to address urgent and near future needs to restore civilian areas and training areas. While the proposed activities are tailored to lower intensity environments and relatively simpler tasks compared to other initiatives, the design of operationally viable, cost-efficient and energy-efficient solutions is complex. Furthermore, the proposed system should bridge the gap between civil society and military forces, enabling the dual use of methods, tools and software in post conflict or post battle areas.

The prototype should be developed to a high TRL (e.g. 6 to 8), based on existing studies as much as possible. Combining dual use technologies and developing them to meet certain military requirements is foreseen (such as, deployability, mobility and climatic tolerance). The environmental footprint should be minimised through energy-efficient design, production, lifecycle management of the materiel and optimised patterns. The goal is to recover weapons residues from affected areas and ultimately recycle them.

This call topic contributes to the STEP objectives, as set out in the STEP Regulation[87], in the target investment area of *clean and resource-efficient technologies*.

**Scope and types of activities**

***Scope***

Proposals must develop an autonomous, energy efficient and self-repairable ground platform equipped with suitable tools, sensors and associated algorithms. This platform should be capable of navigating to reported target positions in an optimal pattern, recovering and sorting detected surface and sub-surface targets for transport and subsequent recycling.

[87] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).

Proposals must focus on how to use current unmanned aerial vehicle (UAV) technology with state-of-the-art sensors. The solutions should set out smart approaches to map surface and sub surface targets in vast open areas, and methods to classify and identify such targets using sensor fusion, Artificial Intelligence (AI) algorithms, and assisted learning.

Moreover, proposals should address swarming and platform cooperation concepts for sharing information directly between platforms, with the aim to increase safety in surrounding areas during clearing tasks, operation beyond communications range or for system scalability.

In addition, proposals may include development tasks to improve or adapt certain sensor technologies and enhanced autonomous and semi-autonomous terrain navigation. Proposals may also describe the use of additional sensors to detect toxic or harmful substances, which could improve the screening/sorting process. Proposals may develop platform cooperation concepts, such as autonomous UAV battery charging from the ground platform.

However, the proposals should not duplicate other initiatives and projects' efforts to develop sensor systems. The proposals should not address clearing emplaced weapons (mines and IEDs). The design of large-scale/industrial recycling procedures for waste and munitions after collection, sorting and transport should also not be considered.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[88] of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |
| (g) | **Qualification**[89] of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |

[88] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[89] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (h) | **Certification**[90] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:
  - Scenario and threat analysis. The proposals should take into account the experience gained from the ongoing conflict in Ukraine and must address (i) ammunition types; (ii) their properties and damage potential on detonation above ground and sub surface; (iii) the numbers used; (iv) area distribution; (v) cost estimates; and (vi) environmental footprint of operations.
  - Life cycle assessment (LCA), demilitarisation and recycling of ammunition. The work should cover relevant ammunition types from the scenario and threat analysis and must include artillery ammunition. The LCA must be based on the best practices and cover energy consumption, the use and availability of materials, and associated costs. Demilitarisation and recycling must focus on technical feasibility, economic aspects and footprint reduction.
  - Environmental impact of unexploded ammunition and ammunition residues.
  - State-of-the-art technologies for detecting, classifying and identifying surface and sub-surface objects. The proposals should cover sensor technologies, sensor fusion methods, and AI-based approaches.
  - Feasibility study on autonomous explosive ordnance disposal (EOD) and render-safe procedures. The proposals should cover the damage potential of ammunition to equipment and material, and outline concepts for autonomous render-safe procedures, e.g. methods for fuse removal of recovered artillery grenades, or other means.
  - Description of the architecture of a remote management system for planning, operations, training and operator training, as well as learning and AI learning, based on open standards and available communication solutions.
- Design:
  - Scalable command, control and information system (C2IS) for planning, operations, training and algorithm learning, and the operation of multiple unmanned vehicles (UxV) systems, based on relevant standards and protocols.

[90] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- Algorithms for sensor fusion and AI methods, including assisted learning.
- Adaption of UAV system to sensor payload for surface and sub surface detection.
- UGV for autonomous and assisted navigation, sensor payload for detection, classification and identification of objects, tools for object retrieval on the surface and subsurface, autonomous accident repair or recovery ability, balanced protection against accidents, low through-the-life footprint.
- Tools or methods for render-safe procedures of artillery grenades and similar items when preparing them for transport.
- Sorting and transport solution/module.

- System prototyping:
  - Scalable C2IS system for planning, operations, training and algorithm learning, and the operation of multiple UxV systems, based on relevant standards and protocols. The system will make use of designed algorithms for sensor fusion and AI methods, including assisted learning.
  - Adapted UAV system with sensor payload for surface and sub surface detection.
  - Unmanned ground vehicle (UGV) for autonomous and assisted navigation, sensor payload for detecting, classifying and identifying objects, tools for object retrieval on the surface and subsurface, autonomous accident repair or recovery ability, balanced protection against accidents, low through-the-life footprint.
  - Tools or methods for render-safe procedures of artillery grenades and similar items as preparation for transport.
  - Sorting and transport solution/module.
- Testing:
  - Development of a test strategy and test plans.
  - Sub system testing:
    - Technical sub systems.
    - Autonomous recovery of buried artillery grenades.
    - Render-safe tools and procedures (fuse removal or other).
    - Transport solution.
    - Selected detonation trials – robustness and repairability.
  - System test: Demonstration of the complete system in a prepared scenario. Documentation of time and resources spent, including training and personnel needs.

- Operational testing in a real environment: Demonstration of the complete system in a real scenario, in close collaboration with operational personnel. If possible, these trials should be carried out with financial support to third parties (FSTP), which could be achieved with the support from Ukraine.

- Demonstrating a thorough understanding of (i) the threat and possible scenarios; (ii) life cycle assessment and demilitarisation of ammunition; (iii) the effects of detonating weapons on materiel and humans; (iv) the environmental impact of military operations; (v) sensor technology; (vi) combined sensor data exploitation; (vii) command and control systems; and (viii) energy efficient technologies.

- Qualification:

  - the qualification process must ensure that the prototypes meet the specific defence requirements in relevant crisis and war scenarios.

- Certification:

  - Identify and assess examples of national or NATO regulations for military clearing operations in military and civilian areas and suggest improvements, where possible.

  - Identify and assess relevant regulations from international humanitarian law and suggest improvements where possible.

  - Propose applicable rules of engagement / concepts of operation for the remote and autonomous operation of the system.

The proposals should demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the following call topics: (i) EDF-2022-LS-RA-CHALLENGE-DIGIT-HTDP related to *Unmanned ground and aerial systems for hidden threats detection*; (ii) EDF-2023-DA-UWW-MCMC related to *Mine counter-measures capabilities*; (iii) EDF-2023-RA-PROTMOB-DEXPLO related to *Demonstrators and technologies to defeat threats posed by Unexploded Explosive Ordnances (UXO) and Improvised Explosive Devices (IED)*; and (iv) EDF-2024-DA-GROUND-UGS-STEP related to *Multipurpose unmanned ground systems*.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- support an operation that combines skilled operators, remote and autonomous use of a combination of air and ground platforms, sensor and information fusion and self-learning abilities to detect, classify, identify, collect and transport waste and objects.

- support autonomous UAV flight in a pre-defined area and detect objects on and below the surface by using a collection of sensors and a smart analysis of ground signs.

- support autonomous UGV navigation to detected positions (including in the air) following a calculated optimal ground pattern in open and agricultural areas. The system should take into account available data and information from sensors and map layers. The UGV should ask for timely operator assistance in challenging situations, ground conditions or terrain based on air and onboard sensor and system information. The system's self-learning ability will be used to improve the safety of navigation. A communication system for data and images for human/machine operations at sufficient range should be included.

- be able to classify, collect and sort surface objects for safe transport. This may include detecting hazardous or toxic materials. The UGV should also be able to uncover and collect artillery grenades and similar objects from a depth of 2 metres and prepare those objects for safe transport autonomously.

- The UGV should be designed to survive an accidental detonation and, to the extent possible, have a self-repair capability for damaged components. It should also be modular and easy to repair and service on base.

- The UGV or a separate UGV system should be capable of safely transporting collected and uncovered materials and objects to a collection site, offload them correctly and report its cargo. The transport unit should be designed to prevent sympathetic detonation of larger objects and follow a route that minimises the danger to surrounding areas.

- The platform should be capable of fully autonomous recovery of buried artillery grenades. This includes the ability to confirm and improve the detection data from the UAV, possibly in several stages, and careful soil removal and object lifting. An autonomous module/tool to separate the fuse from the shell, or other render-safe or risk reduction methods, should be included, as well as a transport unit which may be part of the UGV or on a separate vehicle. The transport unit should prevent sympathetic detonation of larger objects in case of accident.

- The management system should allow for sharing information with military search personnel and receiving manual detections, such as pictures or hand-held detector findings. The system should also be able to take into account intelligence information and to receive pictures of targets/objects from the civilian population and provide safety precautions from experts or object databases. Proposals should explore the use of dual-use solutions and technologies.

- The command, control and communication system should be able to store and analyse collected mission data to draw conclusions and continuously improve the detection system. It should be able to retrieve information from other sources, such as intelligence, military search personnel and the public. Modes for assisted training of algorithms and classification of objects, as well as exercise and training for operators should be included.

- All parts of the system should use an open architecture and protocols in line with relevant standards. Also, the parts should also use modular hardware and software concepts to support adaptability and future upgrades.

- All parts of the system should support low energy and resource consumption, minimum impact on the environment during operations, and transportability (air, road). All the parts should also be able to operate in realistic climatic environments (within the physical limitations of detection systems), including temperature, rain, wind and dust.

**Expected impact**

The outcome of the effort should contribute to:

- disposing ammunition waste and residue in a way that helps avoid and reduce the risk of pollution in military operations. In addition, the need for human involvement in the whole management cycle is reduced;

- developing further technologies used for inventing similar devices, which increases reliability; besides technological reliability, this includes using technology more in procedures and helping redesign the whole cycle of how ammunition waste is managed today;

- extending the innovative approaches to energy resilience, where the potential of robotics and system automation is increasingly used to preserve the environment;

- reducing pollution, in line with the European Green Deal;

- reducing the direct cost for searching and cleaning up hazardous waste and materials;

- improving situational awareness, the resilience and security of EU operations and protection in operational performances;

- facilitating the introduction of new technological systems;

- developing cross-border cooperation between large industrial groups, private companies (including SMEs), research institutes and universities;

- adapting sustainable civilian energy technology to military requirements and contributing to the development of standards;

- stimulating cross-fertilisation between civil and defence technologies and solutions in this area;

- boosting competitiveness and the innovation capacity of the EU defence industry;

- strengthening the EU’s technological sovereignty and strategic autonomy ahead of global competitors.

### 2.5.5. EDF-2026-DA-MATCOMP-SMT-STEP: Smart and multifunctional textiles

- **Indicative budget:** EUR 20 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

European armed forces have adapted to asymmetric military operations, countering small, dismounted and non-uniformed enemies. These operations have emphasised rapid medical evacuation (MEDEVAC) and steady supply lines. However, the reintroduction of symmetric warfare on European soil with the use of armoured platforms, artillery and long-range munitions have led countries across Europe to reorient their operational structure and procedures.

New platforms, such as unmanned aerial vehicles (UAVs) and drones, represent novel threats. These platforms integrate a wide range of sensors with high-precision effectors, enabling attacks on targets ranging from individual soldiers to larger weapon platforms. For dismounted soldiers, maintaining concealment is particularly challenging as more modern sensor and network technology has become available on the battlefield.

As the modern battlefield is re-defined, future soldier systems should be developed in line with updated user and system requirements. These systems should reflect recent battlefield experiences, and consider Europe's climate, terrain and lighting conditions. A critical aim is balancing survivability (protection) with combat ability (mobility and soldier performance).

Smart and multifunctional textiles (SMT) are a new generation of materials and systems with functional properties that can be integrated into uniforms. Smart textiles are textiles that can interact with their surroundings; they respond and adapt to environmental stimuli. Functional textiles provide a specific additional function through their composition, construction and/or finish. Typically, these functions encompass better mechanical resistance, water and/or dirt repellence, fire retardancy, antibacterial protection, protection against ultraviolet radiation, pest deterrence or chemical resistance, thermal isolation, etc.

Smart textiles are functional materials designed to interact with their environment by adapting to changes[91]. These textiles integrate sensors and actuators to regulate body temperature, adjust camouflage properties, manage moisture and water exposure, protect against chemical biological radioactive nuclear (CBRN) agents, provide flame retardancy, and function as communication devices.

Smart textiles also include e-textiles and electronic textiles. These textiles are fabrics that incorporate electronic components to provide additional functionalities beyond those of traditional textiles. These functionalities can include those described below:

- Sensing: Smart textiles can detect and respond to various environmental stimuli such as temperature, humidity, pressure, and light. They can also monitor

[91] According to CEN/TR 16298, *Textiles and textile products - Smart textiles - Definitions, categorisation, applications and standardization needs*.

physiological parameters like heart rate, respiration, and body temperature, and detect and respond to CBRN agents.

- Actuation: These textiles can change their properties in response to external stimuli. For example, they can change colour, shape, or stiffness.

- Communication: Smart textiles can transmit data to other devices. This can be useful in applications like health monitoring, where data on a person's vital signs can be sent to a healthcare provider.

- Energy harvesting: Some smart textiles can generate and store energy. This can be achieved by integrating solar cells or piezoelectric materials that convert mechanical energy into electrical energy.

- Protection: Smart textiles can offer better protection. For example, they can be designed to be fire-resistant and water-resistant, provide ballistic protection, or neutralise chemical warfare agents.

- Comfort and health: These textiles can improve comfort and health by regulating temperature, and moisture, and providing therapeutic benefits.

Smart textiles are used in various applications, including healthcare, sports, military, fashion, and wearable technology. They represent a significant advancement in textile technology, combining traditional fabric properties with electronic capabilities to create multifunctional materials. Smart textiles are part of the Strategic Research and Innovation Agenda of the European Defence Agency (EDA) Materials CapTech (Technology Building Block 09, Advanced and smart textiles for soldier systems and platforms).

***Specific objective***

While smart and multifunctional textiles have broad applications, they need to be adapted to military needs, particularly evolving battlefield conditions. Therefore, the next generation of smart and multifunctional textiles should consider the challenges described below, which a soldier may face in the battlefield:

- introduce new concepts for survivability, including camouflage, and identification of friend or foe (IFF) and increase the operational capacity for warfare in Arctic winter conditions, and hot climates.

- improve soldiers' operational ability by providing them with real-time, actionable situational awareness information without overwhelming them with data (i.e. 'data overload'). When introducing new concepts for situational awareness, the information and data generated from combat clothing may become a cognitive burden if added to all other data collection/information needs. Mitigating measures that avoid 'data overload' should be put in place. The information gathered and shared should be relevant for both soldiers and commanding officers on the ground, such as information about own position, friendly forces and enemies.

- increase soldier's ability to operate undetected and survive in a battle environment where enemies are using UAVs/drones for observation and attacks, during both day and night operations.

As sensor technology (in different parts of the acoustic and electromagnetic spectrum) and sensor fusion have become accessible at lower costs, concealment against multiple sensor types becomes increasingly important.

This topic contributes to the STEP objectives, as defined in the STEP Regulation[92], in the target investment area of clean and resource efficient technologies.

**Scope and types of activities**

***Scope***

The proposals must address the points set out below:

- The development of a signature management solution (e.g. camouflage or other solutions) making an individual soldier less detectable by various battlefield sensors including those used in UAVs/drones. The signature management solution could also include features to avoid automatic recognition.

- The integration of innovative technologies to identify friend or foe.

- Robustness and design for maintainability.

- The integration of innovative technologies (e.g. power distribution, communication and antennas, CBRN sensors and adaptable membranes). The proposal must focus on integrating soldier system technologies, but their development is not in this call topic's scope.

- New concepts for enhanced ballistic protection (fragments and projectiles) that are compatible with sustaining the soldier's comfort and combat effectiveness. Solutions must be based on vulnerability analyses and consider alternative ergonomic and light-weight shapes for hard and soft armour, including protection against threats from UAVs/drones.

- SMT ability to operate in different climate zones, including extreme conditions like in the Arctic.

The proposal may have an option to integrate the textile into soldier systems with a command and control (C2) system.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

[92] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).

| | **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[93] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (g) | **Qualification**[94] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (h) | **Certification**[95] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes<br>(optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:
    - contributing to the development of updated concept of operations (CONOPS) and concept for use (CONUSES);
    - developing harmonisation activities, including for new requirements, specifications and standards through a process that shares knowledge and best practices (cross-fertilisation) with representatives in all domains from supporting Member States and EDF associated countries;
    - carrying out a feasibility study for devices/capability suite concepts connected to new requirements;

[93] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[94] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[95] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

  - assessing options for repair, maintenance and end-of-life management (e.g. the direct repair of embedded components, disassembly, replacement of 'modules', recycling discarded systems).

- Design:

  - Designing an integrated demonstrator of soldier smart and multifunctional textile system, including new capabilities for signature management, personal protection, identification of friend or foe and integration of soldier system technologies.

In addition, the proposals should cover the tasks set out below:

- System prototyping:

  - developing a prototype for testing and evaluation purposes.

- Testing:

testing solutions for monitoring the health of the soldier and their equipment, thermoregulation, geolocation, ballistic protection, signature management, and smart textiles as defence products. The proposals may also cover the tasks set out below:

- Qualification:

  - qualifying solutions (for monitoring the health of the soldier and their equipment, thermoregulation, geolocation, ballistic protection, signature management, and smart textiles as defence products) as defence products.

- Increasing efficiency:

  - developing demonstrators for evaluation purposes showing the operational benefits and added value of new solutions;

  - evaluating demonstrators in representative environments.

The proposals must demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topics: (i) EDF-2022-DA-MACOMP-SMT related to *Smart and multifunctional textiles*; and (ii) EDF-2021-PROTMOB-D-SS related to *Soldier system*.

**Functional requirements**

The new soldier smart and multifunctional textile system should:

- improve operational capabilities and survivability in high-intensity combat scenarios (including, for instance, in presence of hostile drones and electronic warfare);

- adopt a system approach, including standardisation and harmonisation of system specifications, and a modular open architecture, in order to ensure system adaptability and interoperability in a cost effective way;

- enable operations in indoor environments (e.g. urban areas, sewers), constricted spaces (e.g. trenches), in electronic warfare congested environments, and extreme temperatures and environmental conditions.

**Expected impacts**

The outcome of the effort should contribute to:

- providing harmonised solutions that meet future capability needs of EU Member States and EDF associated countries;

- developing new innovative soldier technologies and capabilities in the areas of identifying friend or foe and managing signature.

### 2.5.6. EDF-2026-DA-AIR-SPS: Self-protection system

- **Indicative budget:** EUR 24 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

The main objective of the next generation self-protection systems (SPS) is to increase the survivability of fixed-wing and rotary-wing, combat or non-combat aircraft in hostile environments.

SPS is to face a wide, heterogeneous and evolving spectrum of hostile and directly threatening systems of surveillance. It should prioritise risks in the operational area and select the proper reaction mode through a network of distributed capabilities exploiting sensor and actuators nodes of various types of inter/intra platforms. It should be reconfigurable and scalable depending on the mission and the platform targeted. It should also be able to self-adapt while operating, based on scenario monitoring and mission assets availability. Due to the increasingly rapidly developing technology and AI (Artificial Intelligence), it is necessary to develop modern solutions to increase the survivability and in particular the self-protection of aircrafts and helicopters on the future battlefield.

***Specific objective***

The ongoing conflict in Ukraine calls for not neglecting any high-intensity scenario and questioning the current self-protection capabilities of fixed-wing and rotary-wing, combat and non-combat platforms. Surface-to-air and air-to-air missiles with a wide range of guiding systems (Radio Frequency, optronics) and a wide range of associated surveillance/warning systems are to be considered, as well as hostile fires and fast developing unmanned aerial vehicles (UAV).

In the EDIDP and EDF framework, a cooperative and innovative self-protection system for rotary and fixed wing has been designed and the key innovative elements have been subject to technical risk reduction activities, typically through ground demonstrator and/or flight prototyped and testing. The purpose of this call topic is to complement the development of the

system with its sensors/effectors by performing further prototype tests in order to qualify the full system on the ground.

In addition, this call topic covers the identification of the relevant certification basis which may be used and covers also all necessary studies prior to certification of the system on any fixed-wing and rotary-wing type platform.

**Scope and types of activities**

***Scope***

The proposal must address the complementary design and development activities prior to certification of a self-protection system for rotary-wing and fixed-wing aircraft to operate in a congested and contested environment. Additionally, it must address qualification mainly at sub-system level.

Furthermore, the proposal must analyse and set out the technical specifications that meet the needs and requirements of the supporting Member States and EDF associated countries, especially end-users, and that comply with current regulations and applicable standards.

The proposal must address capability protection of classified information, such as databases used in that kind of systems. The distribution, creation, editing, erasing, updating, uploading and downloading of all data that is part of the SPS must be detailed during maintain and operation.

Moreover, the proposal should address a broad spectrum of recognising, distinguishing and effectively counteracting any specific threat around the aircraft. It is known that the current battlefield is permeated with various types of electromagnetic signals, UAVs or missiles, so it is important to indicate the greatest threat to the platform by the SPS and the use of an appropriate and effective method to counter it. It is important that the SPS has a wide range of active or passive defence systems that can be used at any time.

In addition, the proposal should address the ability to easily manage data by interacting with on-board radar, transmitting encrypted communication standards between other aircrafts and other own or allied forces, and collecting new threat data to build databases by users.

The proposal may address the possibility of SPS to work with various types of sensors, cameras and a swarm of drones, and the implementation of AI would allow for fast analysis of threats, response to them, even autonomously without the direct participation of the crew. These capabilities would make it possible to identify the threat more quickly and increase the survivability of aircraft and helicopters.

The proposal may cover capabilities to increase efficiency during the overall lifetime of the SPS.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|

| | **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(optional) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[96] of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |
| (g) | **Qualification**[97] of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |
| (h) | **Certification**[98] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes<br>(optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- <u>Design:</u>

  - The system design must take into account the following areas of evolution/improvements with respect to the design studies already conducted:

    - Scalability and installation design of the SPS for solution integrated on platform, minimising the impact of retrofit on legacy platforms and optimising the integration on future platforms.

    - Capability of extensive data gathering during the mission, to be performed in background with the main scope of post analysis and AI algorithms training. This can be done exploiting the cooperation with unmanned assets which could be part of the SPS. Situations of warning, once recorded and

[96] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[97] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[98] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

recovered, can contribute to system behaviour update. This must be kept automatic and transparent for the crew.

- Zeroing of all the sensitive data in case of asset loss. This must be taken into account in particular for the unmanned component which could be more exposed to be lost in operation.

- Technical maturation of lower technological readiness level (TRL) sensors and effectors (e.g. active threat warner, jamming), leading to an overall increase, both at subsystem and at a system level of the related TRL.

- System prototyping:

  - Building prototyped system on ground with its sensors and effectors.

  - Preparation of a functioning SPS for qualification.

  - The assessment of validation of the full integrated system must take place:

    - in an emulated environment through Digital Twin methodology identifying the most effective algorithms to be fully compliant with the functional and performance requirements with low power consumption, reduced weight and overall lifecycle cost;

    - employing the hardware in the loop in an incremental way;

    - validation of the system on a dedicated rig.

- Testing:

  - A series of tests of the full system must be performed on a proper rig and/or in flight in order to demonstrate that it meets the functional requirements.

- Qualification:

  - The system must perform complete qualification on the ground in accordance with the consolidated requirements. The qualification must encompass:

    - Functional qualification, to be performed at subsystem level (e.g. single sensor/effector), where possible, and at system level (complete self-protection suite) to assess the current performance of the SPS, where necessary;

    - Environmental qualification (pressure, temperature, vibration etc.), to be performed at subsystem level;

    - Electromagnetic interference (EMI) and electromagnetic compatibility (EMC) qualification, to be performed at subsystem level first and at fully integrated self-protection suite level after.

- The functional qualification activity, even if mostly performed in factory and/or by means of a proper rig, may include some key requirements to be demonstrated in flight.

The proposals may also cover the following tasks:

- Certification:

  - The sub-systems may hold military technical standard order authorisation (MTSOA) based on a common military technical standard order (MTSO) or similar agreed by cooperating ministries of defence in accordance with EMAR 21[99] or equivalent.

- Increasing efficiency:

  - Possible directions of development, including opportunities for increasing efficiency and retrofitting across the life cycle of the SPS.

The proposals must demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topics: (i) EDIDP-ACC-SPS-2020 related to *Self-protection systems for fixed and rotary wing aircraft*; and (ii) EDF-2023-DA-AIR-SPS related to *Self-protection systems*.

**Functional requirements**

The system developed should:

- be designed to equip both fixed-wing and rotary-wing aircraft with appropriate modularity to cope with specific threat list/platform signature/platform kinematics/platform installation and integration constraints;
- hold MTSO approval or similar at sub-system level;
- be based on an open architecture and international standards widely used in this domain (hardware interfaces, software interfaces, protocols and communication links);
- protect its own sensitive data and software (e.g. from cyberattacks) when in operation and prevent any data leak under any circumstances;
- embed compatibility management features to be qualified to operate with other emitters and receivers on board the platform and/or other aircraft involved in a mission;
- provide for, but not limited to, an automatic mode providing suggested countermeasures, including coordinated countermeasures (e.g. manoeuvres, expendables and jamming) that can be implemented without a man in the loop if automatic mode is selected;
- have ways to remove any doubt concerning the source of the alleged hostile system, before alerting the crew;

[99] Certification of military aircraft and related products, parts and appliances, and design and production organisations.

- be compatible with new-generation platform systems architecture (e.g. next generation rotorcraft, future mid-size tactical cargo) and legacy platforms.

Regarding protection against direct threats, the system developed should:

- detect that the aircraft or other aircraft they are flying with, are being engaged by direct threats and provide warning to the mission and/or avionics systems of the aircraft;
- protect the aircraft from direct threats providing identification of such direct threats and specifying the appropriate coordinate countermeasures;
- provide features to counter the direct threats, specifying the most appropriate combination of countermeasures (e.g. expendables, jamming, directed energy weapon and manoeuvres);
- detect incoming threats, perform classification and suggest optimal combination of reactions in terms of countermeasures and escape manoeuvres considering assets available on the single platform and considering the availability of collaborative platforms;
- gather intelligence regarding the direct threat characteristics and fire posts locations and be able to detect changes in those characteristics and locations;
- classify threats, to support sensor system behaviour in complex, congested, cluttered, contested, connected and constrained operational electromagnetic environment.

Regarding indirect threat detection and protection, the system developed should:

- gather and record indications that the aircraft or other aircraft they are flying with, are detected by any hostile surveillance systems and provide warning through the mission and/or avionics systems of the aircraft;
- detect that the aircraft or other aircraft of the group are being tracked by any hostile systems and provide warning to the mission and/or avionics systems of the aircraft;
- provide features to disturb detection and tracking by both passive and active surveillance systems of the enemy;
- suggest, considering the availability of collaborative platforms, the optimal combination of disturbances to interrupt the acquisition chain of enemy sensors;
- gather intelligence regarding indirect threats characteristics and locations and be able to detect differences with expected electronic order of battle (EOB) or changes with reference to previously recorded EOB;
- perform collaborative self-protection with the ability to share collected information with cooperative platforms in networked operations, exchanging electronic support measures (ESM) and electronic countermeasures (ECM);
- share data with other platforms to achieve a faster and more accurate operational situational awareness than with a single platform, taking into account the possible level of classification of such data;

- classify indirect threats during the development of the system (and during the operational phase), to support sensor system behaviour in complex environment;
- be designed to obtain a reduced Size, Weight and Power in order to be installed on fixed-wing and rotary-wing aircrafts;
- adopt, or be compliant, with standards widely used in such fields and or define new needed standard;
- be easy configurable and self-reprogrammable according to the mission and cognitive behaviour;
- be able to exchange information and receive commands from an external centre (e.g. a collaborative naval or aerial platform);
- be designed to be customised and configured according to the specific requirements of each Nation, with particular attention to some algorithms;
- be able to provide on-board processing, to guarantee the completion of the mission without significant loss of information;
- provide for a ground station for the purposes of monitoring/controlling and in order to store, develop and generate information from the data collected during a mission;
- enable data fusion between effectors and sensors from different technologies.

**Expected impact**

The outcome of the effort should contribute to:

- increasing the effectiveness and efficiency of European armed forces;
- preparing for the 2035-2040 horizon and beyond, building European capabilities for new EU/NATO rotary-wing and fixed-wing aircraft, fully compatible with future multi-domain combat collaborative systems;
- upgrading existing platforms as appropriate;
- support the competitiveness and excellence of the European industry in the vertical lift domain and the autonomy of EU in the field of military helicopters;
- establishing and improve a European supply chain that is fully independent of any third country constraints, especially with reference to key technological component (e.g. infrared (IR) detectors, wideband analog-to-digital converter (ADC), lasers, etc.).

### 2.5.7. EDF-2026-DA-AIR-STFS: Smart technologies for next generation fighter systems

- **Indicative budget:** EUR 25 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

## Objectives

### *General objective*

New generation manned and unmanned military aerial platforms require enhanced integrated modular avionics (IMA) able to support new systems architectures and integrate new avionics functions, while providing higher performances, safety and cyber resilience.

Against this background, new solutions regarding, for instance, hardware (HW), software (SW), including operating systems, middleware, system services, and framework (e.g. support programs, compilers, libraries, toolsets), need to be defined to comply with new requirements for processing, network, interfaces, storage, or power supply.

Military aerial platforms, from fighters to helicopters and other specific mission platforms, could benefit from the application of civilian technology breakthroughs and standards. However, they require dedicated solutions to comply with specific military requirements (e.g. SWaP[100], multi-level security data flow and real time reactive response).

In particular, modular architectures for avionics are widely recognised as key to reducing development cycles and costs and to increasing interoperability in multi-industrial collaborative development, compared to classical federated systems. Therefore, the concept of core integrated modular avionics has been already defined in the civil aviation market.

However, the next generation military aerial platforms, both manned and unmanned, will operate through a system of systems approach which implies much higher data sharing and processing needs than in the civilian market, as well as new specific requirements in terms of development cycle (e.g. the need for faster adaptability of mission solutions applying DevSecOps[101] type of development, but also involvement of more industrial entities) and of defence-related missions.

The general objective is then to exploit the knowledge and solutions developed for civilian and military purposes in the application of such technologies on various military platforms as required for defence.

### *Specific objective*

The aim of the project is to increase the maturity of a system architecture in the context of a Next Generation Military Integrated Modular Avionics (NG-MIMA) and to elevate the technology readiness level to TRL 6.

For that purpose, particular prototyping and integration activities will be carried out to show proper internal integration of the system architecture in different domains (safety critical, mission critical, best effort, networking, interoperability) meeting expected behaviours when providing a unique prototype covering all the domains. Demonstrating and evaluating a complete solution agnostic of the type of platforms featuring the key requirements and key performance indicators (KPIs) of the system architecture will be one of the main challenges of the project.

Specific use cases will be identified and used as the trigger for the creation and test of a full integrated demonstrator in a relevant environment, integrating safety critical, mission critical, best effort, networking, interoperability and new developments. Specific platform needs may

[100] Size, Weight and Power.
[101] Development, security and operations concept, which integrates security aspects into every phase of the development life cycle.

not be covered but it must be proved that the system architecture is instantiable and meets the high-level needs.

This full integrated demonstrator should be based on an updated, mature, and validated reference architecture, ready to face the digital hungry battlefields envisaged in the future where military platforms will have to operate.

In addition, it is expected that the proposed design limits critical dependencies on non-European technologies (processes, components, software) and contributes to strengthening the European security of supply.

**Scope and types of activities**

***Scope***

The proposals must address the activities set out below:

- study, design and develop a reference avionics architecture derived from previous activities on IMA architectures;
- integration and prototyping activities needed to evaluate the architecture regarding performance, safety, security, and interoperability requirements;
- demonstrate, via a set of KPIs representative of each type of aerial platforms, that the proposed architecture can be used in different use cases, manned or unmanned aerial systems.
- integrate at least one prototype which will be representative of an aerial system.

Moreover, the proposals should address the activities set out below:

- show how the proposed architecture can contribute to the scalability of a system of systems;
- show how the development, integration and validation cycles of such architecture can be reduced with respect to more traditional avionics' architectures.

In addition, the proposals may address the activities set out below:

- testing on a demonstrator in a relevant military environment;
- propose different designs and prototypes representing different types of aerial systems.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (mandatory) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[102] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (optional) |
| (g) | **Qualification**[103] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (h) | **Certification**[104] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Integrating knowledge:
  - reviewing, completing and correcting the needs in the light of other projects results or studies related to avionics architectures, considering, for instance, new major needs identified by major OEM needs;
  - identifying the critical technologies involved in the system that merit specific actions to reduce the strategic dependences (technologies coming from non-European countries) and increase the security of supply;
  - identifying relevant proofs-of-concept (PoC) of an avionics system or subsystem that can be reused in the project and provide a description of these PoC.
- Studies:
  - supporting technology maturation, providing continuity to studies already carried out, considering the remaining technological gaps and potential new disruptive topics (e.g. application of system architecture and technologies under a system-of-

[102] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[103] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[104] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

system context). The use of European and ITAR[105]-free technologies must be highly prioritised, leveraging on sovereign European technological components, systems and know-how;

- performance analysis of the full integrated demonstrator.
- providing a first candidate for a standard for next generation military IMA by working towards the definition of a common standard taking into account:
    - HW computing resources (including graphical computing);
    - networks connecting these HW resources;
    - packaging;
    - software layers (covering hypervisors, operating systems, and different middleware layers);
    - system design;
    - all associated tools.

- Design:
    - designing a fully integrated demonstrator for an identified aerial system based on the architecture resulting from the integrating knowledge and studies phases above. This demonstrator is to be defined in terms of performance and interface according to the KPIs set out previously;
    - list all the technologies of the proposed design and assess their contribution to the final dependence on non-European technologies. A specific analysis is to be made at each level of integration in the systems: (i) on hardware components (e.g. processors, converters); (ii) interconnection technologies (e.g. connectors, cables, printed circuit boards); (iii) processes; (iv) materials (as those used for the package envelope of the equipment involved in the architecture); (v) network protocols; (vi) software layers (from middleware to operating systems); (vii) associated tools; (viii) programming frameworks; and (ix) test equipment.
    - for the proposed design, identifying the technologies that would require additional development.
- System prototyping:
    - building a demonstrator prototype based on the proposed design from the previous phase. The resulting demonstrator will be evaluated with respect to the expected requirements using the KPIs set out in the previous phases.
    - The avionics architecture demonstrator proposed may integrate sub-systems of a lower maturity, not representative of the final system. This is deemed acceptable if

[105] US International Traffic in Arms Regulations.

most of the proposed demonstrator consists of more mature technologies fit for the demonstration purpose.

In addition, the proposals should cover the tasks set out below:

- Studies:
  - demonstrating by analysing how the proposed architecture can contribute to the scalability of a system of systems;
  - showing how the proposed architecture can contribute to reduce the development, integration and validation cycles of an aerial system.

The proposals may also cover the tasks set out below:

- Studies:
  - studying the compatibility of the proposed architecture with legacy systems in terms of interoperability.
- Design:
  - designing of more than one demonstrator, applicable to more than one type of aerial system.
- System prototyping:
  - building more than one prototype of aerial systems.
- Testing:
  - testing sub-systems prototypes or a prototype of a given aerial system in a representative military environment.

The proposals must demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topic EDF-2023-DA-AIR-STFS related to *Smart technologies for next generation fighter systems*.

**Functional requirement**

The proposed product and technologies should meet the functional requirements set out below:

1) Multi-functional avionics should:
   - Be based on a scalable reference architecture to pave the way for standardisation of interfaces and stacking avionics systems.
   - Include high-speed and performing data buses and protocols, including packaging standards.
   - Provide the capability regarding high-speed data sharing and the interoperability of assets between EU and NATO air defence arsenals.

- Include a real-time operating system for on-board safety and mission systems (both critical and non-critical in terms of safety), with multi-level capabilities.
- Include HW and SW complying with multi-safety and multi-mission (both critical and non-critical).
- Be purposely built to comply with security classification with multi-level security segmentation.
- Allow for integration into supportive HW that would facilitate certification by military authorities in the future (e.g. machine learning, in particular deep learning algorithms).
- Provide for real-time computation and sharing capability orchestration, including process, tools and framework to support the development in a multi-industrial workshare and taking into account DevSecOps type of upgrade.
- Provide a high integrity deterministic avionic network with the necessary redundancy to connect various computing nodes and consider solutions when different platforms are engaged.
- Provide a sufficient level of compatibility to operate a variety of heterogeneous assets, manned and unmanned, during air operations.

2) The embedded data processing and networking capacity should:

- Integrate HW with high data processing, notably through Artificial Intelligence (AI) applications.
- Provide AI-based functional standard interfaces and system monitoring.

3) The system should include a graphics data capability with:

- State-of-the-art high-performance and ad hoc HW and SW infrastructure, that allows processing, interfaces and visualisation of tactical data in real time.

**Expected impact**

The outcome of the effort should contribute to:

- significantly reducing SWaP and costs of the computer packages in aerial platforms;
- creating a European ecosystem for next generation integrated modular avionics for defence platforms, hence fostering the development of European technological sovereignty in this area;
- enhancing the ability to trigger modern and faster innovation towards a European air cloud, currently bottlenecked by the absence of a common NG-MIMA concept;
- improving platform flexibility and modularity with a common open architecture, fostering the use and integration of new disruptive technologies;
- reducing time and costs for iterations of services that require underlying new integrated modular avionics, such as multi-domain mission systems, enhanced collaborative situational awareness and real-time tactical information sharing;

- strengthening Europe's leadership in integrated modular avionics for defence platforms;
- increasing competitiveness and benefit to final buyers and OEMs though the possibility of having concurrent solutions based on the same standard;
- facilitating the development and deployment of multi-domain mission systems, all while achieving a higher TRL and moving closer to operational deployment;
- consolidating the creation of a European ecosystem of integrated modular avionics for military platforms, driving modern and faster innovation in the European air cloud segment.

### 2.5.8. EDF-2026-DA-GROUND-MRL: Multiple rocket launcher system

- **Indicative budget:** EUR 25 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** Several actions may be funded for this topic.

**Objectives**

***General objective***

Due to the changing overall geopolitical context, Member States and EDF associated countries (MS/AC) land forces need to improve their very-long-range indirect fire support capabilities (rocket artillery), as many have been relying on non-European systems that are already approaching the end of their operational life. Several MS/AC are in the process of procuring such capabilities, but available rocket artillery solutions are dominated by non-European suppliers.

Against this background, there is the need to develop a European multiple rocket launcher (MRL) system solutions capable of achieving effects to counter the latest threats, by increasing the range and precision of long-range indirect fire support, maximising interoperability, and optimising the cost-effectiveness of operations in a high-intensity and GNSS[106]-contested or GNSS-denied battle scenario. It is desirable such new solutions being interoperable with components of legacy systems of other origins.

***Specific objective***

The specific objective of this call topic is to develop an independent European solution for a future MRL system adapted to the new threats – such as advanced counter battery capabilities, first person view drones or loitering ammunition – and with increased very long-range compared to current systems, while maintaining interoperability principles.

The targeted European solutions must be cost-driven based on a symmetric high intensity battle assumption. They must address challenges regarding precision, range, capability of fire power and operation in stressful environment – such as GNSS-contested/denied environment battlefield. They must also optimise production and operational costs. The scope of this call topic is limited to the MRL system itself and does not include the development of possible carrier platforms and ammunitions.

[106] Global navigation satellite system.

## Scope and types of activities

### *Scope*

Proposals must address the study and design of an enhanced, fully European MRL system to provide an operative advantage to MS/AC artillery forces. The targeted duration of the action under this call topic is 48 months and proposals must address the MRL system in a modular and scalable approach.

Moreover, proposals should address the study of combinations of various payloads and ammunitions to comply with the desired capabilities against different target sets.

In addition, proposals may address the study and design activities on different types of weapon data link processors (WDLP), communication and information exchange protocols that allow flawless communication between the MRL system and the loaded type of ammunition before and after launching (in flight).

However, proposals should not include studies or design activities related to specific platforms intended as carriers for the MRL system, nor the development of ammunition for the MRL system.

### *Types of activities*

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[107] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes<br>(optional) |

[107] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

| | Types of activities<br>(Art 10(3) of the EDF Regulation) | Eligible? |
|---|---|---|
| (g) | **Qualification**[108] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (h) | **Certification**[109] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes<br>(optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:

  - of current worldwide rocket artillery systems in service, focusing on launcher architecture, fire control, communication, azimuth and elevation and support systems;

  - of logistics and resupply concepts, including modular reloading, container-based systems and autonomous reloading;

  - of battlefield performance of rocket artillery systems, especially taking into consideration the lessons learned from the ongoing conflict in Ukraine;

  - on threat assessment for the MRL system, including ISR[110] (e.g. UxVs[111], FPVD[112], loitering ammunition and satellites), counter-battery fire, electronic warfare and CBRN[113] threats;

  - of communication protocols and data exchange standards between the MRL system and the ammunition, both loaded and in flight;

  - of human-machine interfaces, with the focus on reduced-crew operations, remote control capabilities and automation;

  - of technologies that provide operational advantage for MRL systems in a highly stressful and GNSS-contested/denied environment;

  - of rocket/missile technologies relevant for the desired MRL system taking into consideration ammunition characteristics in terms of range, size, weight and guidance methods;

  - of requirements to the launching system that may be imposed by the different types and calibres of ammunition to be launched from the MRL system;

[108] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[109] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.
[110] Intelligence, surveillance and reconnaissance.
[111] Unmanned vehicle.
[112] First person view drone.
[113] Chemical, Biological, Radiological and Nuclear.

- of camouflage and self-protection technologies that improve MRL system survival capabilities on modern battlefields;
- of technologies and production techniques that will reduce production and maintenance costs;
- of hard and software interfaces, including mounting of the MRL system and various carrier platforms;
- of weapon stabilisation technologies.

- Design:
  - of a modular MRL system architecture, focusing on the launcher structure and architecture, mounting interface and control systems, able to be fitted onto different carrier platforms, including naval vessels, that will be able to integrate and launch legacy/current ammunition and new ammunition developed e.g. in the context of European defence R&D[114] programmes;
  - of resupply systems, including fast and modular reloading, container-based systems and autonomous reloading;
  - of survivability features at system level, such as shoot-and-scoot operational logic, emissions control, and decoy system integration, excluding the carrier platform;
  - a MRL system command and control (C2) system architecture that will provide the foundations for further integrations with relevant national fire control systems and customisation by the different MS/AC always seeking to improve interoperability between MS/AC and with other NATO countries;
  - a training and simulation system architecture, including software-based trainers and emulated fire control environments;
  - a WDLP, based on a standardised protocol of communications dedicated to weaponry systems such as, rockets/missiles, loitering ammunition systems and other (new) forms of ammunition.

In addition, the proposals should cover the following tasks:

- Studies:
  - of possible countermeasures for the MRL system against ISR (including satellites), loitering munitions, UxVs, small UAS[115] (like FPVD) and electronic warfare and research on ground-breaking ideas to foster the survivability and operability of the MRL system in stressful environments;
  - on cognitive algorithms complemented with artificial intelligence (AI) models to improve the situational awareness of the MRL system.

[114] Research and development.
[115] Unmanned Aerial System

In addition, the proposals may cover the following tasks:

- **System prototyping:**
  - of a modular MRL system able to be fitted onto different carrier platforms, including naval vessels, that will be able to integrate and launch legacy/current ammunition and new ammunition.
- Testing:
  - definition of testing protocols for MRL system architecture, including fire control responsiveness and automation effectiveness.

The proposals must demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in the call topics: (i) EDIDP-NGPSC-LRIF-2020 related to *a platform for long range indirect fire support capabilities*; (ii) EDF-2023-DA-GROUND-IFS related to *long-range indirect fire support capabilities for precision and high efficiency strikes*.

**Functional requirements**

The proposed solutions and technologies should meet the functional requirements set out below:

- Deliver relevant effects through a family of unguided and guided rockets/missiles as well as training ammunition (currently in use or newly developed including, ammunition with cargo capability and loitering munitions).
- Perform timely close (at least 30 km) long (at least 80 km) and very long-range (at least 300 km and up to desirable 499 km), indirect fire support at high-value targets and for counter-fire purposes.
- Increase the level of automation and situation awareness to reduce the time of operation, both for fire missions and for resupply.
- Increase system survivability, including the assessment of innovative technologies to improve safety of the MRL system against potential threats, such as improvised explosive devises (IEDs), loitering munitions, UxVs and small UAS like FPVD.
- Having an into-action time (from halt to first launch) and out-of-action time (from last launch to move) of less than 1 minute, even by launching all loaded rockets/missiles (shoot-and-scoot capability).
- Having a reloading time of less than 4 minutes, by adopting fast reloading methods.
- Accurate and robust positioning, navigation and timing (PNT) performances under GNSS-contested/denied environment, therefore the use of alternative guidance methods.
- Scalable and modular approach allowing for easy scalability of the system as well as modular exchange and adaptation to different missions, operational needs and to a variety of types of platforms.

- If the MRL system is mounted on a land platform, the whole system must be capable of being airlifted for operational and strategical deployment.
- C2 system to maximise the interoperability of the MRL system with European and NATO indirect fire capabilities and allow the secure, robust and agile network of communications. The C2 system will be based on a modular architecture that could easily adapt new ammunition types, be integrated with MS/ACs fire control systems for indirect fire and could be customised by the MS/AC to include needs.

**Expected impact**

The outcome of the effort should contribute to:

- gaining EU strategic autonomy in the domain of ground-based very long-range indirect fire support capabilities;
- increasing EU technological and industrial sovereignty reducing dependence on non-European countries.
- maximising interoperability between MS/AC and allies.

### 2.5.9. EDF-2026-DA-GROUND-MBT: Future main battle tank platforms systems

- **Indicative budget:** EUR 125 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic.

**Objectives**

***General objective***

Main battle tanks (MBTs), with their unique combination of protection, mobility and firepower, remain a key element of land military manoeuvre, particularly in the context of conventional warfare. Existing MBT fleets in EU Member States and EDF Associated Countries are ageing, and new MBT technologies need to be developed and their operational effectiveness in all future scenarios thoroughly tested to maintain the current technological edge. Against this background, it is highly necessary to upgrade current main battle tank technologies and develop future technologies capable of outstanding operational effectiveness and mission success in all possible future scenarios.

***Specific objective***

This topic aims to follow up and complement previous activities for the development of future MBT systems, which will need to be based on enhanced operational capabilities in all kinds of environments. It aims to address higher multi-spectrum protection and survivability, advanced all-terrain mobility, superior firepower, long-range threat detection and advanced command and control system, the ability to operate with a reduced crew and, in the future, unmanned, improved logistical sustainability and affordability of manufacturing costs. This would be key to the ability to deploy large numbers of platforms in a short time, if required.

**Scope and types of activities**

***Scope***

The proposal must address design and development of one MBT demonstrator, targeting at least TRL[116] 6 at system level. It must cover the upgrade of current main battle tank technologies and those most recently put into use, including enabling and green technologies, leading to a system level, capable of outstanding operational effectiveness and mission success in all possible future scenarios. Furthermore, the proposals must consider aspects, such as mobility, deployability, autonomy, firepower, protection, C4I[117] interface, cybersecurity and supportability.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[118] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (g) | **Qualification**[119] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (h) | **Certification**[120] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:

[116] Technology Readiness Level
[117] Command, Control, Communications, Computers and Intelligence
[118] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[119] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[120] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

  - reviewing and adapting (if required) the preliminary design review (PDR);
  - carrying out a study on industrialisation and production aspects of the MBT system (e.g. location and set-up, sourcing of critical components and sub systems, battle damage repair catalogue), possibly in multiple sites of different Member States and EDF associated countries, to ensure redundancy in production;
  - drawing up a plan for the qualification and certification of the MBT System, taking into consideration relevant standards and recommend required capabilities and resources of the MS, the EDF associated country and the industry.
- Design:
  - carrying out the critical design review (CDR).
- System prototyping:
  - building a full MBT demonstrator, at least TRL 6 at system level, to demonstrate performance in an operational environment complying with the relevant safety and security standards;
  - integrating at least a modular government furnished subsystem for a C4I system/BMS[121] into the full MBT demonstrator.
- Testing:
  - testing the demonstrator against the functional requirements;
  - testing subsystems in the relevant operational environment (e.g. protection systems).
- Qualification:
  - preparing a qualification procedure against the operational requirements;
  - carrying out an operational demonstration and assist Member States and EDF associated countries for an operation evaluation based on the qualification procedure;
  - performing the final qualification review (FQR) for a demonstrator, at least TRL 6 at system level.

The proposals must demonstrate how they can harness synergies and complementarities with the planned, ongoing, or completed activities as described in the call topic EDF-2023-DA-GROUND-MBT related to *Main battle tank platform systems*.

**Functional requirements**

The proposed MBT should meet the minimum functional requirements set out below:

[121] Battlefield management system.

- have an optimised trade-off between mobility, firepower and protection, with main focus on firepower;
- have redundancy and coherence in mission critical systems. It should be able to operate in degraded modes;
- be equipped with an autoloader;
- be able to carry ammunition for the main armament, on board to handle a minimum of 20 engagements;
- provide firepower to be able to perforate the latest MBT even at their best protected areas at extended range to ensure high first hit and catastrophic kill capability while being static or on the move (priority);
- provide better barrel lifetime than current systems and the main armament must demonstrate significant growth potential;
- support smart/programmable ammunition and be able to use different types of ammunitions and their training variants;
- have a secondary armament to engage medium and light armoured and/or soft targets;
- involve automatic threat detection, identification and tracking, including the ability to handle multiple threats simultaneously, and target distribution across the internal vehicle network.;
- be compliant with the most commonly applicable standards (e.g. STANAG 4754 NGVA[122]);
- include a decision-making system to integrate, correlate and fuse available data from the internal vehicle network (e.g. STANAG 4754 NGVA backbone) to present a completed firing resolution (ready to use) for the crew, reducing their workload;
- provide protection against the following direct threats from:
    - Chemical energy: mines and improvised explosive device (IED), rocket propelled grenades (RPG) (including those with functionality like RPG-30[123]), 'High explosive anti-tank' (HEAT) munitions, 'Anti-tank guided missile' (ATGM) (including 3rd generation ATGM with high angle of attack), loitering ammunition (including airborne IED, first person view, armed UAVs[124]);
    - Kinetic energy: at least 125mm 'Armour piercing fin stabilised discharging sabot' (APFSDS).
- provide protection against electronic warfare (EW) and directed-energy weapons (DEW);
- provide protection against cyber-attacks (not only during mission execution but all along the life cycle);

[122] NATO Generic Vehicle Architecture.
[123] Russian hand-held disposable anti-tank grenade launcher.
[124] Unmanned Aerial vehicles.

- provide protection of the crew against CBRN[125] threats;
- feature an active protection system (APS) capable of defeating multiple threats before requiring reloading of countermeasures;
- add-on passive or reactive protection (besides the tank structure) should as far as possible be bolt on solutions;
- include a system to provide means to rapidly obscure its position to break enemy line-of-sight;
- provide counter measures to withstand or defeat UAS[126] and limited swarm attacks;
- feature own drone observation and recce[127] system (BLOS[128] Recce capability);
- low detectability and electromagnetic signature (e.g. ultraviolet (UV), visible, infrared (IR) from short-wavelength infrared (SWIR) to long-wavelength infrared (LWIR), radar, laser, and acoustic). Detection and signature recognition by multi and hyperspectral sensors are also to be considered;
- feature a 'silent' operation mode with minimum electromagnetic emissions;
- capable of detecting chemical, radiological and nuclear attacks directly on the exterior of the vehicle;
- feature a maximum speed of at least 60 km/h on paved roads, at least 40 km/h on smooth and rugged terrain (apart of paved roads) and an operational range of not less than 600 km averaged on different types of terrains. Additional fuel tanks to achieve the operational range are allowed. The operation range of the MBT should be not less than 350 km in combat (combined road / terrain).
- be able to move from standing with engine in idle to 400 metres in less than 35 seconds;
- feature a wading depth without preparation > 1.20 metres, deep wading depth with crew on board > 2.25 metres (depending on the height), wading depth with snorkel > 5.00 metres, trench crossing capability > 3.00 metres and a climbing capability > 1.10 metres;
- feature a high operational availability to be capable to perform the assigned mission in at least 85% of calls to duty;
- feature sensors to provide real-time and unified information and data presentation to the crew members. This information should be provided also by and to external networks with low latency time. External data should be injected by common interface, with very low latency (time < 100 milliseconds) and continuous data presentation;
- feature vehicle status monitoring systems;

[125] Chemical, Biological, Radiological, and Nuclear.
[126] Unmanned Aerial Systems.
[127] Reconnaissance.
[128] Beyond-Line-of-Sight.

- provide external communications possibility to communicate with nearby ground forces (e.g. using an external phone);
- include an advanced positioning, navigation and timing (PNT) system to ensure trusted PNT for the platform even in challenging GNSS contested and denied environments;
- be capable of reducing fossil fuel consumption and take into account other aspects of green technologies (e.g. total life $CO^2$ footprint, use of recycled or other materials);
- be compliant with the most commonly applicable standards as regards fuel (e.g. STANAG 4362[129]);
- meet emissions standards (e.g. EURO3[130]) for peacetime operation and be able to bypass any installed road-emissions systems for wartime operations. Such system failures must not lead to a mission failure;
- operate in silent mode and extended silent watch with low thermal signature;
- store and supply high density and power of electric energy for sensors, effectors and weapons;
- the total combat weight (complete mass of a vehicle, fully equipped and serviced for operation, including the mass of the fuel, lubricants, coolant, vehicle tools and spares, crew, personal equipment, ammunition and further pay load) should not exceed 60.000 kg, with a structure allowing for 15% weight increase;
- the complete vehicle (i.e. hull and turret) must not exceed the dimensions as follows: (i) High: 2.5 metres; (ii) Length without cannon: 8.0 metres; (iii) Width: 3.8 metres. The vehicle ground clearance should not be less than 0.5 metres;
- have a power assisted track tensioning system, to reduce crew burden and increase crew protection;
- the vehicle should meet transportability requirements and the constraints of roads, railways, tunnels and bridges in Member States and EDF associated countries. Air transportability and sea transport should also be considered;
- allow a range between 5% and 10% of mass growth potential without changing the assigned power/weight ratio;
- ensure interoperability with unmanned ground platforms and manned-unmanned teaming (MUM-T) with an adequate level of interoperability (LOI), and interoperability with UAS;
- equipped with technologies for enhanced situational awareness (SA) (e.g. advanced display devices, 'transparent armour' concepts, allowing visualisation of the environment around the vehicle, automatic surveillance, detection, reconnaissance, and identification);
- include advanced 360° SA and decision-making systems to integrate, correlate and fuse video and data from the available sensors in the platform to provide an enhanced

[129] Fuels for Future Ground Equipments.
[130] European emissions standard for vehicles established by the European Union in 2000.

SA augmented reality picture of the environment of the vehicle and support the decision-making process through multimodal human-machine interfaces combining textual, vocal, acoustic, haptics, 2D and/or 3D visual information, and augmented / virtual reality devices. The system data and image processing include search and tracking, and object recognition;

- include decision-making assistance with advanced crew information presentation capabilities including smart synthesis, prioritisation, and filtering, to keep the most relevant items, especially in the context of reduced crews;
- crew environment and support architectures should be adaptive, open and modular to enable the introduction of innovative technologies as soon as they become mature;
- be able to be operated by a crew of three persons;
- feature static or dynamic on-board simulation for training (embedded);
- incur reduced lifecycle costs compared to current MBT;
- the crew comfort and ergonomics should be considered in the design of the MBT, allowing continuous operation for extended time without loss of effectiveness;
- be able to perform battle damage assessment without compromising survivability;
- the design should avoid unnecessary complexity and explicitly consider cost-driven decisions regarding materials, manufacturing methods, and maintenance, without compromising safety, performance, or durability;
- comply with the most relevant requirements and standards (e.g. from NATO).

**Expected impact**

The outcome of the effort should contribute to:

- the defence and security interests of the EU, its Member States and the EDF associated countries;
- the Capability Development Plan 2023, Capability Development Priority Ground Combat Capabilities;
- the EU level of ambition in terms of strategic autonomy;
- EU resilience and technological sovereignty;
- EU industrial autonomy;
- excellence with the demonstration of a significant advantage over existing products or technologies.

### 2.5.10. EDF-2026-DA-PROTMOB-DMM: Secure digital military mobility system

- **Indicative budget:** EUR 9 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

## Objectives

### *General objective*

Reducing administrative barriers still hinder the rapid movement of armed forces across the borders of EU Member States and EDF associated countries, especially in a constantly deteriorating geopolitical environment. Digitalising the military mobility permit and clearance process, including customs formalities, is therefore crucial for rapid and efficient deployments.

Against this background, this call topic aims to follow up and complement activities in this area to develop a resilient system, including a mobile application, capable of operating in adverse conditions when not all system nodes are available. This requires implementing: (i) advanced encryption methods to secure the urgent exchange of sensitive information; (ii) embedded tracking; and (iii) monitoring capabilities.

### *Specific objective*

This call topic aims to deliver on this commitment. The Commission's action plan on military mobility 2.0[131] specifies that military mobility is vital for European security and defence. The EU Member States and EDF associated countries' forces must respond quickly and with sufficient scale to crises erupting at the EU's external borders and beyond.

Developing a digital system for the fast and secure exchange of information on military mobility was addressed under the EDF in 2021, with the aim to achieve a first major step in digitalising military mobility permits and clearances process.

However, the security situation in Europe has radically deteriorated, marked by Russia's unjustified large-scale military aggression against Ukraine. Moreover, it has been demonstrated how crucial it is to move military aid as quickly and smoothly as possible[132]. Consequently, the prototype developed for 'Movement preparation' in peacetime requires to be further improved.

This call topic therefore aims to achieve the subsequent 'Realisation' phase, which will continue driving innovation to meet Member States' and EDF associated countries' needs in the changed strategic environment, including features that have not been covered yet.

This phase is expected to involve supporting further innovation and developing the essential features of joint information and communication technologies (ICT) in the framework of the secure digital military mobility system (SDMMS) that are needed in times of crisis and war.

## Scope and types of activities

### *Scope*

Proposals must build a SDMMS prototype (TRL[133] 8) that includes additional features such as: (i) post-quantum cryptography; (ii) improved resilience and continuous system operations in times of crisis and war; and (iii) tracking and monitoring functionalities for military movements in departure, transit and destination states.

[131] Action plan on military mobility 2.0.pdf.
[132] White Paper for European Defence – Readiness 2030.
[133] Technology Readiness Level.

Moreover, proposals should address the further digitalisation of military customs formalities (currently handled through Form 302), which is directly aligned with the goal of action plan 2.0 to boost EU-NATO cooperation.

Proposals should address implementing a federated architecture with innovative SDMMS solutions to modernise the interaction between the military and customs authorities across the EU.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[134] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (g) | **Qualification**[135] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (h) | **Certification**[136] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:

[134] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[135] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[136] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

  - studying the possibilities of using the future EU digital identity wallet to unify authentication methods between civilian and military applications;

  - studying the pros and cons of using advanced post-quantum cryptographic encryption in the SDMMS.

- Design:

  - designing a system architecture, modules, components, interfaces, etc. that correspond to outputs from an analysis of system and interoperability requirements. The system design should meet all the requirements of end users. The system design should also take into account comprehensive IT[137] security and interoperability requirements. The system design documents should be drawn up using standard design languages and service descriptions so that people outside the project can read and understand them.

- System prototyping:

  - building a TRL 8 level system to be used by all supporting countries for all functionalities. A complete information system must be developed in line with the established requirements and design. A complete and deployable version of the source code of the system with its accompanying documentation must be provided.

- Testing:

  - testing the results in line with all procedures applicable to data exchange systems software development.

- Qualification:

  - the qualification process must ensure that the prototypes of ICT meet the specific defence requirements in relevant crisis and war scenarios.

- Certification:

  - certifying the system against the Open Web Application Security Project (OWASP) Application Security Verification Standard (ASVS)[138] Level 2. This certification must be checked in all EU Member States and EDF associated countries and follow national military regulations. As communication with the end users progresses, other certification requirements may be identified.

The proposals must demonstrate how they can harness synergies and complementarities with the planned, ongoing, or completed activities described in the call topic EDF-2021-PROTMOB-D-DMM related to *Development of a digital system for the secure and quick exchange of information related to military mobility*.

**Functional requirements**

[137] Information technologies.

[138] This is a software (OWASP ASVS) security standard for web applications mainly used by developers and security testers to ensure a software is built securely – more info: https://owasp.org/www-project-application-security-verification-standard/.

The proposed product and technologies should meet the functional requirements set out below:

- ensure the system can continue full or limited operations in a crisis environment, where some system nodes or communications channels are out of service (i.e. wartime resiliency);
- ensure improved security by implementing post-quantum cryptographic algorithms and technology for message traffic within the system. In a crisis or war, the military may shift most of its communications to a secure environment like NATO Secure Wide Area Network (NSWAN)[139]. Taking into account the nodes in civilian institutions, such as transportation and customs authorities, ministries of foreign affairs, air traffic services, etc., the system needs a solution that enables secure operations to continue in a web-based environment. Therefore, the state-of-the-art encryption should be included;
- include movement tracking and monitoring features to maintain situational awareness throughout all phases of the military movement. Currently, there are no effective measures in place to track military movements, i.e. there is no agreed standards on using GNSS[140] or 4G/5G devices, or a tracking and monitoring information system. Developing standardised and interoperable monitoring and tracking system (possibly mobile) can give the military mobility operators significantly more situational awareness. Such a solution can eliminate a significant amount of reporting and update request, enabling operators to plan and execute cross-border military movements with more speed and agility;
- include a mobile application with essential core features for rapid and dispersed execution. An innovative mobile application can reduce bureaucracy by enabling officers participating in convoy movements to interact with customs officials (and other officials) in real time, eliminating the need for paper and expediting the process;
- include digitalisation of military customs formalities (currently handled via Form 302) to the extent allowed by treaties and agreements. According to end users, Form 302 is one of the main sources of bureaucracy in military movements today. Digitalising these formalities can be an innovative development with a direct positive impact on the field. As part of this digitalisation, the requirements developed by the European Defence Agency (EDA) for a digital military customs system should be taken into account and integrated through close cooperation between the EDA and the consortium;
- be integrable into national military mobility information infrastructure, as several EU Member States have their own national systems for handling military mobility activities. These systems are not standardised and require changes to make them interoperable;
- have an open architecture. Interfaces with national systems must provide for seamless transmission of all applicable data between SDMMS and national systems. The EU

[139] The NATO SECRET Wide Area Network (NSWAN) is employed for Air Command and Control and other areas. Within NSWAN, NATO has several internal data/information providers (like the intelligence community).

[140] Global Navigation Satellite System.

digital identity wallet tools must result in common authentication standards for all EU Member States and EDF associated countries' users.

**Expected impact**

The outcome of the effort should contribute to:

- digitalisation associated with changing policies, legislation, and procedures;
- groundbreaking post-quantum cryptography solutions providing security while maintaining speed and flexibility in message traffic;
- driving innovation in digitalisation by offering digital solutions to military customs formalities;
- supporting the action plan on military mobility 2.0 and new requests to revolutionise military mobility in Europe in times of peace and war.

### 2.5.11. EDF-2026-DA-NAVAL-EMSAS: Enhanced medium-size semi-autonomous surface vessel

- **Indicative budget:** EUR 90 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

The goal is to study, design, prototype, test and qualify an enhanced medium-sized semi-autonomous surface (EMSAS) vessel with multi-mission capabilities.

This call topic complements and follows up previous activities supported by the EDF in the field of medium-size semi-autonomous surface vessels. The aim is to develop a flexible fast-moving platform for the specific conditions of the littoral environment, providing improved coastal defence capabilities based on different mission modules. The platform should also be adaptable for other naval warfare missions.

Medium-sized should be understood as a vessel that can host the designed mission modules.

Semi-autonomy should be understood as an option to remotely operate the platform and the on-board mission module. Autonomy refers to the ability to operate the platform and the mission module in a human-on-the-loop including the self-protection weapons on-board. Given the constraints associated with certain use cases, security and safety considerations, and non-permissive electromagnetic environments, the EMSAS vessel must incorporate on-board solutions for human control. These solutions must be intended for non-permanent use in no threat conditions, with a focus on reduced manning.

Dual-use technologies and items should be prioritised wherever feasible, with an emphasis on integrating commercial applications to reduce overall costs.

***Specific objective***

This call topic specifically aims to review concepts and designs developed and implemented following the EDF call topic EDF-2022-DA-NAVAL-MSAS, while enabling new design, prototyping, testing and qualification activities concerning the platform with integrated ISR[141] and ASuW[142] itself and specific mission modules.

The mission modules to be addressed are:

a. seabed warfare (SBW) (design, prototyping, testing and qualification);

b. anti-submarine warfare (ASW) (design, prototyping, testing and qualification);

c. naval mine warfare (NMW) (initial design);

d. naval mine countermeasures (NMCM) (initial design - optional).

**Scope and types of activities**

***Scope***

This proposal must address:

- the evolution of the medium-size semi-autonomous surface vessel, including autonomy and solutions for the full physical and logical integration of specific mission modules and solutions for the remote monitoring and control of the vessel;
- the detailed design and prototype of an EMSAS vessel (i.e. the platform) with integrated ISR and ASuW capabilities;
- the detailed design and prototype of mission modules related to SBW and ASW;
- testing and qualifying the EMSAS vessel prototype and the mission modules prototypes (i.e. SBW and ASW) as a whole system;
- the initial design until the PDR[143] of a mission module related to NMW.

Moreover, the proposals should address:

- progress on the collaborative use of smaller multi-domain drones in combination with semi-autonomous/autonomous unmanned naval vessels and the introduction of enhanced machine-learning/AI[144] tools for such a collaborative operation;
- conceptual solutions for offshore logistics for semi-autonomous/autonomous unmanned naval vessels;
- the initial design until the PDR of a mission module related to NMCM.

**Types of activities**

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|

[141] Intelligence, surveillance and reconnaissance.
[142] Anti-surface warfare.
[143] Preliminary Design Review.
[144] Artificial Intelligence.

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[145] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (g) | **Qualification**[146] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (h) | **Certification**[147] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:
    - Technical studies, based on what has been already achieved in the field of medium-size semi-autonomous surface vessels, including:
        - autonomy (e.g. including COLREG[148] compliant re-routing algorithms);
        - secure communications, and command and control (C2);
        - cyber security including cyber awareness;
        - information/data management (e.g. on-board and outside storage and handling) including battle damage;
        - robustness and resilience design of mission critical systems;

[145] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[146] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[147] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.
[148] Convention on the International Regulations for Preventing Collisions at Sea, 1972.

- electronic warfare (EW) resilience requirements;
- navigation systems resilience, in line with applicable laws at sea;
- logistic and user package, including emergency procedures;
- emission control for stealth and signature management and evaluation;
- performance metrics for operational evaluation;
- performance metrics for logistic support evaluation based on various logistic concepts;
- a maintenance and supportability plan to achieve a maximum operational availability.

- Technical studies, based on EDF-2026-DA-NAVAL-MSAS results of design, prototyping, testing and qualification activities. On, among others, the following subjects:
  - investigate the consequences of full autonomy (IMO[149] degree 4) on a larger than medium-sized platform, including laws and regulations;
  - investigate the consequences of extended unmanned operations (>30 days) in an ocean environment monitoring and maintenance of the platform;
  - preliminary design of the core platform without manning and accommodation facilities on board, considering transport routes and service space for maintenance.

- Design:
  - Full design of the core platform (i.e. EMSAS) including the autonomy package, the control station (i.e. equipment needed for remote/autonomous monitoring/control of an EMSAS vessel), the secure communication suite (e.g. internal, sea-shore, sea-sea), cyber security and cyber awareness solutions, and the integrated ISR and ASuW capabilities;
  - Full design of the mission modules and their integration related to SBW, and ASW operations;
  - Initial design, until the PDR, of a mission module related to NMW.
- System prototyping:
  - Core platform (i.e., EMSAS), including the autonomy package, the off-board control station, the secure communication suite, cyber security and cyber awareness solutions, and the integrated ISR and ASuW capabilities;
  - Mission modules related to SBW and ASW;

[149] International Maritime Organization.

  - Digital twin functionality for lifecycle support including cost management.

- Testing:

  - Components and system integration of the prototyped elements;

  - Trials in harbour and at sea, in a scenario-based environment, including congested, confined and shallow waters including proposed maintenance levels and procedures.

- Qualification:

  - The whole EMSAS vessel (i.e., the platform) and prototyped mission modules to assess the maturity for operational use.

The proposals may also cover the following tasks:

- Technical studies, based on what has been already achieved in the field of medium-size semi-autonomous surface vessels, including:

  - the collaborative use of smaller multi-domain drones in combination with semi-autonomous/autonomous unmanned naval vessels and the introduction of enhanced machine-learning/AI tools for such a collaborative operation;

  - potential usage of multi-domain UxV[150] as range extenders of EMSAS vessel capabilities including those provided by the mission modules;

  - two-way use of EMSAS modular mission capabilities for energy generation, storage, and redistribution to support other systems or units;

  - conceptual solutions for offshore logistics for semi-autonomous / autonomous unmanned naval vessels;

  - concept and procedures for certification.

- Initial design, until the PDR, of a mission module related to NMCM.

The proposals must demonstrate how they can harness synergies and complementarities with at least the planned, ongoing, or completed activities described in the call topic EDF-2022-DA-NAVAL-MSAS related to *Medium-size semi-autonomous surface vessel*.

When relevant, the proposals may demonstrate how they can harness synergies and complementarities with the planned, ongoing, or completed activities described in the call topics: (i) EDF-2021-NAVAL-R-DSSDA related to *Digital ship and ship digital architecture*; (ii) EDF-2021-NAVAL-R-SSHM related to *Ship Structural Health Monitoring*; (iii) EDF-2022-DA-NAVAL-NCS related to *Naval Collaborative Surveillance*; (iv) EDF-2023-DA-UWW-MCMC related to *Future maritime mine countermeasures capability*; (iv) EDF-2023-DA-UWW-ASW related to *Unmanned anti-submarine and seabed warfare*; (v) EDF-2024-DA-NAVAL-FNP related to *Functional smart system-of-systems under an integral survivability approach for future naval platforms*; (vi) EDF-2024-DA-UWW-AHMS related

[150] Unmanned Systems

to *Autonomous heavy minesweeping system*; (vii) EDF-2025-DA-NAVAL-DSNCC related to *Digital Ship and Naval Combat Cloud*; and (viii) EDF-2025-RA-UWW-SOASW related to *Stand-off anti-submarine warfare engagement*.

For the purpose to seek for interoperability between actions working on seabed protection and warfare, it is encouraged that the proposal addresses possible linkages to the action under the topic EDF-2026-R-UWW-CBSI related to *Layered Critical Seabed Infrastructure Protection*.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

1) General

- The EMSAS vessel should be capable of being operated and controlled from remote operating control station located on or off-shore.
- The EMSAS vessel should be able to operate in semi-autonomous mode, with a preference for full autonomous mode, including the integrated capabilities and the mission modules on-board, enabling 24/7 littoral operations.
- The EMSAS vessel should be able to operate in harsh marine environments with large temperature variations from weather decks to machinery spaces with long mean times between failures in line with the most commonly applicable standards (e.g., STANAG 4194 ANEP-11)[151].
- The EMSAS vessel should be capable of at least 2.000 nautical mile transits at sustained speeds of 18 knots and/or 10 days monitored operations at 10 knots. Although the speed should be reliant on hull form, the selection of propulsion plant and propelling system should consider reaching minimum 20 knots at maximum RPM[152] configuration.
- In addition to conventional combustion engines, the proposals should consider electrical propulsion, air independent propulsion (AIP), other means (e.g. fuel cells) and/or advanced alternate fuels, as well as an optimal management of the integrated propulsion energy system.
- The EMSAS vessel should be deployable, including by means of sealift, and capable of a sustained deployment, operating independently or as integral part of a naval task group.
- The conceptual approach to the logistic and user's package should consider advanced techniques for integrated system diagnostics, enabling prognoses about the vessel's condition. Reduction of cost and time in production and in-service support should be considered by design.
- Appropriate measures through its design or other means should be considered to reduce all facets of visual characteristics, electronic emissions and own signature, including the monitoring and reduction of radar, acoustic, infrared and magnetic signatures.

[151] Standardised wave and wind environments for NATO operational areas.
[152] Revolutions per minute.

- The system should provide automatic situational awareness, threat identification and behavioural analysis utilising AI[153] algorithms. Without prejudice of the human-in-the-loop condition when required, those AI algorithms should improve decision-making in real-time without the intervention of the control station.
- The EMSAS vessel should be designed as a remote-controlled data hub platform comprised of smaller USV[154] and/or UUV[155], and the EMSAS vessel should operate as a rely-station to extend the operating radius.
- The EMSAS vessel should provide launch-and-recovery systems for multi-domain UxV, including smaller surface, sub-surface and aerial drones.
- Terminology and definitions used in the design should follow best practices for Unmanned Maritime Systems.
- The EMSAS vessel should support easy integration of future mission module types and upgrades to address evolving threats and operational requirements as well as obsolescence issues.
- The EMSAS vessel should provide for modular energy generation, storage, and distribution, supporting its own operations and other connected systems.
- A self-defence weapons suite should be considered as part of the core platform. Any specific mission module should incorporate specific weapons as required by the respective mission.
- The ASuW integrated capability should be able to engage surface targets. The EMSAS should be able to become a weapon carrier integrated into a wider C4ISR[156] network. Operating the weapons system should require human intervention for engagement. Engagement of air targets should be limited to self-defence.
- The ISR integrated capability should allow for surveillance tasks such as patrol and search. Sensors on-board should be capable of all weather, day/night operations in extreme climate and littoral operating environment. Any capabilities on board, including specific mission modules, should benefit from the outputs of this ISR integrated capability and complement it as needed.

2) Positioning, Guidance, Navigation and Control

- In addition to the encrypted (military) GNSS[157], an alternative positioning system should be considered, to provide redundancy, and reliable positioning in a GNSS-denied environment.
- Smooth, feasible and optimal trajectory commands to the control system should be generated and updated continuously based on the information from the navigation system, assigned missions, vessel capability and environmental conditions.

[153] Artificial Intelligence.
[154] Unmanned Surface Vehicle.
[155] Unmanned Underwater Vehicle.
[156] Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance.
[157] Global Navigation Satellite Systems.

- Include identification of USVs' current and future states (i.e., position, orientation, speed, acceleration) and their surrounding environment based on USVs' past and current states and environmental information (e.g., winds, currents).
- Provide autonomous safe participation in maritime navigation in accordance with certification.

3) Autonomy package

- The EMSAS vessel should be able to sail and run missions autonomously while maintaining human-in-the-loop control for weapon engagements.
- The autonomy package should allow human operators to take control of certain specific roles, while other roles remain under the autonomous control of the EMSAS vessel or its remote-control station.
- The autonomy package should comply with the most commonly applicable standards (e.g., STANAG 4817 latest edition[158]).
- Without excluding and fully compatible with a human on board operation mode to be used when appropriate, the autonomy package should enable the EMSAS vessel to operate up to the autonomy degree 4 for navigation and mission execution, and up to the autonomy degree 3 for the mission modules and for the weapon systems. The package should be in line with the 100$t^h$ session of IMO's Maritime Safety Committee (MSC 100): *The M-SASV is remotely controlled without seafarers on board. The ship is supervised from another location and controlled and operated when necessary*.
- The autonomy package should enable the vessel to navigate autonomously, understand its environment, make decisions and determine actions by itself for a safe navigation under supervision. In particular, it should allow the EMSAS vessel to transit out of harbour and follow a mission pattern in a designated area for a designated period.
- The autonomy package should enable the vessel to monitor and control its on-board equipment, systems and facilities, taking any required actions to protect them.
- Each mission module should have an autonomous operating mode enabling remote control in a way that reduces the number of operators and their workload.

4) Secure communications suite

- To ensure resilient and redundant command and control, the communications suite should support secure, real-time and automated two-way communication between the control station, and both the core platform and the on-board mission module (including any UxV integrated into the mission module).
- The communication suite should ensure intelligence gathering, analysis, positioning and surveillance tasks in fully autonomous mode with off-line data retention capabilities to prevent data losses.

5) Specific mission modules

- Only one specific mission module should operate on board the EMSAS vessel.

[158] Multiple Area Control of Unmanned Platforms.

- Mission modules should be standardised as much as possible and designed to reduce specific integration requirements into the EMSAS vessel, and the time to reconfigure the EMSAS.
- The SBW module should address seabed protection (e.g. protection of critical seabed infrastructure) and provide offensive capabilities.
- The ASW module should be equipped with sensors to detect, locate, classify, and track sub-surface threats by using passive and/or active acoustic devices with sufficient range. The module should also have effectors to engage targets as needed, including possible stand-off ASW operations deployed from the EMSAS vessel.
- At a minimum, the NMW module should support naval mining operations.
- The NMCM should provide capabilities for naval mine countermeasures, mine hunting, minesweeping or both, including stand-off NMCM operations, deployed from the EMSAS vessel.

6) Cyber security

- Considering EMSAS vessel's heavy reliance on software and connectivity, robust protection against cyber threats should be considered, particularly:
  - navigation and control systems that communicate with shore-based or naval task group networks;
  - systems that monitor the EMSAS vessel's status, including connected elements;
  - secure communication systems that access the ship's GNC[159] systems or other systems/subsystems via radio, satellite or other wireless means, including the data exchange interface with on-board or shore-based control station;
  - machinery and propulsion systems;
  - UxV launching and recovery systems;
  - secure communication systems between EMSAS vessel and UxV;
  - physical security and intruder detection systems.

**Expected impact**

The outcome of the effort should contribute to:

- an affordable EMSAS vessel class with autonomous capabilities especially suitable for specific missions;
- new CONOPS[160] for autonomous systems that are aligned with emerging technologies and the challenges of large USV in ocean-going scenarios;
- open architecture that is tailored to missions to facilitate operational versatility;

[159] Guidance, Navigation and Control.
[160] Concept of Operations.

- a modular design to facilitate support and management in limited and small spaces;
- reduced underwater signatures and environmental footprint;
- a common certification approach for USV.

## 2.6. Call EDF-2026-DA-EXP

- **Targeted type of actions:** Development actions (expedited call)
- **Form of funding:** Actual costs grants following the call for proposals
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation
- **Indicative budget for the call:** EUR 40 000 000 for one topic that addresses one category of actions.

### 2.6.1. EDF-2026-DA-EXP-DIGIT-MDOC-STEP: Military multi-domain operations cloud services

- **Indicative budget:** EUR 40 000 000 for this topic under the EDF-2026-DA-EXP call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

Military operations require more flexibility and mobility to gain and maintain the initiative and to respond to threats. The collaborative, more efficient, digitised and secure approach of multi-domain operations (MDO) across the land, air, maritime, cyber and space domains is key for Information superiority, future mission management and smart decision support. Overall military advantage will be achieved through complete situational awareness based upon current data from all available sources, as well as technical and procedural standards-based interoperability (*see* NATO STANAGs and Federated Mission Networking Spiral Specification). In modern warfare, milliseconds can make the difference in a contested, highly disruptive military environment, and information gaps in the non-real time reporting chain can have serious consequences.

Currently, information is not shared sufficiently in military systems and is instead kept siloed in sub systems interconnected by point-to-point interfaces. Looking at the example of the land (or ground) domain, the first steps to overcome this situation took different approaches to generic architectures that improved information sharing within the platform and opened up the subsystems to new use cases. For example, vehicle-centric architectures have improved information sharing within a vehicle, but there is still an interoperability gap beyond the vehicle. Information exchange must not be limited to the same kind of systems, for example, land vehicles; instead, it should enable sharing information through the combat network of communications among any military systems, regardless of their nature. In this call topic, ‘cloud’ should be understood as a deployment of networked military capabilities, and not as an external infrastructure to connect to in order to obtain a service.

The lack of information sharing and coordination across all combat domains is even more striking. This is because a suitable information exchange is not possible due to different data models at the service layer. This leads to different information interpretations of the same information, resulting in situational pictures for the same situation.

Besides this anticipated command and control (C2) convergence, the digitalisation of the military in every domain is also replacing legacy systems and introducing new highly performant sensor systems. These sensor systems increasingly create new amounts of data, which are highly valuable at different tactical, operational and strategic levels, as well as within different operational domains. This information may not be currently shared and used, as the communication technology's data exchange and physical communication capabilities are not advanced enough to achieve the desired level of information exchange for full implementation of MDO. Instead of connecting each sensor individually to a dedicated (but isolated) effector, a cross-domain network of reconnaissance and effector system-of-systems needs to be created.

Cloud-native architectures are well-suited for commercial applications that have access to reliable, wideband communication networks and whose supporting resources are readily available and are not at risk of physical destruction or disruption. However, the military environment often has a lack of robust networking media and services, especially at the highly mobile tactical edge. Therefore, commercial cloud solutions need to be substantially adapted to operational and tactical use cases. This adaptation implies that the digital infrastructure relies on its own strength, whenever dependencies on external infrastructure fail. It also implies that separated digital infrastructures can recombine and resync instantaneously, whenever possible.

Multi-domain operational clouds (MDOC) are the intellectual framework needed to unify several information spaces to achieve decision superiority and multi-domain command and control. To reach this goal, the military operations' cloud and their associated network should have critical attributes, such as the ability to self-form, self-heal, gracefully degrade, and maintain redundancy. This framework enables collection and integration of data in an open, adaptive information system that is scalable from platform level to different headquarter levels of all combat domain. As a result, C2 and operational agility are expected to be significantly improved across the full range of military operations (e.g. improving joint fire, situational awareness, resynchronising). Dedicated services for information exchange will adapt the information synchronisation within MDOC to the available network bandwidth and robustness at all command levels, particularly in the most challenging environments with narrow and disruptive networks at the tactical edge level (including the physical destruction of induvial nodes).

***Specific objective***

This call topic aims to build on existing results from previous efforts in multi-domain operations and improve architectures for robust military operations, particularly those at the tactical edge. To achieve this, improved communication processes, from at least a networking perspective, should be considered. Secure and reliable IT[161] services and data and information sharing in the operational context of an all-domain European military mission should be involved. The representative operational context in which the results can be demonstrated, validated and verified should consider a serious degradation of IT services in a high intensity

[161] Information Technologies.

conflict. This includes the physical destruction of civilian IT infrastructure (data processing centres, fixed and mobile data and telephone networks, etc.) and a contested electromagnetic environment. In this scenario, MDOC should enable data exchanges among sensors and effectors belonging to different command components in the 'kill chain' (simulated/emulated, represented by digital twins if necessary).

The objective of this call topic is therefore to build on and improve existing concept demonstrators for cloud efforts in multinational multi-domain operations. Based on this technical foundation, it is to combine existing and future multilevel community-of-interest (COI) and COI-enabling services into a federated, multi-national service mesh. The aim of this mesh is to enable and support multi-level situational awareness and C2 capabilities for multi-domain operations and provide military operations with the capability to improve their battle rhythm in collaborative multi-domain warfare.

While the combat cloud has many advantages, there are also challenges to successfully develop and incorporate it into modern warfare. These challenges include interoperability and security issues and ensuring decentralised execution at tactical and operational levels.

The goal of this call for proposals is to overcome the operational difficulties identified in a real combat environment by improving the architecture and laying down the framework that is expected to enable the development of networked combat capabilities. The primary objective of this call topic is to deliver a first combat cloud prototype. MDOC should provide and support COI and COI-enabling and core application services to any connected application for synchronisation, consumption and use. These services include:

- consolidated situation data services (real-time and non-real-time);
- IT-security services (including cyber defence);
- geodata and imagery services;
- CSD interface and catalogue services;
- workflow and messaging services;
- data labelling and binding for federated system-wide DCS[162] support;
- compatibility measures to ensure the concepts and solution architectures of zero trust, recognising the current contradictions between zero trust and DCS;
- operation plan templates and operation plans.

The aim of this call topic is to:

- provide a set of use cases to refine the operational needs and high-level features of a combat cloud solution. These cases should address all levels from strategic to tactical, including current and future tools within the UE;
- provide a topology of services following command, control and communication (C3) taxonomy and FMN standards, capable of covering the operational needs in a unified service approach from the strategic level to tactical level, integrating all domains in a "all-domain C2" approach;

[162] Data Centric Security

- provide the technological solutions – both hardware and software – at the appropriate technology readiness level (TRL) that is capable of supporting European collaborative cloud functionalities;
- integrate the technological solutions into the current strategic C3 systems in the EU's operational context;
- identify interfaces with current and legacy tactical systems to ensure a seamless and efficient interoperability from the strategic level to tactical level based on the fundamentals into existing C3 tools.

This call topic contributes to the STEP objectives, as defined in STEP Regulation[163], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

The proposals must design, implement and demonstrate an operational prototype of a MDOC solution able to standardise services across the battlefield from strategic to tactical level in an 'all-domain C2' environment. Testing the prototype should be based on a system demonstrator at TRL 5 or higher.

This demonstrator must cover:

- airborne assets, such as combat, unmanned and transport fixed-wing and rotary-wing aircraft;
- ground-based assets, such as reconnaissance vehicles, combat vehicles and combat support assets;
- maritime assets;
- cyber assets, such as open-source data streams;
- access to space-based assets;
- federation of assets from different operational domains.

However, the proposals should not address the development of any C3 tools for planning, managing or evaluating operations.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities** (Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |

[163] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | **System prototyping**[164] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (g) | **Qualification**[165] of a defence product, tangible or intangible component or technology | Yes (mandatory) |
| (h) | **Certification**[166] of a defence product, tangible or intangible component or technology | Yes (optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:
  - reviewing the concept of operations (CONOPS) according to new requirements;
  - exploring edge principles and technologies for tactical level applications;
  - carrying out an architectural gap analysis based on new requirements;
  - developing a roadmap up to operational readiness that includes the roadmap up to initial operational capability, the roadmap up to final operational capability and the accreditation strategy;
  - providing all the engineering documentation as needed for the approval of the operational concept, analysis of the implementation and accreditation of the system.
- Design:

[164] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[165] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[166] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- evaluating the architectural gap analysis to design the final reference architecture;
- evaluating tactical requirements for the architecture;
- developing a catalogue for end-to-end capabilities in a federated system (TRL5);
- designing and implementing data gateways to translate relevant military data formats (e.g. JDSS, FFI, LINK and VMF);
- designing and implementing information security concepts, such as data labelling, to be binding for all involved data elements, reusing any applicable NATO standards and FMN specifications;
- designing and implementing a federated prototype CI/CD process model;
- designing and implementing a prototype federated governance process model.

- System Prototyping:
  - implementing new and augmented design components based on the updated use case analysis;
  - building a system prototype, based on the selected proof-of-concept components, new components, mock-ups and simulations.
- Testing:
  - demonstrating the mandatory capability feature set of MDOC system through the system prototype;
  - setting KPI[167]s to support validation (latency, throughput, availability, fault recovery, etc);
  - creating a test and validation plan with stakeholders to check that the solution meets the requirements and the overall architecture design;
  - creating the test environment emulating relevant components of an operational environment;
  - collecting and analysing test results and feedback from supporting Member States and EDF Associated Countries and operational stakeholders for continuous improvement and potential follow-on activities;
  - producing a technical dossier, including architecture, results, lessons learned.
- Qualification:
  - the qualification process must ensure that the system prototype meet the specific defence requirements in relevant crisis and war scenarios.

[167] Key Performance Indicator

In addition, the proposals should cover the following tasks:

- Studies:
  - exploring a cohesive and distributed MDO data lake structure based on a semantic reference model (compatible with NCDF – NATO Core Data Framework).
- Design:
  - designing and implementing data labelling and binding for federated system-wide DCS support compatible with the most recent commonly applicable standards (e.g. STANAGs 4774[168] ,4778[169] and 5636[170]);
  - designing and implementing information security concepts to support ABAC[171] and ICAM[172] in line with the most commonly applicable standards (e.g. ADatP-5663) including a federated approach to policy enforcement and administration points (PEP/PAP);
  - designing zero trust in compliance with the most recent concepts and solution architectures (e.g. ACP 240[173]), thereby resolving the current contradictions between zero trust and DCS.
- Testing:
  - demonstrating further the MDOC system's important capability features through the system prototype.

The tasks within the project for this call must in any case cover at least:

- continuous IT and core service integration and deployment;
- implementation of enabling and emerging technologies;
- integration of COI enabling services;
- implementation of modelling and simulation services;
- implementation of security concepts, such as DCS (e.g. STANAGs 4774, 4778 and 5363), ABAC, ICAM (e.g. ADatP- 5663), and ZT (e.g. ACP 240);
- implementation of performance measurements;
- integration of selected available services;
- analysing required communication and computational resources;
- TRL maturity control;

[168] Confidentiality Metadata Label Syntax.
[169] Metadata Binding.
[170] NATO Core Metadata Specification (NCMS).
[171] Attribute-based access control.
[172] Identity, credential and access management.
[173] NATO Allied Communication Publication 240 – Data-centric interoperability Concepts and Design Requirements.

- setting up and maintaining an integration test and simulation bed;

- real world demonstration of selected elements.

Use cases may evolve over time, but currently include: (i) mission preparation and planning; (ii) intelligence, surveillance and reconnaissance (ISR); (iii) strategic maritime patrol system/anti-submarine warfare (MPS/ASW); (iv) airborne warning and control system/airborne early warning (AWACS/AEW); (v) collaborative threat evaluation and target assignment (TEWA); (v) joint fire support, (JFS, CAS); (vi) collaborative medical evacuation (MEDEVAC); (vii) data management for logistics and maintenance; and (ix) C2 for all operational domains.

The proposals must demonstrate how they can harness synergies and complementarities with-other activities, including at least the planned, ongoing, or completed activities described in the call topic EDF-2021-DIGIT-D-MDOC related to *Military multi-domain operations cloud*.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- Use open-source solutions to the maximum possible extent to ensure the sovereignty over the provided solution by the end user and relevant governmental stakeholders;

- If cloud service providers are used for the abovementioned studies, design, prototyping, and testing activities related to cloud based digital platforms, these should only be established in the EU or in EDF associated countries and owned and controlled by EU or EDF associated countries entities;

- Combine real-time data and non-real-time data networks and synchronise information for collaboration between air/sea and land platforms. This should include the introduction of gateways for data streams for conversion and compression purposes.

- Adapt its information synchronisation in MDOC to the available network bandwidth, including complete loss of connection and robustness at all command levels, particularly in narrow and disruptive networks at the tactical edge level (including physical destruction of individual nodes).

- Provide a modular and scalable concept that accommodates the integration of ongoing programs (including national programmes), with appropriate flexibility for a large European cooperation.

- Incorporate the definition and specification of network & information infrastructures, IT environment, cyber resilience, interfaces and initial services for the cloud of clouds and its three layers: tactical edge, tactical fog and operational or strategic permanent infrastructures.

- Provide (i) a degradation and failover concept for autarkic and partly autarkic operations of single entities which ensure the continuity of operations in case of communication disconnect or interrupt; and (ii) a concept for degradation of services

for mobile platforms with limited resources, including the re-integration of such separated entities.

- Demonstrate the resiliency and the performance of the services at different tactical levels.
- Support the automatic management of IT service deployment and orchestration beyond individual national cloud-based infrastructures.
- Maintain consistency of data after a failure through the use of recovery mechanisms.
- Manage automatically and aggregate always increasing battlefield information using traditional or artificial intelligence techniques to support and relieve human operators.
- Consider interoperability with NATO agreed interfaces and processes for the envisaged use cases, including a taxonomy of services compliant with C3 taxonomy and NATO Architecture Framework (NAF) as the foundation for the system's development.
- Provide a modular and scalable concept that accommodates the integration of ongoing programs (including national programs), with appropriate flexibility for a large European cooperation.
- Be ready to provide cloud infrastructure services in real time strengthening collaborative capabilities in EU missions and operations at strategic and operational levels.
- Enable a dynamic data disaggregation, ensuring service-data relationship and data needs from individual roles in the context of the mission.
- Follow, if new requirements allow to do so, the roadmap defined so as to be able to cope with the complexity of the architectural design, integration and demonstration of the system.
- Address the implementation and integration of cloud subsystems and interfaces for the following key clusters:
    - C2 cloud solutions;
    - ISR applications;
    - software defined network;
    - agile terminals;
    - in-depth Cyber awareness (including cyber risk analysis, native Data Centric Security compatibility for control and use of federated services).
- include automatic information fusion and management from all connected military assets (air, sea and land) based on certified hardware, standard interfaces and integration with information services.

- comply with the most commonly applicable standards (e.g. STANAGs 4559, 4607[174], 4609[175], 4676[176] , 4586[177] (UAV C2), 4774, and 4778.

- be FMN compliant when synchronising with the relevant FMN spiral of development.

In any case, the proposed solution should be complaint with the most common current and emerging interoperability standards (e.g. NATO STANAGs, Federated Mission Networking spiral specifications, as well as open applicable standards such as OpenTelemetry, OpenAPI, TM Forum API ecosystem, OpenAI)

Furthermore, the proposed solution should be able to host and seamlessly integrate with existing C2/C3 solutions in the EU, as described in the call topic EDF-2022-DA-C4ISR-EC2 related to *European command and control system*.

**Expected impact**

The outcome of the effort should contribute to:

- developing, implementing and integrating a European collaborative MDOC, which provides information superiority to the European armed forces;

- enabling European armed forces to coordinate their activities in all combat domains based on the same situation data, regardless of the application they use, and avoid mismatches of data in information exchange due to different data models at the service layer, which would result in different situation pictures;

- providing inputs for a multilateral development project that gives Member States and EDF associated countries an enhanced, digitised and secure battlespace across all operations domains;

- implementing and validating operation cloud services, which will help identify further development and research potential for realising the operational cloud;

- creating a decentralised combat cloud architecture at tactical level, which will improve the collaborative combat effectiveness of multi-national force elements by providing high-performance edge processing capacities that are flexible and robust, taking into account SWaP platform limitations;

- creating a decentralised military cloud architecture at strategic level, which will provide higher echelon units with much more accurate and timely information, enabling different analysis, e.g. planning processes. The improved information quality will also help, for example, to estimate units' combat readiness, providing a differentiator that can help success in combat;

- providing innovative near real-time information architectures, which can lead to new approaches achieving information superiority, and can be subject to further studies;

- boosting the Europe's military sovereignty and technological sovereignty;

[174] NATO Ground Moving Target Indicator (GMTI) Format.
[175] NATO Digital Motion Imagery Standard.
[176] NATO Intelligence, Surveillance and Reconnaissance Tracking Standard.
[177] Standard Interfaces of UAV Control System (UCS) for NATO UAV Interoperability.

- strengthening the EU's contribution to NATO and its FMN initiatives which aim to improve NATO's next-generation technical and procedural interoperability.

## 2.7. Call EDF-2026-DA-ACC

### 2.7.1. EDF-2026-DA-ACC-AIRDEF-EATMI: High-end endo-atmospheric interception

- **Indicative budget:** EUR 100 000 000 for this topic under the EDF-2026-DA call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic.

**Objectives**

***General objective***

Air superiority remains one of the EU capability development priorities identified as part of the revised 2023 Capability Development Plan[178]. This priority includes specifically A2AD (anti-access area denial) type and BMD (ballistic missile defence) capability shortfalls. The emergence of new threats such as manoeuvring ballistic missiles and hypersonic cruise missiles (including air-launched ones) or hypersonic glide vehicles represents an additional challenge for European and NATO ground and naval-based air defence systems. Existing knowledge and technologies in the field of weapon systems and missiles design inside the EU represent, however, an opportunity to develop a European capability based on an endo-atmospheric air defence effector able to intercept and defeat current and emerging post-2030 ballistic and cruise missile threats.

***Specific objective***

This call topic aims to:

- follow up and complement previous activities for the development of an endo-atmospheric interceptor by maturing key technologies required to successfully counter hypersonic and ballistic threats. It should build on initial concept designs and advance the required technologies through the development of dedicated demonstrators;
- contribute to the ongoing related initiatives at EU level to reach at least TRL[179] 6 at system level by 2030 for the interceptor and should build on the results obtained under the concept phases developed following previous calls topics;
- contribute and support a future preliminary design review of the full interceptor system. It should pave the way for a future development and industrialisation phase, ideally from 2030 onwards, including qualification and certification.

**Scope and types of activities**

***Scope***

The action must have two complementary pillars. One pillar focused on technology maturation to achieve at least TRL 5 for the different system components and technologies.

[178] EDA, *2023 Capability Development Plan*, qu-03-23-421-en-n-web.pdf.
[179] Technology Readiness Level.

The other focused on the preliminary definition of the system, including assessment activities of the main critical technologies identified. These activities conducted in parallel allow for a decisive progress on the maturation of the concept of counter-hypersonic and ballistic threats interceptor, thus paving the way for future preliminary design review.

The technology maturation must cover at least the following system components and technologies identified as critical for the development of a counter-hypersonic and ballistic threats interceptor:

- kill-vehicle flight,
- on-board terminal guidance sensors,
- platform separation,
- stage separation,
- interceptor aerodynamics,
- propulsion,
- guidance, navigation and control,
- weapon system battle lab simulation,
- lethality.

Moreover, the proposals should address maturation of data link technologies.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[180] of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |

[180] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

| | **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|---|
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes<br>(mandatory) |
| (g) | **Qualification**[181] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (h) | **Certification**[182] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes<br>(optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- Studies:
  - Preliminary definition phase:
    - reviewing the common user's requirements (considering ongoing related initiatives at EU level, including the results from previous calls);
    - reviewing interceptor initial technical requirements specification;
    - reviewing of interceptor initial technical requirements specification;
    - preparing a preliminary test and evaluation master plan (TEMP) in view of achieving TRL 6 at system level from 2030 onwards and for a system at TRL 9 from 2035 onwards.
- Design:
  - Preliminary definition phase:
    - Reassessing and simulating the functional chain of the interceptor system, to identify boundaries and shortfalls;
    - setting out cyber security requirements;
    - providing preliminary safety plan at system level;
    - drawing up a preliminary maintenance plan and integrated logistic support;
    - setting up the preliminary design of the interceptor and selection of technological options at subsystem level;
    - carrying out the system requirements review (SRR) at interceptor system level;

[181] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[182] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- specifying and designing the demonstrators of technological options at subsystem level;
- Carrying out a ready to test review for the most critical components;
- Carrying out the preliminary system functional review (SFR) of the interceptor;
- Providing the system engineering plan (SEP) in view of achieving TRL 6 at system level from 2030 onwards and for a system at TRL 9 from 2035 onwards.

- Technology maturation phase:
  - Technology demonstrators to reach at least TRL 5 for the different system components and technologies for:
    i. kill-vehicle,
    ii. on-board terminal guidance sensors,
    iii. platform separation,
    iv. stage separation,
    v. interceptor aerodynamics,
    vi. propulsion,
    vii. guidance, navigation and control,
    viii. Lethality.

- <u>System prototyping:</u>
  - At least the subsystems/functions set out below must be addressed:
    - platform separation: technologies for separation from naval and ground platforms;
    - stages separation;
    - propulsion: booster, mid-course, terminal phase;
    - on-board sensors: technologies (IR[183] and/or RF[184]) and algorithms;
    - interceptor aerodynamic: for complete interceptor stages;
    - lethality: enhanced warhead and safety arming and disarming device;
    - kill vehicle flight control devices.

[183] Infrared.
[184] Radiofrequency.

  - building a battle lab simulator for at least engagement planning kill chain, performances, threat tracking and acquisition.

- Testing:

  - battle lab simulations for at least engagement planning kill chain, performances, threat tracking and acquisition;

  - delivering a test plan and success criteria for demonstrators at least TRL 5 for the different system components and technologies;

  - testing the demonstrators at least TRL 5 for the different system components and technologies;

  - providing trial's reports.

In addition, the proposals should cover the following tasks:

- Study:

  - Technology maturation phase:

    - Technology demonstrators for data links.

- System prototyping:

  - prototyping the propulsion system, in particular propulsion for cruise and final stage flight, including TVC if necessary;

  - Carrying out preliminary activities to build a system demonstrator at least TRL 6 by 2030, based on technical requirements specifications from preliminary definition phase (e.g. system demonstrator preliminary requirements, test plan, long lead items provisioning).

- Testing:

  - lethality package: fragment generation trial and fragment penetration at the relative velocity trial.

The proposals must demonstrate how they can harness synergies and complementarities with ongoing or completed activities described in the call topics (i) EDF-2021-AIRDEF-D-EATMI or (ii) EDF-2023-DA-DS-AIRDEF-EATMI.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- Versatility to address both ballistic missiles (including high manoeuvrable ones) and emerging hypersonic threats (hypersonic glide vehicles and hypersonic cruise missiles);

- High manoeuvrability and agility to cope with manoeuvring targets at different altitudes;
- High average speed to protect large areas with a fair balance in terms of sensor suite capabilities including early warning envisaged or available at the 2035+ horizon;
- Be compatible with legacy launchers with a fair balance in terms of performance and overall feasibility;
- Be interoperable with existing surface-based air and missile defence (SBAMD);
- Be interoperable with the NATO integrated air and missile defence system (NATINAMDS);
- High-speed and long-range connectivity between fire control, sensors and effectors for an Integrated dynamic networking to counter new threats combined effects;
- compatible radar suite roadmap integration;
- integration with the launcher/platform C2[185] function for engagement.

**Expected impact**

The outcome of the effort should contribute to:

- the defence and security interests of the EU and its Member States, in particular the EU capability development priorities identified as part of the revised 2023 Capability Development Plan;
- the European integrated air and missile defence priority identified as a capability shortfall;
- Europe's resilience and European technological sovereignty.

### 2.8. Call EDF-2026-LS-DA-DIS

- **Targeted type of actions:** Development actions
- **Form of funding:** Lump sum grants following the call for proposals
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation.
- **Specific provisions for the call:** The proposals need to build upon or integrate results that have been achieved within one or several projects that had been funded under an EU programme call with a focus on civil applications. This previous project(s) may be completed or may still be active. The submitting consortium does not need to be constituted or even to include a participant or result owner of the previous project(s). However, applicants must provide a confirmation that they have or will have the necessary rights to use and commercialise the results of the previous project(s).
- **Indicative budget for the call:** EUR 29 000 000 for one call topic addressing one category of actions.

[185] Command and control.

### 2.8.1. EDF-2026-LS-DA-DIS-OTHR-STEP: New abilities in the over-the-horizon sensing

- **Indicative budget:** EUR 29 000 000 for this topic under the EDF-2026-LS-DA-DIS call.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic. However, depending on the quality of the proposals submitted and the budget available, more than one proposal may ultimately be funded for this topic.

**Objectives**

***General objective***

EU requirements for surveillance, as set out in the EU Capability Development Plan (CDP), describe the necessity for increased situational awareness through means such as long-range radar systems. HF over the horizon radars can be a viable solution that offers target detection over long-range by exploiting propagation characteristics of HF waves. This can cover distances of thousands of kilometres by using sky waves, which are reflected down from the ionosphere, or a few hundred kilometres by using surface waves, which follow the Earth's curvature.

However, sky-wave radars have an extensive blind area (the skip distance) because the sky waves reflect down to earth at distances beyond 1,000km and thus leave areas at shorter ranges without illumination.

For the reasons stated above, such installations are well suited to countries covering a large area, particularly because of the zone within a radius of approximately 1 000 km from the radar transmitter which is not covered by sky-wave propagation.

The USA, Russia, and Australia among others have already developed OTH radars and can monitor such large areas. For geographically confined countries though, collaborative air and maritime picture over large areas can be acquired only through a cooperation between users of OTH radar units operating in a networked environment.

To enhance situational awareness and operation superiority, there is an EU requirement to improve detection, tracking and identification capabilities over wide areas and with minimum latency. High frequency over-the-horizon systems therefore need to be improved, while an EU concept for cognitive and scalable network of HF OTH sensors should be investigated. As the OTH HF radars exist in many countries, (non-)cooperative passive radar network/mode should also be investigated and implemented to increase the coverage and detection ability of OTH radar networking in mixed passive-active mode (e.g. similar to DMPAR[186] concept – supported by stationary assets).

Therefore, new technologies should be developed by integrating different HF infrastructures (transmitters and receivers) in a collaborative active and passive mode to increase the air and sea detection range for monitoring, early warning and detection of low-flying stealth aircraft. This includes:

- collaborative active and passive OTH radar networking;
- ionospheric sounding network;

[186] Deployable Multiband Passive Active Radar

- cognitive spectrum management and algorithms to detect challenging targets

***Specific objective***

The objective of this topic is to follow up and complement previous activities in the field of over-the horizon (OTH) sensing, in particular the development of technologies for an EU OTH radar network concept, providing deep cooperation and data sharing for strategic surveillance. In this context, both high-frequency (HF) surface (active, cooperative and non-cooperative passive) and sky-wave radar technologies should be explored and integrated for their respective advantages in terms of area covered at long ranges and as a gap-filler in an agile network. OTH radar networks are intended to increase coverage and to improve detection and tracking of challenging targets (such as hypersonic targets, slow surface targets and low-observable targets).

Improved detection, tracking and identification capabilities over large areas with increased range and minimum latency are needed to increase situational awareness and operational superiority. High-frequency over-the-horizon systems therefore need to be improved, while an EU concept for a cognitive and scalable network of HF OTH sensors could be further explored.

The over-the horizon radar will cover maritime and airspace as well as various geographical areas, for example the Atlantic Ocean, Mediterranean Sea and Arctic Circle.

This topic addresses the technologies for an EU OTH radar network concept offering deep collaborative and data sharing for strategic surveillance. In this regard, both (active, cooperative and non-cooperative passive) HF surface-wave and sky-wave radar technologies should be explored and integrated regarding their respective advantages in terms of covered area in long ranges and as a gap filler into an agile network.

It is expected that the TRL of the involved technologies advance from TRL 2-3 to TRL 5-6.

This topic contributes to the Strategic Technologies for Europe Platform (STEP) objectives, as defined in the STEP Regulation[187], in the target investment area of deep and digital technologies.

**Scope and types of activities**

***Scope***

The proposals must address the study, research and experimentation of the intended solution and conclude with the creation of a proof-of-concept design that can exhibit the developed functionality and act as a testbed for the development of prototype-scale projects in the future.

Moreover, the proposals should address the detection of challenging targets, such as hypersonic threats, slow surface targets and low-observable targets (stealth). The required technologies should be demonstrated (partially or entirely) through small scale or reduced functionality (e.g. shorter antennas, reduced power) technology demonstrators. Modularity in terms of future expansion towards a prototype is required. Initial tests of use within the network with existing equipment/infrastructures will be considered in a positive light. Additionally, EU-sourced technology should be incorporated to the greatest possible extent.

In addition, the proposals may address a demonstrator for the proof-of-concept.

***Types of activities***

[187] Regulation (EU) 2024/795

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| | **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[188] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (g) | **Qualification**[189] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (h) | **Certification**[190] of a defence product, tangible or intangible component or technology | Yes<br>(optional) |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes<br>(optional) |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

- <u>Studies:</u>

  - developing cognitive approaches for a network of HF-OTH active/passive radars (resource management at node and system level, including management of available illuminators of opportunity (IoO) and specific modes such as COMINT/SIGINT/ELINT[191]);

  - feasibility study of developing an artificial intelligence/machine learning (AI/ML) framework for experimentation based on big data;

  - exploring intelligent management of the electromagnetic spectrum;

[188] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[189] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[190] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.
[191] Communications intelligence, Signals intelligence, Electronic intelligence.

- exploring tracking and adaptive filtering algorithms for multistatic configuration;
- studying synchronisation issues over long distances; immediate synchronisation with sky-wave signals providing longest ranges (with coarse resolution); operation in GNSS denied environment.

- Design:
  - designing the on-site multi-sensor tracker, and tracker concepts to fuse the detects and optional detects from additional other sensors;
  - designing the AI/ML framework, provide technical specifications, considering risk reduction analysis;
  - drawing up the architectural design of a radio-frequency synchronisation system.

In addition, the proposals should cover the tasks set out below:

- Studies:
  - concept study covering a minimalistic approach to a working OTH-B sensor including antenna, transmitter and receiver;
  - studying covering the possible use of existing HF sources for OTH-B sensing;
  - studying the possible range of an HF OTH-B radar in Europe with special emphasis on static atmospheric noise;
  - studying the possible range of an HF radar in Europe with special emphasis on static atmospheric noise;
  - developing real-time atmospheric propagation models based on real time ionospheric sensing and processing of data collected by a network of sensors such as advanced ionosphere stratification models;
  - studying, setting out and developing new signal processing techniques for, among others:
    - clutter mitigation;
    - improving tracking capabilities and target localisation;
    - special system combinations (e.g. hybrid modes of sky-surface-wave or sky-wave-LOS) and multiple input multiple output (MIMO) configuration.
  - reducing/using multipath and doppler fading;
  - studying the very long baseline related issues:
    - synchronisation of installations;
    - direct signal disturbance mitigation;

    - exploitation of passive mode exploiting (non-)cooperative illuminators in HF band.

- developing support for multiple radar configurations for better footprint management of passive/cooperative/active configurations (e.g. one remote illuminator/multiple reception sites or multiple remote illuminator/multiple reception sites);

- studying HF sky-wave radars, including:

    - focus on receiver architectures, mainly oriented to software-defined radio (SDR) technology;

    - focus on transmitter technologies, particularly on power amplifier architectures;

    - signal waveforms and coding;

    - weak remote signal reception and analysis;

    - novel antenna element designs, array architectures and/or scanning techniques.

- Design:

    - designing distributed modular multi-channel receiver stations, tailored for supporting extensive antenna arrays, suited for simultaneous reception of sky-wave and surface-wave signals;

    - including real-time processing to extract detects from targets illuminated by sky-wave signals and in parallel extract detects from targets illuminated by surface-wave signals.

    - designing rapidly deployable nodes;

    - Carrying out a design study of a minimalistic demonstrator for a working OTH-B sensor including antenna, transmitter and receiver.

The proposals may also cover the tasks set out below:

- System prototyping:

    - demonstrating a working experimental prototype of an OTH-B sensor;

    - demonstration a working experimental prototype of an HF Radar;

    - demonstrating a working experimental prototype of a passive HF radar with illumination from suitable existing sources of HR radiation.

The proposals must demonstrate how they can harness synergies and complementarities with other activities, including at least the planned, ongoing, or completed activities described in

the call topic EDF-2021-DIS-RDIS-2 related *to New technologies for air and sea long range detection.*

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- The system should operate at long over-the-horizon ranges, far beyond current existing systems, to detect and track air and sea targets (such as large aircraft, and ships moving at a speed of above 25 knots).
- The system should fill the gaps and extend current air and sea EU radar surveillance coverage, using a collaborative network of sensors and the necessary synchronisation.
- The system should implement advanced ionospheric sounding networks and validated models to operate cognitive radar management schemes for radar network operation.
- The system should implement advanced signal processing to improve OTH detection and tracking performances and target localisation.
- The proposed design should be suitable for operations in potentially challenging environments and conditions triggered by anthropogenic activities, under jamming, and operations in congested, contested and constrained spectrum environments.
- Hardware and software design should support big data processing in real time and should support integration of several different AI/ML based applications.

**Expected impact**

The outcome of the effort should contribute to:

- developing the necessary infrastructure to the participant member states for making them capable to pursue research and development in the OTH radar fields;
- collaborative operational exploitation of the OTH active and passive radar network;
- incorporating ionospheric propagation models for supporting the radar in real-time;
- investigating future research projects on detecting extra-atmospheric and hypersonic objects;
- identifying critical components and units;
- strengthening the collaboration between industries and research institutes;
- supporting enhanced, safe and secure operations in friendly and hostile environment and under all possible geophysical conditions, assisted by AI/ML algorithms;
- working out a robust system concept for a longest-range radar based on surface-wave and sky-wave OTH-R technology suited for the surveillance of the EU territories and seas;
- achieving competitive edge over low observable targets at varying altitudes;
- contributing to reducing or preventing the strategic dependencies of the Union.

## 2.9. Call EDF-2026-LS-DA-SME

- **Targeted type of actions**: Development actions (dedicated to SMEs).
- **Form of funding:** lump sum grants following the call for proposals.
- **Targeted type of applicants:** any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation. Members of the consortium need to be SMEs (as defined in Commission Recommendation 2003/361/EC).
- **Indicative budget for the call:** EUR 30 000 000 to support one call topic:

### 2.9.1. EDF-2026-LS-DA-SME-NT-STEP: Non-thematic development actions by SMEs

- **Number of proposals to be funded:** several proposals may be funded for this topic.
- **Range of EU financial contribution per proposal:** The requested funding cannot exceed EUR 6 000 000.

**Objectives**

This call topic encourages the driving role of innovative SMEs to turn technology and research results into defence products in a fast and cost-efficient way, possibly by adapting technologies from civil applications or addressing hybrid warfare.

This call topic contributes to the STEP objectives, as set out in the STEP Regulation[192], in any of the target investment areas.

**Scope and types of activities**

***Scope***

The proposals must address innovative defence products, solutions and technologies, including those that can improve readiness, deployability, reliability, safety and sustainability of forces in defence tasks and missions, for example in terms of operations, equipment, infrastructure, energy solutions, surveillance systems or digital solutions.

The proposals must address target investment areas as set out in the STEP Regulation, and reach at least TRL4[193].

In addition, to best complement R&D efforts already targeting civil applications and to encourage the efficient spinning-in of knowledge, innovation and technological development to the defence sector, this call topic also welcomes proposals for add-on development actions to adapt solutions originally developed for civil applications and previously not applied in defence sector.

***Types of activities***

The following table lists the types of activities and whether they are eligible or ineligible:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | **Eligible?** |
|---|---|

[192] Regulation (EU) 2024/795

[193] The definition of TRLs is shared with other EU programmes, such as Horizon Europe. A reference to this definition is publicly available at https://horizoneuropencpportal.eu/sites/default/files/2022-12/trl-assessment-tool-guide-final.pdf.

| Types of activities (Art 10(3) of the EDF Regulation) | | Eligible? |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | No |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes |
| (e) | **System prototyping**[194] of a defence product, tangible or intangible component or technology | Yes |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | Yes |
| (g) | **Qualification**[195] of a defence product, tangible or intangible component or technology | Yes |
| (h) | **Certification**[196] of a defence product, tangible or intangible component or technology | Yes |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes |

The proposals must address at **least one activity** among design, system prototyping, testing, qualification, certification and increasing efficiency.

The proposals must describe a clear work breakdown structure and link the proposed tasks to eligible activities.

The proposals should include clear descriptions of the proposed criteria to assess work package completion.

**Functional requirements**

This call topic is open to technology development for defence within STEP target investment areas. The proposals should describe the targeted functionalities and the foreseen means to measure progress toward the achievements of these functionalities.

**Expected impact**

The outcome should contribute to:

- developing innovative and cost-effective solutions for defence applications;

[194] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[195] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[196] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- drawing up ground-breaking or novel concepts and approaches, new promising future technological improvements or the application of technologies or concepts previously not applied in the defence sector;

- improving innovation capacity across Europe by involvement of SMEs that can make a difference in the future;

- creating potential future market opportunities for SMEs, especially by facilitating access of SMEs to defence markets and supply chains;

- developing European research and technology ecosystems and strengthening EU Member States' and EDF associated countries' defence supply chains.

## 2.10. Call EDF-2026-LS-DIS

- **Targeted type of actions**: Actions dedicated to disruptive technologies for defence.
- **Form of funding:** Lump sum grants following the call for proposals.
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and involving at least two legal entities established in at least two different EU Member States or EDF Associated Countries. At least two of the eligible legal entities established in at least two EU Member States or EDF Associated Countries shall not, during the entire period in which the action is carried out, be controlled, directly or indirectly, by the same legal entity, and shall not control each other.
- **Indicative budget for the call:** EUR 27 000 000 to support one call topic addressing one category of actions.

### 2.10.1. 2.8.1 EDF-2026-LS-DIS-NT-STEP: Non-thematic actions targeting disruptive technologies for defence

- **Number of proposals to be funded:** Several proposals may be funded for this topic.
- **Range of EU financial contribution per proposal:** The requested funding cannot exceed EUR 3 000 000.
- **Project duration:** Between 12 and 24 months. Projects of longer duration may be accepted in duly justified cases.

**Objectives**

This call topic aims to fund proposals that can deliver 'disruptive technologies for defence', as defined in Article 2(13) of the EDF Regulation. This refers to enhanced or entirely new technologies that bring about a radical change, including a paradigm shift in the concept and conduct of defence affairs, for example by replacing or rendering obsolete existing defence technologies.

This call topic contributes to the STEP objectives, as defined in the STEP Regulation[197].

**Scope and types of activities**

***Scope***

[197] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).

Proposals must address disruptive knowledge gain, products or technologies in any area of defence interest at TRL 4 and above[198], provided they relate to one or more of the STEP investment areas, i.e. digital technologies and deep-tech innovation, clean and resource-efficient technologies, and biotechnologies[199] (e.g., Artificial Intelligence, quantum technologies, autonomous systems, robotics, advanced materials). Funding will not be provided without a clear technological objective targeting defence applications.

Proposals must demonstrate their disruptive impact on defence applications in order to accelerate the creation and deployment of novel solutions for armed forces and to support the uptake and diffusion of innovations in the defence sector. Therefore, they must focus on at least one of the following:

- rapidly enhancing of operational readiness and effectiveness;
- improving strategic decision-making processes;
- addressing emerging threats through cutting-edge technologies or products;
- embracing disruption to enable armed forces to gain a technological edge, and adapting to rapidly evolving security challenges;
- ensuring extensive technological superiority over potential adversaries.

Proposals must have the following essential characteristics:

- A disruptive impact in a defence context: the proposals must clearly demonstrate how the proposed solutions would have a disruptive effect if integrated into a realistic military operation;
- A radical vision: the proposals must present a clear and compelling vision enabled by a new or enhanced technological concept that challenges current paradigms.
- A clear output orientation: the proposals must create, develop or improve a technology that brings about radical change, including a paradigm shift in the way defence affairs are conceived and conducted, such as by replacing existing defence technologies or rendering them obsolete.

Proposals should aim to create, underpin and improve defence products and technologies with the potential to significantly disrupt the battlefield, or to develop technologies or assets that can increase the efficiency of defence products and technologies. Proposals should therefore aim to design a defence technology or product to be ready for validation or propose systems proven in operational environments, with the objective of achieving a rapid time-to-market.

The proposals should include clear descriptions of the technical goals and metrics to assess work package completion.

***Types of activities***

The following table lists the types of activities which are eligible, and whether they are mandatory or optional *(see Article 10(3) EDF Regulation)*:

[198] The definition of TRLs is shared with other EU Programmes, such as Horizon Europe. A reference to this definition is publicly available at https://horizoneuropencpportal.eu/sites/default/files/2022-12/trl-assessment-tool-guide-final.pdf.

[199] As described in the Guidance Note concerning certain provisions of Regulation (EU) 2024/795 establishing the Strategic Technologies for Europe Platform (STEP) – C(2024)3148 final of 8.5.2024.

| | **Types of activities** (art 10(3) EDF Regulation) | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes (mandatory – at least (a) or (b)) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes (mandatory -at least (a) or (b)) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes (optional) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes (mandatory- at least (d) or (i)) |
| (e) | **System prototyping**[200] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[201] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[202] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | Yes (mandatory – at least (d) or (i) ) |

The proposals must address **the following combination of activities: (generating knowledge or integrating knowledge) combined with (design or increasing efficiency).**

Accordingly, based on the combination chosen, the proposals must cover at least the following tasks:

- Generating knowledge:
  - Collect and interpret information from the battlefield or relevant exercise areas (data, observation)
  - Identify new concepts aimed at creating, underpinning and improving disruptive knowledge, products and technologies for defence applications that can achieve

[200] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.
[201] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.
[202] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

significant effects in the area of defence[203], focusing on further developing defence technologies and products validated in lab and in relevant industrial environment.

- Refine and expand the experience from the battlefield.
- - Combine knowledge with existing studies or design (of TRL 4 or 5) and, through the application of a disruptive concept and technology, identify ways that would drastically improve the effects.

- Integrating knowledge:
  - Identify and frame the problem.
  - Define the research/innovation challenge clearly that require multiple perspectives.
  - Map which knowledge domains are relevant.
  - Map key theories, concepts, and methods used in different fields.
  - Identify overlaps, gaps, and contradictions in current knowledge. Combine qualitative + quantitative approaches where useful.
  - Assess whether different knowledge domains were effectively combined.
  - Look for synergies and new insights that could not emerge from a single field.
- Design:
  - Use innovative concepts on existing studies to adapt the existing design or even re-design, through the application of a disruptive concept and technology, in a way that would drastically improve the effects.
  - Use observations, data and experience from the battlefield to identify areas needing a design optimisation or change.
  - Provide alternative design concepts
- Increasing efficiency:
  - Evaluate, review and adjust existing timewasters, labour-wasters or redundant procedures.
  - Experiment on increasing autonomy, reducing limitations and reducing dependencies of any kind in the battlefield

**Functional requirements**

This call topic is open to any technology with a high disruption potential. The proposals should describe the targeted functionalities and the foreseen means to measure progress toward the achievements of these functionalities.

[203] Article 10.3 (a) of the EDF Regulation.

**Expected impact**

The outcome of the effort should contribute to:

- Enhancing innovation capacity of the EDTIB by identifying and exploring ground-breaking concepts and approaches or by applying technologies and concepts previously not applied in the defence sector;
- Enhancing competitiveness of the EDTIB and creation of new defence market opportunities;
- Enhancing defence research and innovation capacity across Europe by involvement of actors that can make a difference in the future, such as excellent researchers, ambitious high-tech SMEs or visionary departments of large companies, universities or research and technology organisations.

## 3. ACTIONS IMPLEMENTED WITHOUT CALL FOR PROPOSALS

### 3.1. EDF-2026-RA-EUCI-IBA-DS-AIRDEF-CHGV: Countering hypersonic glide vehicles

- **Indicative budget:** EUR 68 000 000 for this topic.
- **Indicative number of proposals to be funded:** One proposal may be funded for this topic.

**Objectives**

***General objective***

In future armed conflicts, hypersonic weapons that can circumvent current air and missile defence systems could increasingly be used against EU Member States and EDF associated countries. Many simulation models have been developed to describe hypersonic glide vehicles (HGVs), but there is a need to improve knowledge of the HGV threats, particularly the most demanding ones. This includes understanding their signatures and kinematic behaviours, which is crucial for successfully detecting, tracking and countering these threats.

***Specific objective***

This topic aims to contribute to developing more effective countermeasures against hypersonic threats by collecting information on signatures and on manoeuvring capabilities at the hypersonic regime.

This topic is a follow-on of EDF-2024-DA-EUCI-CHGV and should complement the PESCO TWISTER project.

**Scope and types of activities**

***Scope***

The proposal must be a continuation of the project following the EDF-2024-DA-EUCI-CHGV call topic.

The proposal must address the results and findings of the predecessor project, following the EDF-2024-DA-EUCI-CHGV call, and apply them to: (i) the further development of the HGV

demonstrator, ultimately leading to a full-scale system; and (ii) optimising the sensor network for positioning and tracking.

The proposal must complement previous activities in this field, with a view to build, test and fly a basic full-scale HGV demonstrator (form fit function) with improved manoeuvrability. The aim is to collect signatures and kinematic data to validate HGV simulation model(s) and gain an accurate understanding of the technology and to enable counter HGV systems to successfully detect and engage the threat.

However, the proposal should not address other hypersonic carrier systems such as cruise missiles. It should be restricted to HGVs.

***Types of activities***

The following table lists the types of activities and whether they are (i) eligible or ineligible; and (ii) mandatory or optional:

| **Types of activities**<br>(Art 10(3) of the EDF Regulation) | | **Eligible?** |
|---|---|---|
| (a) | Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (**generating knowledge**) | Yes<br>(optional) |
| (b) | Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (**integrating knowledge**) | Yes<br>(optional) |
| (c) | **Studies**, such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions | Yes<br>(mandatory) |
| (d) | **Design** of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such a design has been developed, including any partial test for risk reduction in an industrial or representative environment | Yes<br>(mandatory) |
| (e) | **System prototyping**[204] of a defence product, tangible or intangible component or technology | No |
| (f) | **Testing** of a defence product, tangible or intangible component or technology | No |
| (g) | **Qualification**[205] of a defence product, tangible or intangible component or technology | No |
| (h) | **Certification**[206] of a defence product, tangible or intangible component or technology | No |
| (i) | Development of technologies or assets **increasing efficiency** across the life cycle of defence products and technologies | No |

The proposals must therefore cover at least the tasks set out below as part of the mandatory activities:

[204] 'System prototype' means a model of a product or technology that can demonstrate performance in an operational environment.

[205] 'Qualification' means the entire process of demonstrating that the design of the product, component or technology meets the specified requirements, providing objective evidence by which particular requirements of a design are demonstrated to have been met.

[206] 'Certification' means the process by which a national authority certifies that the product, component or technology complies with the applicable regulations.

- Studies:
  - Expand the technological assessment for HGVs, taking into consideration the results of the previous call EDF-2024-DA-EUCI-CHGV;
  - Further assess relevant scenarios, and examine existing simulation model(s);
  - Re-evaluate space-, air- and/or surface-based sensor platforms assessed in EDF-2024-DA-EUCI-CHGV for multiple wavelengths recording and data integration;
  - Collect relevant data from flight campaigns in a controlled environment, to inform defence requirements and validate simulation models;
  - Update the setting of a sensor system/network that can record all required data for counter measures to close the find, fix, track, target, engage and assess (F2T2(EA)) loop on an HGV threat;
  - Continue the work carried out following the previous call EDF-2024-DA-EUCI-CHGV, focusing on a full-scale demonstrator:
    - perform a technological assessment of HGVs, taking into account the existing and identified emerging technologies on hypervelocity, using different geometric and physical parameters (range, materials, trajectories, speed, manoeuvring capability, signatures, etc.) and combining physical and functional accurate simulation modelling;
    - explore the materials and technologies required for HGVs;
    - study aerodynamic loads, heating and kinematics, electromagnetic (EM) and infrared (IR) signatures, plasma effects on signatures and kinematics;
    - explore on-board sensor technologies to overcome failure e.g. due to heat, as well as hardened up- and down-link communication technologies;
    - model and simulate possible trajectories, behaviours and manoeuvring capabilities of HGVs;
    - propose solutions for further developments within the scope of this project.
- Design:
  - Design and build a full-scale HGV demonstrator based on the EDF-2024-DA-EUCI-CHGV call vehicle, with improved manoeuvring capabilities;
  - Demonstrate a manoeuvrable generic HGV as threat representation for simulation model(s) validation and defence assessment;
  - Design a test environment for the full-scale HGV demonstrator, which should:
    - use components, facilities and resources provided by the supporting Member States and EDF associated countries;

- be a combination of simulation, ground-based demonstrations and in-flight demonstrations, where applicable and relevant;
- be able to collect, extract and process all relevant signatures and kinematic data to validate HGV simulation models.

- select and adapt the launcher and booster system, which is required for the basic full-scale HGV demonstrator, as available in supporting EU Member States and EDF associated countries. Existing systems, experimental or in-service, are preferred over new developments.

To avoid duplicating efforts, the proposal must demonstrate how it can harness synergies and complementarities with other activities, including at least the planned, ongoing or completed activities described in the call topics: (i) EDIDP-SSAEW-EW-2020 related to *Early warning*; (ii) EDF-2022-DA-SPACE-SBMEW related to *Space-based missile early warning*; (iii) EDF-2021-AIRDEF-D-EATMI and (iv) EDF-2023-DA-DS-AIRDEF-EATMI, both related to *Endo-atmospheric interceptor – concept phase*.

**Functional requirements**

The proposed product and technologies should meet the functional requirements set out below:

- The full-scale HGV demonstrator should be based on the results of the EDF-2024-DA-EUCI-CHGV call topic and have:
  - improved manoeuvring capabilities for the entire flight and control/actuation systems to ensure a stable flight;
  - an updated set of various on-board sensors;
  - updated transmitter systems to send (e.g. via telemetry) all data required to assess the flight trajectory.
- The full-scale HGV demonstrator to be built and used for validating the designed HGV simulation model(s) should:
  - have the main characteristics of known HGVs used as weapon systems of possible adversaries, including size, symmetry, GNC and payload, to enable the validation of the designed representative HGV simulation models;
  - be equipped with a set of various onboard sensors, data-recording systems and other instrumentations to collect relevant data;
  - be capable of real-time transmitting of measurement data (e.g. telemetry or datalink system);
  - for in-flight demonstrations, be launched at the required altitude (between 30 and 80 km during gliding phase) with a velocity between 8 and 12 Mach, using adapted launcher and booster systems.
- The test environment, including at least in-flight demonstrations of the full-scale HGV demonstrator, should:

- evaluate stable flight and structural endurance for a realistic trajectory with speed in the hypersonic regime;
- allow for observing, collecting and recording signatures and kinematic behaviours during the gliding phase with at least two different existing sensors (e.g. visual, IR with multiple wavelengths from NIR to LWIR, UV, RF with multiple frequencies);
- allow for validating the simulation models designed to build a full-scale HGV demonstrator.

**Expected impact**

The outcome of the effort should contribute to:

- reducing dependencies on non-EU solutions for hypersonic and counter-hypersonic technologies;
- increasing knowledge about hypersonic threats and technologies to help develop an effective European air and missile defence.

**Appendix 1 - Preliminary Evaluation Plan for the EDF 2026 Technological Challenge**

**Preliminary evaluation plan**
**for the EDF technological challenge on**
**AI-based tactical situational awareness using swarms of small robots and drones**
(Topics EDF-2026-LS-RA-CHALLENGE-DIGIT-AISAP-STEP and EDF-2026-LS-RA-CHALLENGE-DIGIT-AISAO)

## 1. Introduction

This appendix is the preliminary evaluation plan for the EDF technological challenge on AI-based tactical situational awareness using swarms of small robots and drones (AISA). It provides a general description of the testing environment, metrics and protocols under which the research teams participating in the challenge will evaluate their systems. This appendix is provided as part of the call document for the topics of the EDF call EDF-2026-LS-RA-CHALLENGE to help frame the challenge and enable applicants to prepare projects that can run seamlessly together. For each evaluation campaign, a more detailed evaluation plan will be produced by the challenge organisers in coordination with the participating teams.

## 2. Overall concept and timeline

This technological challenge aims to measure, in an objective and comparable way, the performances of different approaches to **automatic threat classification in a ground tactical environment**. The challenge focuses on **kinetic threats from devices involving projectiles and explosives**, and it does not cover non-kinetic threats such as electronic warfare. The goal of the R&D teams participating in the challenge is to detect and recognise kinetic threats in an area with maximum accuracy, using swarms of small robots and drones.

The challenge involves both **field tests and AI-module tests**. The field tests serve not only to evaluate integrated systems but also to collect representative data for the AI-module tests. The sensor data, particularly the optical data, collected by the participating teams during the field tests are gathered and annotated by the organisers. This should enable the evaluation of the AI modules' ability to recognise the content of the data before mapping the data to a geographic coordinate system. Furthermore, the data used in the AI-module tests are shared across teams, in order to ensure the comparability of the results. In addition, these data remain available after the tests and can be used by the teams to further develop AI modules. The design of the field tests and the AI-module tests are closely related and are **developed jointly for each evaluation campaign**.

During the field tests, **several test areas** are set up, and a rotation schedule is organised for each team to test their system in all areas. The challenge organisers provide the areas to explore in the form of digital maps. For each area, landmarks are positioned on the ground and are indicated on the map to **ensure a clear coordinate system**.

**Various scenarios** can be considered, including in open-air and urban environments. Areas can have various shapes, including elongated ones for scenarios, such as road clearance. Devices may be: (i) fully automatic, such as landmines or victim-operated improvised explosive devices (IEDs); (ii) remotely operated, such as command-operated IEDs; or (iii) directly operated, such as firearms or artillery guns. The involvement of human operators in

the test areas may be excluded for security reasons. Nevertheless, the devices should still be detected as potential threats.

To limit ambiguity in the evaluation protocols and metrics and to encourage the development of specialised AI models, **the types of devices to be recognised in an area are mostly known ones listed and documented in the evaluation plans**. However, to also encourage the ability of these models to recognise any type of threat, a few types of devices not listed in the evaluation plan will be included. The list of device types documented in the evaluation plans is expanded for each evaluation campaign, by including at least the types introduced in the previous campaign.

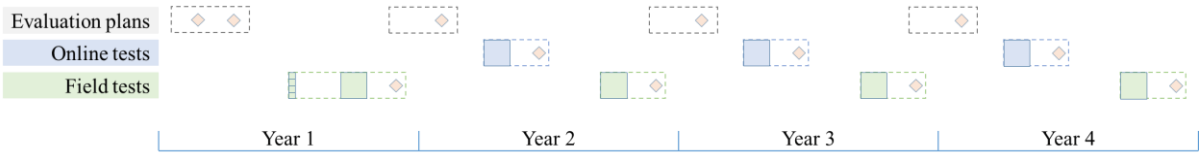
The technological challenge lasts four years and covers **four evaluation campaigns**, each lasting about a year. The first one only involves field tests. The following three evaluation campaigns involve both field and data-based tests. For each of these three campaigns, a proposed general timeline is provided below:

- January: evaluation plan discussion workshop
- April: data-based tests
- June: debriefing workshop
- September: field tests
- November: debriefing workshop

For the first campaign, a proposed general timeline is set out below:

- Spring: evaluation plan discussion workshops
- June: individual on-site trials
- September: field tests
- November: debriefing workshop

This proposed general timeline is illustrated below:




Each field test campaign lasts about a week and a half. The first few days are devoted to setting up the teams and trials, which use a small-scale test area available to the participating teams with minimal constraints. At least three days are devoted to the actual tests. At least one evening session is organised to test in night conditions. Several test areas with various levels of difficulties are available. Different teams can conduct in parallel in the different testing areas. The last day is devoted to a debriefing meeting before the teams' departure.

The precise timeline for each field and AI-module test campaigns is set out in the specific evaluation plan of each evaluation campaign.

Discussion and debriefing workshops gather all stakeholders together and are expected to last about two days, including travelling time. Additional meetings are likely to be needed but can take place online.

Over the challenge duration, field test campaigns are hosted in at least two different sites.

## 3. Systems

Systems should be able to be moved from one test area to another within a few minutes.

## 4. Tasks and metrics

### a. Overview

The table below provides an overview of the tasks that are evaluated in the framework of the challenge.

| Task | Metric | Measurable during | |
|---|---|---|---|
| | | Field tests | AI-module tests |
| Threat classification on sensor data | Classification error rate | | X |
| Threat classification and mapping | Classification error rate | X | X |

These tasks are detailed in the following subsections.

### b. Threat classification on sensor data

The objective of the task is to recognise threat objects in data collected from sensors onboard robots and drones. This is a classic object-classification task, with specific types of objects to be recognised.

The objects to be recognised are targets that pose kinetic threats, i.e. involving projectiles and/or explosives. A list of object types for the most common objects to be recognised is annexed to the evaluation plan. An object type is identified by its name and possible variants. To be correctly recognised, an object type must be assigned a correct name. Further variants of the name not documented in the evaluation plan may be accepted if justified. Some objects might not be listed in the evaluation plan but still need to be identified.

### c. Threat classification and mapping

The task is similar to the previous one, but the recognised threats should be indicated on a map of the area to be explored.

## 5. Communication

Unless otherwise specified, participating teams are free to use their results and methods. The organisers will prepare documents summarising the challenge-level results and submit them to the participating teams for comments and the granting authority for approval before publication.

## 6. Security aspects

All participating systems must be fully compliant with the safety and security regulations in force (annex to be included in the detailed evaluation plans). If compliance cannot be ensured, the team concerned must notify the organising team promptly in order find a suitable solution.

Additional security measures for the test areas can be set out in the detailed evaluation plans, such as:

- restrictions on usable electromagnetic frequencies and power;

- flight restrictions

## 7. Participation rules

Participants must respect the rules to ensure that AI-module tests are not biased and should not look at the data content until the processing is complete.

## 8. Logistics

During each field test period, the organisers make a separate working area available for each team. The teams are responsible for covering their own accommodation and travel costs.

## 9. Threats list

- Improvised explosive devices (IEDs):
    - roadside bombs;
    - concealed explosive devices;
    - booby-trapped buildings and vehicles.
- Minefields or explosive ordnance:
    - concealed minefields;
    - abandoned and unexploded ordnance.
- Enemy drones or unmanned aerial vehicles (UAVs):
    - small, stealthy drones for reconnaissance or attack;
    - UAVs with explosive payloads.
- Snipers or designated marksmen:
    - concealed sniper positions;
    - camouflaged or disguised snipers.
- Camouflaged or concealed enemy positions:
    - trenches, bunkers and dug-in positions;
    - camouflaged sniper positions;
    - hidden machine gun nests.
- Ground warfare assets
    - military infrastructure;
    - armoured Vehicles;
    - dismounted soldiers;
    - artillery and rocket positions.