

EDF-2022-DA-SPACE-SBMEW: Space-based missile early warning

Budget:

The Union is considering a contribution of up to EUR 90 000 000 for this topic under the call EDF-2022-DA.

Number of actions to be funded: Up to one action may be funded for this topic

Objectives

General objective

Taking into full consideration the ongoing EU, Member States and Norway funded activities in this domain, the topic general objective is to contribute to the further development of a European space-based early warning capability against various types of missile threats: ballistic, hypersonic and anti-satellites (ASAT). This topic will focus on the one hand, on the consolidation of the overall system architecture and on the other hand, on the development of the critical technologies needed for such capability.

Specific challenge

The specific challenges of the topic reside in the following considerations:

- recent developments and tests of ballistic missiles, hypersonic gliders and ASAT missiles have recalled the eminent and rising threat to the European people arising from those capabilities;
- there are currently neither sufficient European sensor capabilities for detection and tracking of such threats nor European capabilities available for their interception;
- until today, Europe is dependent on third-party systems for space-based early warning;
- European capabilities for ballistic missile defence (BMD) and against ASAT threats – e.g., sensor capabilities like space-based early warning and the corresponding distribution of object tracking information – are addressed in capability plans of several EU Member States and associated countries, but only partially developed and not yet operational;
- sovereignty and safety are essential for the EU as well as the capability to act, based on its own intelligence, and the ability to defend, based on its own decisions;
- the detection and interception of ballistic and hypersonic threats are complex and costly and would benefit from a cooperative approach at EU level;
- an integrated and inclusive approach to study and develop solutions in a collaborative and coordinated way using the expertise and capacities available in the EU (both at industry and government level), including dedicated national spending, will contribute to a better and sustainable closing of the capability gap in this field.

Scope and types of activities

Scope

Project proposals must address activities needed to further develop a fully European missile early warning and tracking capability that would lead to an autonomy in the field of threat assessment

and theatre defence and the ability to provide a system that is coherent, complementary and interoperable with other systems, including non-EU ones (e.g., NATO systems).

More precisely, project proposals must address:

- the implementation study of a feasible space-based missile early warning (SBMEW) system and its concept of operations (CONOPS), taking into account existing development plans;
- the identification, analysis and mitigation of the critical technical and technological risks associated with the development in the EU of a SBMEW capability, taking into account the status of existing assets within European industry that can contribute to such capability.

Types of activities

The following types of activities are eligible for this topic:

| 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) | 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 design has been developed, including partial tests for risk reduction in an industrial or representative environment | Yes (mandatory) |
| (e) | System prototyping 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 of a defence product, tangible or intangible component or technology | Yes (optional) |
| (h) | Certification 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 following tasks must be performed as part of the mandatory activities of the project:

- Studies:
 - consolidation of the SBMEW mission, system requirements and architecture as a basis for an implementation plan for all intended objectives of the system;
 - maturation of the SBMEW system CONOPS (if possible, supported by simulations), especially addressing the mission objectives, the strategies, tactics, policies and constraints affecting the system operation, the involved organisations, activities and interactions among operators, users from Member States and Norway, and their respective roles and responsibilities;
 - as an optional task: assessment, via models and simulation, of the added value of new imaging technologies (*e.g.*, hyperspectral) for identification of threats;
- Design:
 - definition, development and exploitation of SBMEW system simulations addressing all SBMEW missions, allowing assessment of real time and non- real time performances of the system and interoperability with external systems, including C231 (*e.g.*, NATO, EU and national C2, radars, BMD and SSA32 systems);
 - maturation and de-risking/developments of SBMEW critical subsystems and technologies (especially the detectors, the pointing mechanisms, the cooling mechanisms, the on-board computing, the sun protection and the secure satellites communication and control system), including tests of demonstrators to achieve a level of technological readiness allowing the launch of the real capability in space by end of the decade;
 - update of programmatic elements (*e.g.*, costs, planning, risks, cooperation scheme) for the development of a European SBMEW capability.

³¹ Command and control

³² Space situational awareness

The proposed development should fulfil the following requirements:

- the architecture of the SBMEW system should be composed of:
 - a space segment;
 - a ground segment (mission and control);
 - a user segment
- the CONOPS should address:
 - operations planning, real time operations and deferred time operations;
 - intelligence missions;
 - joint operations with non-space sensor systems for launches observation and space surveillance;
 - joint missions with external sensors and effectors for early warning and missile defence;
- the SBMEW simulations should include for all missions:
 - an integrated representation of the threat;
 - an integrated representation of the environment, including the presence of clouds and sun impact;
 - an integrated representation of the space sensors and platforms including their tasking;
 - on-board and on-ground image and data processing algorithms which should:
 - be able to represent the detection of the threats by the space sensors considered;
 - be able to measure and estimate the trajectory of all detected launches (including related accuracy/uncertainty and launch departure point and predicted impact points);
 - allow to contribute to aggressor identification and to recognise the detected ballistic missiles and launchers within a catalogue of known objects or to identify them as unknown;
 - a demonstration, against all threats, of an end-to-end analysis of SBMEW real-time and non-real-time performances with synthetic data for consolidation of the mission and observation requirements;
 - a demonstration of interoperability with external systems (e.g., NATO, EU and national C2, radars, BMD and SSA systems);
 - an interface with external data providers (e.g., military SSA catalogues);

- demonstration of agility of the system to cope with operational mission change/ evolution;
- the SBMEW risk mitigation activities of the critical subsystems and technologies should include:
 - study and stepwise breadboard if required, to achieve sufficient technological readiness level;
 - detectors;
 - cooling mechanisms;
 - pointing mechanisms;
 - sun protection;
 - on-board computing;
 - Satellite reliable secure command/control and Early Warning Communications

Expected impact

Implementation of a European collaboration on this topic will:

- allow sharing of resources and building a common operational view on ballistic, hypersonic and ASAT missile threat assessment;
- augment dramatically EU political power and international credibility towards superpowers for control of international regulations, control of international treaties, intelligence on missile technology development in specific countries and if necessary operational theatre defence capability.

Beside the establishment of a European sovereignty, it can furthermore provide a significant and valuable in-kind contribution to NATO BMD.