



Brussels, 30.6.2021
C(2021) 4910 final

COMMISSION IMPLEMENTING DECISION

of 30.6.2021

on the financing of the European Defence Fund established by Regulation (EU) No 2021/697 of the European Parliament and the Council and the adoption of the work programme for 2021

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THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, hereafter referred to as the ‘TFEU’,

Having regard Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union, amending Regulations (EU) No 1296/2013, (EU) No 1301/2013, (EU) No 1303/2013, (EU) No 1304/2013, (EU) No 1309/2013, (EU) No 1316/2013, (EU) No 223/2014, (EU) No 283/2014, and Decision No 541/2014/EU and repealing Regulation (EU, Euratom) No 966/2012¹, hereafter referred to as the ‘Financial Regulation’, and in particular Article 110 thereof,

Having regard to Regulation (EU) No 2021/697 of the European Parliament and of the Council of 29 April 2021 establishing the European Defence Fund and repealing Regulation (EU) No 2018/1092², hereafter referred to as the ‘EDF Regulation’, and in particular Article 24 thereof.

Whereas:

- (1) In order to ensure the implementation of the European Defence Fund for the year 2021 it is necessary to adopt a financing decision, which constitutes the annual work programme, for 2021. Article 110 of the Financial Regulation establishes detailed rules on financing decisions.
- (2) The envisaged assistance is to comply with the conditions and procedures set out by the restrictive measures adopted pursuant to Article 215 of the TFEU.
- (3) It is necessary to allow for the payment of interest due for late payment on the basis of Article 116(5) of the Financial Regulation.
- (4) In order to allow for flexibility in the implementation of the work programme, it is appropriate to allow changes which should not be considered substantial for the purposes of Article 110(5) of the Financial Regulation.
- (5) The measures provided for in this Decision are in accordance with the opinion of the EDF Programme Committee established by Article 34 of EDF Regulation.

¹ OJ L 193, 30.7.2018, p.1.

² OJ L 170, 12.5.2021, p.149.

HAS DECIDED AS FOLLOWS:

Article 1
The work programme

The annual financing decision, constituting the annual work programme for the implementation of the European Defence Fund for 2021, as set out in the Annex, is adopted.

Article 2
Union contribution

The maximum Union contribution for the implementation of the programme for 2021 is set at EUR 930 300 000, and shall be financed from the appropriations entered in the following lines of the general budget of the Union:

- (a) budget line 13.0201 - Capability development: EUR 620 200 000;
- (b) budget line 13.0301 - Defence research: EUR 310 100 000;

The appropriations provided for in the first paragraph may also cover interest due for late payment.

Article 3
Flexibility clause

Cumulated changes to the allocations to specific actions not exceeding 20% of the maximum Union contribution set in the first paragraph of Article 2 of this Decision shall not be considered to be substantial for the purposes of Article 110(5) of the Financial Regulation, where those changes do not significantly affect the nature of the actions and the objective of the work programme.

The authorising officer responsible may apply the changes referred to in the first paragraph. Those changes shall be applied in accordance with the principles of sound financial management and proportionality.

Done at Brussels, 30.6.2021

For the Commission
Thierry BRETON
Member of the Commission



Brussels, 30.6.2021
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ANNEX 1

ANNEX

to the

Commission Implementing Decision

on the financing of the European Defence Fund established by Regulation (EU) No 2021/697 of the European Parliament and the Council and the adoption of the work programme for 2021

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1. INTRODUCTION

The European Union is faced with increasing geopolitical instability and a complex set of conventional and new threats while the defence sector is fragmented and lacks investments in important research and capability development projects. Therefore, the Union is taking steps to bear more responsibility for its security and defence, to contribute to its strategic autonomy and freedom of action and to assist in creating a more competitive and integrated European defence technological and industrial base. Following the Preparatory Action on Defence Research (PADR) and the European Defence Industrial Development Programme (EDIDP), the European Defence Fund (EDF) has been created to foster the competitiveness, efficiency and innovation capacity of the defence technological and industrial base throughout the Union. It should complement, leverage and consolidate collaborative efforts and cross-border cooperation between legal entities in developing defence capabilities that respond to security challenges while strengthening and improving the agility of both defence supply and value chains. The EDF should also foster better exploitation of the industrial potential of innovation, research and technological development at each stage of the industrial life cycle of defence products and technologies.

The EDF is implemented through annual work programmes from 2021 to 2027. Priorities identified in the annual work programme are in line with the Union capability priorities commonly agreed by Member States, in particular through the Capability Development Plan (CDP)¹. Due consideration has been given to legacy PADR and EDIDP work programmes, to existing proposals from the Permanent Structured Cooperation (PESCO) framework and to the Common Security and Defence Policy (CSDP) capability shortfalls.

This work program sets out in detail the research topics and the categories of actions to be financially supported by the Fund in the year 2021 (see table below):

- The work programme identifies 15 thematic *categories of actions*, among which research topics are identified, where appropriate.
- The contribution of each *category of actions* to the three *fields* defined in the EDF Regulation² is also indicated.

¹ The purpose of CDP is to increase coherence between Member States' defence planning and to encourage European cooperation by looking at future operational needs and defining common Capability Development Priorities. The latest version of CDP was endorsed by the EDA Steering Board in Capability Directors formation in June 2018.

² Pursuant to article 24(3) the research topics and categories of actions shall cover products and technologies in the fields of:

- (a) preparation, protection, deployment and sustainability;
- (b) information management and superiority and command, control, communication, computers, intelligence, surveillance and reconnaissance (C4ISR), cyber defence and cybersecurity; and
- (c) engagement and effectors.

EDF thematic categories of actions	Fields covered		
	(a)	(b)	(c)
1. Defence medical support, Chemical Biological Radiological Nuclear (CBRN), biotech and human factors	X		
2. Information superiority		X	
3. Advanced passive and active sensors	X	X	
4. Cyber		X	
5. Space		X	
6. Digital transformation	X	X	
7. Materials and components	X	X	X
8. Energy resilience and environmental transition	X		
9. Air combat	X		X
10. Air and missile defence	X	X	X
11. Ground combat	X	X	X
12. Force protection and mobility	X	X	
13. Naval combat	X	X	X
14. Underwater warfare	X	X	
15. Simulation and training	X		

In addition to these 15 thematic *categories of actions*, there are:

- A *category of actions* addressing disruptive technologies on specific *topics*,
- A *category of actions* focused on open calls, including a focus on SMEs, in order to foster innovation as a key objective of the EDF.

EDF non thematic categories of actions
16. Disruptive technologies
17. Open calls for innovative and future-oriented defence solutions

Each *category of actions* may lead to one or more *calls for proposals*, each of them addressing one or more *topics*. The list of *calls for proposals* and associated *topics* addressed in this annual work programme is defined in section 3.

Topics target actions that in accordance with Article 10(3) relate to one or more *activities* listed in the table below. The table includes which *activities* can be covered by research actions and by development actions respectively. A topic can focus on one or more *activities*, but can allow additional *activities* that would lead to (“*upstream activities*”) or result from (“*downstream activities*”) these *activities*.

Activities		Short name	Coverage	
			Research action	Development action
(a)	Activities aiming to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence	Generating knowledge	Covered	Not covered
(b)	Activities aiming 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	Covered	Covered
(c)	Studies, such as feasibility studies to explore the feasibility of new or improved technologies, products, processes, services and solutions	Studies	Covered	Covered
(d)	The 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 which may include partial tests for risk reduction in an industrial or representative environment	Design	Covered	Covered
(e)	The development of a model of a defence product, tangible or intangible component or technology, which can demonstrate the element's performance in an operational environment (system prototype)	System prototyping	Not covered	Covered
(f)	The testing of product, tangible or intangible component or technology	Testing	Not covered	Covered
(g)	The qualification of tangible or intangible component or technology	Qualification	Not covered	Covered
(h)	The certification of product, tangible or intangible component or technology	Certification	Not covered	Covered
(i)	The development of technologies or assets increasing efficiency across the life cycle of defence products and technologies	Increasing efficiency	Not covered	Covered

2. LEGAL BASIS

All actions that will be funded under this work programme have their legal basis in Regulation (EU) 2021/697 (EDF Regulation).

3. ACTIONS IMPLEMENTED UNDER THE WORK PROGRAMME IN 2021

This section lists, for each *category of actions*, the scope of the *calls for proposals* and associated *topics*, together with their main characteristics. These *calls for proposals* and *topics* result from a discussion with the EDF programme committee made of representatives from the Member States and associated countries.

Management mode:

As per Article 8(1) of the EDF Regulation, the actions set out in this work programme shall be implemented in direct management by the Commission.

By way of derogation, in accordance with Article 8(2) of the EDF Regulation, specific actions may, in substantiated cases, be carried out under indirect management by bodies as referred to in point (c) of Article 62(1) of the Financial Regulation, for example in case of complex actions where a project manager has been appointed by co-financing Member States.

The change of management mode set in the present work programme will:

- Be assessed at the time of the award decision and be subject to the prior assessment of the bodies concerned regarding their qualification to manage the grants.
- Require a further decision of the Commission at the level of the College, in accordance with article 110(5) of the financial regulation, taking into account in particular the complexity of the action, the level of Member States co-financing and a cost benefit analysis.

3.1. Defence medical response, Chemical Biological Radiological Nuclear (CBRN), biotech and human factors (MCBRN)

This *category of actions* will lead to two *calls for proposals* in 2021.

3.1.1. EDF-2021-MCBRN-R: Capabilities for CBRN risk assessment, detection, early warning and surveillance

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 18 500 000 under this call
- **Number of actions to be funded:** Several actions, addressing different solutions, may be funded

Proposals will be called against the following topic:

3.1.1.1. EDF-2021-MCBRN-R-CBRNDIM: Detection, identification and monitoring (DIM) of CBRN threats

New and improved methods and technologies for the performant detection, identification and monitoring (DIM) of CBRN agents, as well as epidemics, emerging disease and pandemic influenza constitutes an important part of early detection and warning of infectious disease

events (biological hazards), chemical and radiological threats. CBRN early warning systems also collect, integrate, and inform military users, as well as relevant users in the health security sectors, about potential CBRN threats, epidemics, emerging diseases and pandemic influenza that can cause public health emergencies that undermine the full security of countries, from both natural or intentional origins.

Proposals shall cover the generation of knowledge, methods and technologies leading to improved capacities for sampling, detection, identification, characterisation, monitoring as well as assessment of CBRN threats with a focus on biological agents, but not excluding chemical or radiological threats.

Activities should include but are not limited to innovative, technological improvements in detection technologies, notably regarding the quality of the basic input, *i.e.* data from sensors, methodologies and tools (or databases) for the identification and characterization of agents in complex bio-samples including sampling procedures, dynamic mapping of threats, vulnerabilities and capacities to respond at geographical levels, mapping of strategic CBRN detection technologies and related production capacities in Europe, agent classification and spread prediction based on artificial intelligence/machine learning, data processing, control measures, effectiveness of control measures and monitoring of their implementation in real-time, and use on mobile and field based platforms(modular, scalable and adaptable).

Synergies and complementarity with ongoing activities in the field of CBRN DIM, notably EU funded actions under Horizon2020 and Horizon Europe, shall be ensured.

Targeted activities: Activities aiming to create, underpin and improve knowledge, activities aiming to increase interoperability and resilience, not excluding downstream activities eligible for research actions.

3.1.2. EDF-2021-MCBRN-D: Defence medical countermeasures

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 50 000 000 under this call.
- **Number of actions to be funded:** Several actions, addressing different solutions, may be funded

Proposals will be called against the following topic:

3.1.2.1. EDF-2021-MCBRN-D-MCM: Development of defence medical countermeasures

Defence medical countermeasures (MCMs) must be kept up-to-date, available and able to respond to the continuously changing and novel health threats posed by CBRN. MCMs may include any medicines or medical devices aimed to combat CBRN threats. This extends to countermeasures that prevent or treat the threat, but also to countermeasures that combat novel modes of delivery of such threats.

Proposals should focus on innovation and development of MCMs or an additional integration into military intelligence and information systems and corresponding civil capacities. Proposals are encouraged to provide for an analysis into novel MCMs and related technology,

analysis of gaps and recommendations to ensure baseline preparedness standards and indicators, mapping of CBRN MCM capacities across EU, as well as options for ensuring EU's access and availability of MCMs.

Targeted activities: Study, design, not excluding upstream or downstream activities.

3.2. Information superiority (C4ISR)

This *category of actions* will lead to one *call for proposals* in 2021.

3.2.1. EDF-2021-C4ISR-D: ISR and advanced communications

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 70 000 000 under this call
- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

Proposals will be called against any of the following topics:

3.2.1.1. EDF-2021-C4ISR-D-HAPS: High-altitude platform systems

Unmanned high-altitude platform systems (HAPS) are capable of flying in the stratosphere, at a significantly lower altitude compared to satellite, and with very long endurance. They are ideal carriers for sensor and communication systems to persistently perform intelligence, surveillance and reconnaissance tasks and serve as low delay communication relay, compared to geo-stationary satellites. Such HAPS should be able of carrying on board high resolution of optical and radar sensors as well as low latency communication, possibly through a network of HAPS.

Targeted activities: Studies, design, not excluding upstream activities.

3.2.1.2. EDF-2021-C4ISR-D-COMS: Robust defence multi-dimensional communications

Current tactical data links and communications systems have operational and coalition limitations including vulnerabilities that need to be addressed. Wideband and reliable communication for operational interoperability, mobility and security that is robust against detection, acquisition and jamming are key capabilities for defence operations and electronic warfare, including far from the battlefield.

This topic addresses design and development activities in that respect, using commercial and military secure hardware, software and architecture, including LTE 5G and beyond, digital transceivers, considering multi-functional digital antenna systems, all with a SWAP-C (Size, Weight, Power and Cost) approach.

Targeted activities: Studies, design, prototyping and testing, not excluding upstream and downstream activities.

3.3. Advanced passive and active sensors (SENS)

This *category of actions* will lead to one *call for proposals* in 2021.

3.3.1. EDF-2021-SENS-R: Optronics and radars

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 38 000 000 under this call
- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

Proposals will be called against any of the following topics:

3.3.1.1. EDF-2021-SENS-R-IRD: Infrared detectors

Infrared detectors are technological components for a wide range of systems and applications and their performance are a determining factor for situational awareness and operation superiority. With increasing sophistication, further research and development activities are increasingly demanding and costly. Technological improvements that benefit defence capabilities while supporting the competitiveness of the European defence industry call for a European approach.

This topic addresses components that are enablers for high-performance infrared detectors. It supports the establishment and sustainment of a European supply chain in this domain, independent from end-user restrictions imposed by non-EU nations. Complementarity should be ensured with past and current work funded through national programmes, the EDA framework, and other R&D programmes.

Targeted activities: Activities aiming to create, underpin and improve knowledge, and studies.

3.3.1.2. EDF-2021-SENS-R-RADAR: Advanced radar technologies

New concepts and enhanced technologies for active and passive radars, including new system architectures of hardware building blocks and software modules, adaptive beamforming and multi-spectral/multi-static advanced antennas as well as highly integrated components and new packaging and integration solutions, are to be investigated in order to cope with new and upcoming challenges regarding detection and early warning, thus contributing to a trustworthy situational awareness.

Furthermore, this topic also addresses the investigation on possible optimization of the radar performances in mobile application, including autonomous operations, in particular in severe environment or extreme mission conditions.

Targeted activities: Activities aiming to create, underpin and improve knowledge, activities aiming to increase interoperability and resilience, studies and design.

3.4. Cyber (CYBER)

This *category of actions* will lead to two *calls for proposals* in 2021.

3.4.1. *EDF-2021-CYBER-R: Cyber threat intelligence and improved cyber operational capabilities*

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 13 500 000 under this call
- **Number of actions to be funded:** Several actions, addressing different solutions, may be funded

Proposals will be called against the following topic:

3.4.1.1. EDF-2021-CYBER-R-CDAI: Improving cyber defence and incident management with Artificial Intelligence

Cyber threats are becoming increasingly complex and sophisticated, including new types of threats and attacks that can consist of e.g. malware exploiting unknown vulnerabilities, targeted phishing attacks, abnormal user behaviour etc. That is why research activities are expected to address the use of AI-based systems for improved cyber operations capabilities.

The aim is to focus on research that addresses solutions for preparedness and response against new and evolving threats in cyberspace, including dark and deep web, for improved cyber forensics and cyber defence operations, for example by integrating solutions that must extend usual cyber kill-chain detection capabilities, IT/OT resilience and cyber forensics. The proposals are expected to address AI for cyber operations, including solutions for AI-based incident detection, mitigation, automated handling, response and the integration of AI/automation into existing processes used in cyber operations in order to enhance efficiency and effectiveness.

Targeted activities: Activities aiming to create, underpin and improve knowledge, activities aiming to increase interoperability and resilience, studies and design.

3.4.2. *EDF-2021-CYBER-D: Improved capacity for cyber training and exercises*

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 20 000 000 under this call
- **Number of actions to be funded:** Up to one action may be funded

Development actions for improved cyber training and exercises are needed in order to improve cyber operational capability. Personnel development is one of the key requirements

of effective cyber defence. Extensive training is needed to enhance the skills of cyber defence workforce.

Cyber Ranges help with the education and training of cyber response forces by enabling the simulation of cyber-attacks and the execution of responsive operations in controlled environments. New emerging threats, including the use of artificial intelligence, need to be addressed via cyber operators' training and exercises. Cyber Ranges can also be useful for testing a new countermeasure prior to integrate on real systems. This topic addresses the urgent need for enhanced and better coordinated cyber defence measures in Europe by improving the efficiency of cyber trainings and exercises, including for example those involving defence related critical energy infrastructure.

Proposals will be called against the following topic:

3.4.2.1. EDF-2021-CYBER-D-IECTE: Improved Efficiency of Cyber Trainings and Exercises

The majority of Cyber Ranges have monitoring and/or scoring capabilities that provide a general overview on how the individuals or teams are performing in the training or exercise. However, current systems fail to provide deeper insight into the particular actions cyber operators perform and the status of the environment the participants are in. There is a need for a comprehensive system that (a) allows collecting all such data during trainings and exercises and (b) involves automated analysis tools that assess participant's performance, and c) takes into account scenarios involving user-simulation and systems enabling analysis and assessment of the decision-making process of cyber operators, which should be accessible and interoperable for different cyber ranges.

Since the impact of cyber-attacks must be considered as a cross-domain challenge and many cyber ranges focus only on one domain and its functionalities, there is a need for an improved multi-domain cyber range simulation capability.

The objective of this topic is to create a toolset that allows significantly increased efficiency in the cyber trainings and exercises process while also enhancing cyber ranges interoperability and cost-efficiency.

Targeted activities: Studies, design, system prototyping, and testing not excluding upstream or downstream activities.

3.5. Space (SPACE)

This *category of actions* will lead to one *call for proposals* in 2021.

3.5.1. EDF-2021-SPACE-D: Resilient space-based PNT and SATCOM

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**

The Union is considering a contribution of up to EUR 50 000 000 under this call

- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

This call aims at improving space-based PNT resilience in contested environments through the mapping and analysis of threats. It will complement the on-going EDIDP project on Galileo PRS receivers and contribute to reinforce Galileo as a credible European solution for defence applications.

This call aims also at accompanying the development of European technologies and products for interoperable and resilient military satellite communications.

Proposals will be called against the following topics:

3.5.1.1. EDF-2021-SPACE-D-SGNS: Space- and ground-based NAVWAR surveillance

This topic addresses navigation warfare activities. It aims at collecting information on jamming and spoofing threats, including from space, and at sharing and processing this information in an interoperable way in order to implement NAVWAR services such as detection and geolocation of threats and implementation of countermeasure strategies at GNSS emitter and receiver level, thus improving the resilience of space-based PNT.

Targeted activities: Studies, design, prototyping and testing.

3.5.1.2. EDF-2021-SPACE-D-EPW: European protected waveform and accompanying technologies for resilient satellite communications against jamming

This topic aims at bridging a shared and recognised gap in terms of European interoperable protected waveform for satellite communications in military applications, including in joint operations. The scope also addresses complementary ancillary technologies to provide an integrated multi-layered security and resilience approach for military satellite networks. These developments may have positive externalities on GovSatCom initiative.

Targeted activities: Studies and design, not excluding downstream activities.

3.6. Digital transformation (DIGIT)

This *category of actions* will lead to two *calls for proposals* in 2021.

3.6.1. EDF-2021-DIGIT-R: Artificial intelligence

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 18 500 000 under this call
- **Number of actions to be funded:** Several actions, addressing different solutions, may be funded

Proposals will be called against the following topic:

3.6.1.1. EDF-2021-DIGIT-R-FL: Frugal learning for rapid adaptation of AI systems

An important crosscutting need for Artificial Intelligence is to create technologies for trustworthy autonomous and frugal learning, i.e. the ability of a system to adapt and learn from its environment, including from user supervision, for a reasonable cost and without intervention from expert developers nor regression. Such technologies can be highly disruptive and have high impacts for many capabilities, especially when the information to manage is highly variable or unpredictable and high adaptability is needed. These technologies can also alleviate the current need to provide data to the system developers to get improvements depending on such data, which can be critical when the data is confidential, and is thus critical for defence. They can more generally enhance technological independence. Selected actions should include the organisation of technological challenges addressing well-defined goals in order to bootstrap and drive progress toward answering identified defence needs, while leveraging other research and generating spill over effects.

Targeted activities: Activities aiming to create, underpin and improve knowledge, not excluding downstream activities eligible for research actions.

3.6.2. EDF-2021-DIGIT-D: Cloud technologies

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 40 000 000 under this call
- **Number of actions to be funded:** Up to one action may be funded

Proposals will be called against the following topic:

3.6.2.1. EDF-2021-DIGIT-D-MDOC: Military multi-domain operations cloud

Military operations require higher flexibility and mobility to gain and maintain the initiative. A collaborative, more efficient and digitized secure, cyber resilient battlespace across Land, Air, Maritime and Space domains is key for information superiority, future mission management, spectrum dominance and smart decision support. Therefore, the development of a common shared Information Space with a “Cloud of Clouds” approach, leading to a Multi-Domain Operations Cloud (M-DOC), is needed. The ambition is to combine via sensor fusion existing and future systems into a federated network & collaborative services in order to enable and support Command and Control and provide the capability for an improved battle rhythm for military operations in collaborative multi-domain warfare.

Targeted activities: Studies, design, system prototyping, not excluding upstream and downstream activities.

3.7. Energy resilience and environmental transition (ENERENV)

This *category of actions* will lead to one *call for proposals* in 2021.

3.7.1. *EDF-2021-ENERENV-D: Energy efficiency and energy management*

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following call for proposals
- **Targeted type of applicants:** Any eligible consortium as defined in Articles 9 and 10(4) of the EDF Regulation
- The Union is considering a contribution of up to EUR 133 000 000 under this call.
- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

This call aims at optimising the distribution and management of energy within or between defence systems, e.g. by making use of innovative solutions based on artificial intelligence.

Proposals will be called against any of the following topics:

3.7.1.1. EDF-2021-ENERENV-D-EEMC: Energy independent and efficient systems for military camps

This topic aims at developing concepts, processes and products for autonomous military camp that integrates a wide energy source approach, with several different technological bricks (fuel cells, batteries, synthetic fuels small refinery, hybrid electric generator, deployable solar panel, etc.) with a focus on Energy Security, reducing heat waste and efficiency. The proposals should assess the current industrial solutions and identify the possible needs for adapting existing products to the military operational requirements. Ongoing and finalized defence studies and research, representing a substantial base for this subject, need to be taken into account. The proposed solution should be applicable to military deployable camps (support and mobility) without any drop of operational performances. Moreover, energy transition is an operational asset making it possible to be more efficient, aiming at a better autonomy and strengthening the resilience of military forces. It could also bring tactical benefits like the reduction of noise, thermal and electromagnetic signature.

Targeted activities: Studies, not excluding upstream and downstream activities.

3.7.1.2. EDF-2021-ENERENV-D-NGES: Next generation electrical energy storage for military forward operation bases

This topic aims at developing new alternative technologies for deployable energy storage systems that are reliable, stable, compact, lightweight, high power (SWaP), mobile, safer, smart managed, characterized by the lack of "memory effect" and with a high operating time (number of discharge / charge cycles). In addition, both the technology and energy storage devices should be interoperable with other devices (military and cooperative) used in operations and cooperating areas. Furthermore, the current existing energy storage systems should be assessed for military use. The proposed solution should be easy to deploy, monitor, manage in military forward operation bases and function in different geographical locations, weather and climate conditions (including extreme environments).

Targeted activities: Studies and design, not excluding upstream and downstream activities.

3.7.1.3. EDF-2021-ENERENV-D-PES: Alternative propulsion and energy systems for next generation air combat systems

This topic aim at efficient sub and supersonic enhanced propulsion systems combined with a more efficient on-board energy management system coming mainly from the conversion of

fuel energy by the engine into propulsion, power, compressed air, etc. within an optimized thrust and power integrated system, which are key for next generation air combat systems, and which are likely to require more propulsive and non-propulsive energies. This will require a significant increase of power consumption of new airborne equipment (weapons, detection, communication, etc.), a global management of energy available on board should now be considered, at system level, optimizing together propulsive and non-propulsive energies of military platforms (from generation to transport, storage and use). The efficiency of energy use could be greatly improved, as well as the ecological footprint of Defence systems.

In addition, to preserve the European technological sovereignty, newly developed technology building blocks should include resource-saving technology building blocks from a European supply chain and high-temperature materials. Moreover, the next generation propulsion and energy integrated systems should be evaluated within EU with adapted testbeds. As the latter will be open to such joint EU technology development activities, it would also be an opportunity to enhance cross-border collaboration between large industrial groups, SME and academics.

Targeted activities: Studies, not excluding upstream and downstream activities.

3.8. Materials and components (MATCOMP)

This *category of actions* will lead to one *call for proposals* in 2021.

3.8.1. EDF-2021-MATCOMP-R: *Advanced materials and structures, and critical electronics*

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 40 000 000 under this call
- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

This call aims at research to increase the strength of defence systems leading to improved safety and higher survival of military personnel, and the independence of the European defence industry on critical electronic components used in advanced defence systems. Complementarity should be ensured with work done in other categories of actions such as *Ground combat* and *Naval combat* and with other R&D programmes, including the *Space programme*. Although the results should clearly benefit a defence purpose, synergies with specific calls in the other programmes should be explored.

Proposals will be called against the following topics:

3.8.1.1. EDF-2021-MATCOMP-R-PHE: Materials and structures for enhanced protection in hostile environments

This topic aims to improve the performance of protective materials against ballistic and novel threats in different military applications. The funded project should address aspects related to characterization and testing of new and aged materials and prepare a platform to test the

outcome of current and future projects (funded by national, EDA Cat. B, PADR, EDF but also other R&D programmes) in terms of performance and improved functionality.

Targeted activities: Activities aiming to create, underpin and improve knowledge, and studies, not excluding other activities eligible for research actions.

3.8.1.2. EDF-2021-MATCOMP-R-RF: Advanced RF components

This call aims at strengthening the supply chain for leading-edge radio-frequency defence applications. It builds on a rich legacy of R&D projects performed over the last decades in national, EDA and EU activities. The outcome of these projects should be brought to a next level of maturity, thereby in particular demonstrating that a viable European supply chain, independent from end-user restrictions imposed by non-EU nations is achievable.

Targeted activities: Activities aiming to increase interoperability and resilience, studies and design.

3.9. Air combat (AIR)

This *category of actions* will lead to two *calls for proposals* in 2021.

3.9.1. EDF-2021-AIR-R: Next generation vertical take-off and landing systems

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 40 000 000 under this call.
- **Number of actions to be funded:** Up to one action may be funded

Proposals will be called against the following topic:

3.9.1.1. EDF-2021-AIR-R-NGRT: Next generation rotorcraft technologies

Military rotorcraft are the workhorses of battlefields, fulfilling missions like armed reconnaissance, search and rescue, medical evacuation, utility, air assault, and close aerial support, which are critical for the success of military operations.

This topic addresses technologies for next generation rotorcraft systems, with higher speed, greater endurance and longer range, to be fully integrated in the future battlefields through a systems-of-systems approach.

Targeted activities: Studies, including demonstrations, not excluding upstream or downstream activities eligible for research actions.

3.9.2. EDF-2021-AIR-D: Avionics and advanced air combat

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**

The Union is considering a contribution of up to EUR 41 000 000 under this call.

The budget earmarked on 2021 appropriations for this action will be completed by an amount of EUR 109 000 000 from 2022 appropriations. This 2022 complementary budget is subject to the adoption of a separate financing decision.

- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

Proposals will be called against the following two topics:

3.9.2.1. EDF-2021-AIR-D-EPE: Enhanced pilot environment for air combat

The improvement in the performance of effectors and platforms and the networking of more and more various systems in an increasingly collaborative combat mode result in a greater diversity and a greater amount of information to deal with, while requiring an even higher pilot's responsiveness. The objective is therefore to improve the gender-neutral cockpit environment and to provide the pilot of next generation air combat systems with enhanced tools and avionics in order to keep the pilot efficiently focused on the mission to be carried out, e.g. through AI-based pilot support, integrated sensor management, path finding technology or manned-unmanned teaming (MUM-T) enhanced features.

Targeted activities: Studies, including demonstrations, design, not excluding upstream or downstream activities.

3.9.2.2. EDF-2021-AIR-D-CAC: European interoperability standard for collaborative air combat

Nowadays, European air forces are built on a wide variety of heterogeneous systems, thus leading to the challenge of interoperability at the functional, software and hardware levels. The objective is therefore to develop jointly a European perspective enabling the member states to address with a middle to long-term perspective collaborative air warfare, through a common European standard that must be compliant with ongoing activities in Europe in that respect and with NATO too. It is to combine all still existing and future air combat systems in Europe, manned and/or unmanned, which shall be enabled to interoperate for the fulfilment of their missions in an unprecedented, integrated and connected manner. The air combat systems shall be able to share efficiently their sensors and effectors resources, and information and situational awareness, overall ultimately leading to decision and air superiority.

Targeted activities: Studies, design, including demonstrations, not excluding upstream or downstream activities.

3.10. Air and missile defence (AIRDEF)

This *category of actions* will lead to one *call for proposals* in 2021:

3.10.1. EDF-2021-AIRDEF-D: Protection against high-velocity aerial threats

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**

The Union is considering a contribution of up to EUR 28 000 000 to support a single action under this call

The budget earmarked on 2021 appropriations for this action will be completed by an amount EUR 72 000 000 from 2022 appropriations. This 2022 complementary budget is subject to the adoption of a separate financing decision.

- **Number of actions to be funded:** Up to one action may be funded

Proposals will be called against the following topic:

3.10.1.1.EDF-2021-AIRDEF-D-EATMI: Endo-atmospheric interceptor – concept phase

Defeating post-2030 threats such as manoeuvring ballistic missiles, hypersonic cruise missiles or hypersonic glide vehicle requests a high-speed and very early reconnaissance and high-speed C2 system, but a responsive and effective interception system too. There is thus a need to investigate for a concept for a European interceptor, encompassing e.g. new aerodynamic and actuator system for the high manoeuvrability, highly agile guidance concepts, sensor systems able to operate in different air levels, etc. This would be eventually an opportunity to relocate in Europe related technologies and materials, and in the meantime a way to complement valuably the NATO BMD with a consistent EU contribution.

Targeted activities: Studies, not excluding upstream or downstream activities.

3.11. Ground combat (GROUND)

This *category of actions* will lead to two *calls for proposals* in 2021.

3.11.1. EDF-2021-GROUND-R: Precision Strike Capabilities

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**

The Union is considering a contribution of up to EUR 10 000 000 under this call
- **Number of actions to be funded:** Up to one action may be funded

Proposals will be called against the following topic:

3.11.1.1.EDF-2021-GROUND-R-IW: Improved warheads

Defeating improved protection systems of main combat platforms, hardened targets and reinforced (critical) infrastructures remains a focal challenge for military operations. Enhanced effects on targets, like blast, perforation, penetration, shock, bubble effects or electromagnetic pulse, are required to defeat such advanced protection systems. In this way, the development of new types of warheads with higher performance is required. Activities should cover the research on an enhanced penetration performance.

Targeted activities: Activities aiming to create, underpin and improve knowledge, activities aiming to increase interoperability and resilience, studies and design.

3.11.2. EDF-2021-GROUND-D: Fleet upgrade and close combat

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 41 000 000 under this call
The budget earmarked on 2021 appropriations for this action will be completed by an amount of EUR 109 000 000 from 2022 appropriations. This 2022 complementary budget is subject to the adoption of a separate financing decision.
- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

Proposals will be called against the following topics:

3.11.2.1.EDF-2021-GROUND-D-FMGV: Future modular ground vehicles and enabling technologies, including green technologies

The evolving operational environment requires the development of next generation and the modernisation of current armoured platforms with improved robustness, agility, versatility and interoperability. Moreover, future land vehicles will require the ability to operate in adverse conditions, in digitised battlefield and network centric environments, and to obtain scalable effects, while ensuring efficient maintainability and support, high level of operational readiness and optimized life cycle cost. This topic addresses mainly technologies enhancing the mobility performance of ground platforms, making them more capable, modular and energy-efficient.

Targeted activities: Design, system prototyping and testing, not excluding upstream or downstream activities.

3.11.2.2.EDF-2021-GROUND-D-UGVT: Unmanned ground vehicle technologies

There are significant cooperation opportunities in the Union regarding unmanned systems, which could be based on a shared operational concept and the resulting harmonisation of requirements. Moreover, the CDP analysis identifies the need to deploy unmanned systems to reduce the danger to human personnel and manned platforms, as well as to increase robustness, sustainability and resilience of ground systems. A comprehensive set of unmanned systems should contribute to the capability of land manoeuvre in the joint operational environment to gain positional advantage in respect to the adversary. Purely unmanned tracked vehicles as funded under EDIDP will be not considered under this topic.

Targeted activities: Studies, design and system prototyping, not excluding downstream activities.

3.11.2.3.EDF-2021-GROUND-D-3CA: BLOS collaborative close combat architecture

The availability of mobile precision systems able to provide the necessary high degree of accuracy and efficiency, avoiding widespread collateral damage, and reducing exposure of

friendly forces is a priority for Member States' armed forces. In this context, some requirements are becoming increasingly important, e.g. to provide the land and naval combat units with the ability to defeat at medium and long ranges, and with a very high degree of accuracy and reliability. In order to meet these requirements, development activities on a beyond line of sight (BLOS) collaborative close combat architecture are required.

Targeted activities: Studies, design, system prototyping and testing, not excluding upstream or downstream activities.

3.12. Force protection and mobility (PROTMOB)

This *category of actions* will lead to one *call for proposals* in 2021:

3.12.1. EDF-2021-PROTMOB-D: Soldier & logistic systems

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 50 000 000 under this call
- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

Proposals will be called against the following topics:

3.12.1.1.EDF-2021-PROTMOB-D-SS: Development of full-size demonstrators for soldier systems

Soldier Systems support force protection, increase operational effectiveness, reliability and endurance of individual soldiers and formations. They comprise the gender-neutral equipment of individual military personnel to be able to operate with a sufficient level of protection in any operational environment. Soldier Systems are a primary force multiplier. The development and integration of cutting-edge technology is key for forces.

Targeted activities: Studies, design, system prototyping and testing not excluding upstream or downstream activities.

3.12.1.2.EDF-2021-PROTMOB-D-DMM: Development of a digital system for the secure and quick exchange of information related to military mobility

Timely and accurate logistic information and sharing is required for the efficient management and coordination of multinational logistic networks and hubs. Information management for multinational logistics, including for Military Mobility related information, contributes to enhanced efficiency and effectiveness, notably to the reduction of overall costs and environmental footprint, flexibility of forces, improved interoperability and fair burden sharing between Member States or conservation of scarce local resources.

In particular, no results generated through this topic shall be subject to any control or restriction by non-associated third countries or by non-associated third-country entities,

directly, or indirectly through one or more intermediate legal entities, including in terms of technology transfer.

Targeted activities: Design or system prototyping, not excluding upstream or downstream activities.

3.13. Naval combat (NAVAL)

This *category of actions* will lead to two *calls for proposals* in 2021.

3.13.1. EDF-2021-NAVAL-R: Smart ships

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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:**

The Union is considering a contribution of up to EUR 43 500 000 under this call, while considering a contribution of up to:

- EUR 29 000 000 to support an individual proposal addressing the topic EDF-2021-NAVAL-R-DSSDA
- EUR 14 500 000 to support an individual proposal addressing the topic EDF-2021-NAVAL-R-SSHM.

- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

Proposals will be called against any of the following topics:

3.13.1.1.EDF-2021-NAVAL-R-DSSDA: Digital ship and ship digital architecture

Integration, in a digital environment, of the technologies on board the naval platforms with a view to enable optimization of design phases, a better integration of sensors and combat systems, facilitate predictive maintenance including remote system health monitoring and mitigation, and provide training environment for a reduced crew.

Targeted activities: Studies and design, not excluding upstream activities eligible for research actions.

3.13.1.2.EDF-2021-NAVAL-R-SSHM: Ship structural health monitoring

Researching on structural health monitoring techniques and their integration in an expert system specific for naval vessels.

Targeted activities: Studies and design, not excluding upstream activities eligible for research actions.

3.13.2. EDF-2021-NAVAL-D: Offshore patrol vessel

- **Targeted type of actions:** Development actions
- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 60 000 000 under this call
- **Number of actions to be funded:** Up to one action may be funded

Naval combat systems and platforms are essential assets to ensure presence where needed, and exercise control and power at sea.

Proposals will be called against the following topic:

3.13.2.1.EDF-2021-NAVAL-D-MMPC: Modular and multirole patrol corvette

The design of a new multirole and modular corvette class vessel able to increase current capabilities of the navies mainly in terms of Maritime Situational Awareness, Surface Superiority and Power Projection and also to carry-out other regular missions done by the navies such as to ensure freedom of navigation.

Targeted activities: Studies and design, not excluding upstream activities.

3.14. Underwater warfare (UW)

Not addressed in the 2021 work programme.

3.15. Simulation and training (SIMTRAIN)

Not addressed in the 2021 work programme.

3.16. Disruptive technologies (DIS)

This *category of actions* will lead to one *call for proposals* in 2021.

3.16.1. EDF-2021-DIS-RDIS: *Research for disruptive technologies for defence applications*

- **Targeted type of actions:** Research actions contributing to disruptive technologies for defence
- **Form of funding:** Grant following call for proposals
- **Targeted type of applicants:** Any consortium of eligible legal entities as defined in Article 9 of the EDF Regulation and involving at least two legal entities established in at least two different Member States or associated countries. These two legal entities 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:**
The Union is considering a contribution of up to EUR 60 000 000 under this call
- **Number of actions to be funded:** Several actions, addressing different topics, may be funded

- **Other information:** Grants signed under this call for proposals will implement a lump sum approach

This call aims at to focus research and development to develop the next generation of active systems for enhanced protection of

Proposals will be called against the following topics:

3.16.1.1.EDF-2021-DIS-RDIS-QSENS: Quantum technologies

The possession and deployment of quantum technologies for sensing is potentially a game changer in many defence applications, which means that maturing and mastering these technologies is necessary for mission superiority, but also competitiveness. In particular, quantum sensors for positioning, navigation and timing (PNT) and target acquisition (TA), including chip-sized accelerometers and gyroscopes, quantum vector magnetometers for magnetic navigation/geo-referencing based on magnetic anomaly maps, and electromagnetic and optronics sensing, could be investigated.

Targeted activities: Activities aiming to create, underpin and improve knowledge, activities aiming to increase interoperability and resilience, studies, design.

3.16.1.2.EDF-2021-DIS-RDIS-NLOS: Non-line-of-sight optical sensors applications

NLOS applications can extend the perception range of optical sensors to areas hidden from direct view while conserving the high spatial optical resolution. Novel quantum and optical sensing devices, laser technologies and computational algorithms such as geometrical reconstruction and artificial intelligence could thus be investigated in order to expand the perception range of the forces and therefore increase their survivability and their superiority on the battlefield.

Targeted activities: Activities aiming to create, underpin and improve knowledge, activities aiming to increase interoperability and resilience, studies.

3.16.1.3.EDF-2021-DIS-RDIS-OTHR: Over-the-horizon radars applications

In order to enhance situational awareness and operation superiority, there is a EU requirement to improve detection, tracking and identification capabilities of over wide areas, with increased range of detection and minimum latency. High frequency (HF) over-the-horizon (OTH) systems need therefore to be improved whilst an EU concept for cognitive and scalable network of HF OTH sensors could be investigated.

This topic addresses the technologies for an EU OTH radar network concept offering deep collaborative strategic surveillance and data sharing. In this regard, both HF Surface- and Sky- Wave radar technologies, possibly in combination with higher frequency sensors, should be explored regarding their respective advantages in terms of covered area in long ranges and gap filler.

Targeted activities: Activities aiming to increase interoperability and resilience, studies, design.

3.16.1.4.EDF-2021-DIS-RDIS-AMD: New materials and technologies for additive manufactured defence applications

Additive manufacturing (AM) allows producing multi-functional parts and has been introduced into various industry segments over the last decade. For future military

applications employing materials that are even more advanced, the AM process still requires significant technology development in order to establish robust and high yield processes to tap its full potential. The complexity of the necessary processes of additive manufacturing requires a profound understanding of material chemistry, metallurgical structures on microstructural level as well as defect detection on the macroscopic level. Research activities could include but are not limited to identification and analysis of material properties, such as (super)alloys or concrete composites, full functional 3D printed electrified structures, new technologies to further improve military propulsion, AM parts or structures for an improved protection of soldiers and equipment, specialized AM-materials for function and structure in next-gen ammunition and missiles or AM technologies for ballistic functional structures as well as new approaches to lightweight applications. Materials and products have to be as safe and sustainable as possible by design and during their life cycle³.

Proposals should balance R&T efforts in the following areas:

- Identification and analysis of new materials for AM for defence application
- Innovative AM technologies and procedures for the production of multi-functional parts

Targeted activities: Activities aiming to create, underpin and improve knowledge.

3.17. Open calls for innovative defence technologies (OPEN)

This *category of actions* will lead to three *calls for proposals* in 2021.

3.17.1. EDF-2021-OPEN-RDIS: Open call addressing disruptive technologies for defence

- **Targeted type of actions:** Research actions contributing to disruptive technologies for defence
- **Form of funding:** Grant following call for proposals
- **Targeted type of applicants:** Any consortium of eligible entities as defined in Article 9 of the EDF Regulation and involving at least two legal entities established in at least two different Member States or associated countries. At least two of the eligible legal entities established in at least two Member States or 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:**
The Union is considering a contribution of up to EUR 10 000 000 under this call
- **Number of actions to be funded:** Several actions, addressing different solutions, may be funded
- **Other information:** Grants signed under this call for proposals will implement a lump sum approach

Successful SME beneficiaries may be offered Business Coaching, to reduce the time of bringing the results to the next phase, e.g. development.

Proposals will be called against the following topic:

³ COM(2020) 667 final - Chemicals Strategy for Sustainability; Towards a Toxic-Free Environment, COM(2021) 400 final - Pathway to a Healthy Planet for All; EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'

3.17.1.1.EDF-2021-OPEN-RDIS-open: Research contributing to disruptive technologies for defence

The proposals should consist of activities aiming to create, underpin and improve disruptive technologies that can achieve significant effects in the area of defence.

Targeted activities: Generating knowledge, not excluding downstream eligible activities for research actions.

Range of financial contribution of the Union per proposal: The requested funding should match the ambition of the proposed action and be duly justified. In any case, the requested funding should not exceed EUR 4 000 000.

3.17.2. *EDF-2021-OPEN-R: Open call focused on SMEs for research on innovative and future-oriented defence solutions*

- **Targeted type of actions:** Research actions
- **Form of funding:** Grant following 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) or research organisations
- **Indicative budget for the call:**
The Union is considering a contribution of up to EUR 17 500 000 under this call
- **Number of actions to be funded:** Several actions, addressing different solutions, may be funded
- **Other information:** Grants signed under this call for proposals will implement a lump sum approach

Successful SME beneficiaries may be offered Business Coaching, to reduce the time of bringing the results to the next phase, e.g. development.

Proposals will be called against the following topic:

3.17.2.1.EDF-2021-OPEN-R-SME: Research on innovative and future-oriented defence solutions

This topic addresses innovative defence technologies, materials and solutions, including those that can improve readiness, deployability, reliability, safety and sustainability of EU forces in all spectrum of tasks and missions, for example in terms of operations, equipment, infrastructure, basing, energy solutions, new surveillance systems.

Targeted activities: Any eligible activities for a Research action, excluding studies only.

Range of financial contribution of the Union per proposal: The requested funding should match the ambition of the proposed action and be duly justified. In any case, the requested funding should not exceed EUR 4 000 000.

The share of eligible costs allocated to research organisations within the consortium cannot exceed 40% of the total eligible cost of the proposed action.

3.17.3. *EDF-2021-OPEN-D: Open call dedicated to SMEs for development of innovative and future-oriented defence solutions*

- **Targeted type of actions:** Development actions

- **Form of funding:** Grant following 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:**
The Union is considering a contribution of up to EUR 36 000 000 under this call
- **Number of actions to be funded:** Several actions, addressing different solutions, may be funded
- **Other information:** Grants signed under this call for proposals will implement a lump sum approach

Successful SME beneficiaries may be offered Business Coaching, to reduce the time of bringing the results from the SME-specific projects to the next phase, whether the next phase being further development or the market.

Proposals will be called against the following topic:

3.17.3.1.EDF-2021-OPEN-D-SME: Development of innovative and future-oriented defence solutions

This topic addresses innovative defence products, solutions, materials and technologies, including those that can improve readiness, deployability, reliability, safety and sustainability of EU forces in all spectrum of tasks and missions, for example in terms of operations, equipment, infrastructure, basing, energy solutions, new surveillance systems.

Targeted activities: At least design or beyond, not excluding upstream activities

Range of financial contribution of the Union per proposal: The requested funding should match the ambition of the proposed action and be duly justified. In any case, the requested funding should not exceed EUR 4 000 000.

3.18. Other actions

These actions will support some communication activities on the political priorities related to the European Defence Fund, dissemination activities, matchmaking events and awareness-raising activities. These activities, which are referred to in Article 32.3 of the Regulation (EU) 2021/697 (EDF Regulation), will be implemented by Commission departments.

In addition, these actions will cover the recruitment of external expertise necessary for the evaluation of EDF proposals (remunerated experts referred to in Article 237 of the Financial Regulation), as well as the development and support of IT systems adapted to EDF specificities (this includes the website activities of the European Network of Defence-related Regions).

Form of funding	Public procurement in direct management
Indicative budget	The Union is considering a contribution of up to EUR 600 000 to support these actions

The information and communication activities referred to in Article 32.2 of the Regulation (EU) 2021/697, will be implemented under the institutional autonomy from the EDF administrative budget.

Information and publicity obligations for the recipients of Union funding referred to in Article 32.1 of the Regulation (EU) 2021/697, will be addressed in the grant agreement.

Business Coaches in the European Defence Fund

Small and Medium-sized Enterprises play a role in achieving more innovative solutions. To provide an easy entrance into participating in the European Defence Fund, open SME-calls have been introduced. To reduce the time of bringing the results from the SME-specific actions to the next phase, whether the next phase being development or the market, the European Commission will provide business coaching to the SME beneficiaries under the SME-calls. This action will support:

- The setting up of a pool of experts that can provide targeted business coaching;
- A mechanism for matching between the skills offered by the coaches and the requirements for coaching by the SME and the actual assignment of the coaches.

In addition, such business coaching will also be proposed to SMEs involved in the awarded actions under the open disruptive research call.

Form of funding	Public procurement in direct management
Indicative budget	The Union is considering a contribution of up to EUR 1 200 000 to support this action

4. INDICATIVE BUDGET

Union actions*	Total budget and percentage of 2021 appropriations					
	Research		Development		TOTAL	
- Grants	EUR 309 500 000	33,3%	EUR 619 000 000	66,6%	EUR 928 500 000	99,8%
- Prizes						
- Procurement						
- Blending operations						
*Among which:						
<i>benefitting the cross-border participation of SMEs</i>	<i>EUR 17 500 000</i>	<i>5,65 %</i>	<i>EUR 36 000 000</i>	<i>5,81 %</i>	<i>EUR 53 500 000</i>	<i>5,76 %</i>
<i>supporting disruptive technologies for defence</i>	<i>EUR 70 000 000</i>	<i>22,61 %</i>			<i>EUR 70 000 000</i>	<i>7,53 %</i>
<i>for direct award</i>						
- Other actions ⁴	EUR 600 000	33,3%	EUR 1 200 000	66,7%	EUR 1 800 000	0,2%
TOTAL	EUR 310 100 000	33,3%	620 200 000 EUR	66,7%	EUR 930 300 000	100%

Appendix 2 to this work programme is providing detailed figures per *category of actions*.

Appendix 3 to this work programme is providing a multiannual indicative budget summary for each *category of actions*.

Reference of the operational budget lines:

- For Research: 13.03
- For Development: 13.02

⁴ Costs arising from technical or administrative assistance such as preparatory, monitoring, control, audit and evaluation activities including corporate information technology system.

5. SUMMARY INFORMATION AND FUNDING PRINCIPLES

Summary information

In 2021, the Commission will run the following actions:

- 23 competitive calls for proposals, among which 11 to support research actions and 12 to support development actions.

Grants will be awarded to consortia after the publication of calls for proposals.

Funding principles

Pursuant to Article 13 of the EDF Regulation, maximum funding rates that will apply to eligible costs of funded actions will be determined for each activity covered by the action and will be composed of:

- a baseline funding rate (see **Table 1** below);
- an increase in the baseline funding rate ('bonus') where conditions are met (see **Table 2** below).

The overall increase in the baseline-funding rate following the application of the increase of funding rates listed in Table 2 cannot exceed 35% of the total eligible costs of the activity.

The financial assistance of the Union provided under the Programme including the increased funding rates cannot exceed the values provided in **Table 3**.

Indirect eligible costs shall be determined by applying a flat rate of 25% of the total direct eligible costs, excluding direct eligible costs for subcontracting and financial support to third parties and any unit costs or lump sums that include indirect costs.

As an alternative, indirect eligible costs may be determined in accordance with the recipient's usual cost accounting practices on the basis of actual indirect costs provided that those cost accounting practices are accepted by national authorities for comparable activities in the defence domain, in accordance with Article 185 of the Financial Regulation, and that they have been communicated to the Commission by the recipient. By way of indication, this optional regime will be implemented as follows:

- Before the signature of the grant agreement:
 - o Usual accounting practices of the opting applicant to calculate its indirect costs to be described in detail in the application;
 - o National authority to certify that these accounting practises are accepted at national level for comparable activities in the defence domain;
 - o The Commission to check if the indirect costs calculated by the applicant do not contain ineligible costs within the meaning of Article 186 of the Financial Regulation and will make adjustments, where applicable, for the calculation of the maximum grant amount.
- At the end of the action:
 - o The opting beneficiary declares its actual indirect costs calculated following the methodology agreed ex ante;

- Financial statement of the opting beneficiary to be accompanied by a Certificate of Cost Statement (CFS) provided by an external auditor as foreseen in the Model Grant Agreement;
- The auditor establishing the CFS will follow the methodology agreed ex-ante to certify the amount of the actual indirect costs.
- Possibility for the Commission to audit the actual indirect costs following the methodology agreed ex ante (internal audit service or external mandated auditors).

The necessary details and forms (template for the description of the usual accounting practises of the applicant, conversion table, list of ineligible costs) will be part of the call documents published by the Commission on the website of the institution (annexes to the Guide for applicants).

Table 1. Applicable baseline funding rates

Activities		Baseline funding rate	
		Research action	Development action
(a)	Activities aiming to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence	100% of eligible costs	<i>Not applicable</i>
(b)	Activities aiming 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	100% of eligible costs	Up to 65% of eligible costs
(c)	Studies, such as feasibility studies to explore the feasibility of new or improved technologies, products, processes, services and solutions	100% of eligible costs	Up to 90% of eligible costs
(d)	The 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 which may include partial tests for risk reduction in an industrial or representative environment	100% of eligible costs	Up to 65% of eligible costs
(e)	The development of a model of a defence product, tangible or intangible component or technology, which can demonstrate the element's performance in an operational environment (system prototype)	<i>Not applicable</i>	Up to 20% of eligible costs
(f)	The testing of product, tangible or intangible component or technology	<i>Not applicable</i>	Up to 45% of eligible costs
(g)	The qualification of tangible or intangible component or technology	<i>Not applicable</i>	Up to 70% of eligible costs
(h)	The certification of product, tangible or intangible component or technology	<i>Not applicable</i>	Up to 70% of eligible costs
(i)	The development of technologies or assets increasing efficiency across the life cycle of defence products and technologies	<i>Not applicable</i>	Up to 65% of eligible costs

Table 2. Increase of funding rates (bonus) for development actions:

Condition to be fulfilled to get the corresponding bonus	Bonus (additional number of percentage points to the baseline funding rate)
PESCO bonus	
Action developed in the context of the permanent structured cooperation (PESCO)	+ 10%
SME bonus	
Proportion of eligible costs allocated to SMEs established in the EU $\geq 10\%$ (for the activity concerned)	Proportion of eligible costs allocated to non-cross-border SMEs established in the EU (up to maximum 5%) + Twice the proportion of eligible costs allocated to cross-border SMEs established in the EU
Mid-cap bonus	
Proportion of eligible costs allocated to Mid-caps established in the EU $\geq 15\%$ (for the activity concerned)	+ 10%

Table 3. Applicable maximum funding rates

Activities		Maximum funding rate	
		Research action	Development action
(a)	Activities aiming to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence	100% of eligible costs	<i>Not applicable</i>
(b)	Activities aiming 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	100% of eligible costs	Up to 100% of eligible costs
(c)	Studies, such as feasibility studies to explore the feasibility of new or improved technologies, products, processes, services and solutions	100% of eligible costs	Up to 100% of eligible costs
(d)	The 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 which may include partial tests for risk reduction in an industrial or representative environment	100% of eligible costs	Up to 100% of eligible costs
(e)	The development of a model of a defence product, tangible or intangible component or technology, which can demonstrate the element's performance in an operational environment (system prototype)	<i>Not applicable</i>	Up to 55% of eligible costs
(f)	The testing of product, tangible or intangible component or technology	<i>Not applicable</i>	Up to 80% of eligible costs
(g)	The qualification of tangible or intangible component or technology	<i>Not applicable</i>	Up to 80% of eligible costs
(h)	The certification of product, tangible or intangible component or technology	<i>Not applicable</i>	Up to 80% of eligible costs
(i)	The development of technologies or assets increasing efficiency across the life cycle of defence products and technologies	<i>Not applicable</i>	Up to 100% of eligible costs

APPENDIX 1: SUMMARY OF CALLS AND CALL TOPICS PER CATEGORY OF ACTIONS

Categories of actions	Research		Development	
	Calls	Call topics	Calls	Call topics
	11	17	12	20
1. Defence medical support, CBRN, biotech and human factors	EDF-2021-MCBRN-R	EDF-2021-MCBRN-R-CBRNDIM	EDF-2021-MCBRN-D	EDF-2021-MCBRN-D-MCM
2. Information superiority			EDF-2021-C4ISR-D	EDF-2021-C4ISR-D-HAPS EDF-2021-C4ISR-D-COMS
3. Advanced passive and active sensors	EDF-2021-SENS-R	EDF-2021-SENS-R-IRD EDF-2021-SENS-R-RADAR		
4. Cyber	EDF-2021-CYBER-R	EDF-2021-CYBER-R-CDAI	EDF-2021-CYBER-D	EDF-2021-CYBER-D-IECTE
5. Space			EDF-2021-SPACE-D	EDF-2021-SPACE-D-SGNS EDF-2021-SPACE-D-EPW
6. Digital transformation	EDF-2021-DIGIT-R	EDF-2021-DIGIT-R-FL	EDF-2021-DIGIT-D	EDF-2021-DIGIT-D-MDOC
7. Energy resilience and environmental transition			EDF-2021-ENERENV-D	EDF-2021-ENERENV-D-EEMC EDF-2021-ENERENV-D-NGES EDF-2021-ENERENV-D-PES
8. Materials and components	EDF-2021-MATCOMP-R	EDF-2021-MATCOMP-R-PHE EDF-2021-MATCOMP-R-RF		
9. Air combat	EDF-2021-AIR-R	EDF-2021-AIR-R-NGRT	EDF-2021-AIR-D	EDF-2021-AIR-D-EPE EDF-2021-AIR-D-CAC
10. Air and missile defence			EDF-2021-AIRDEF-D	EDF-2021-AIRDEF-D-EATMI
11. Ground combat	EDF-2021-GROUND-R	EDF-2021-GROUND-R-IW	EDF-2021-GROUND-D	EDF-2021-GROUND-D-FMGV EDF-2021-GROUND-D-UGVT EDF-2021-GROUND-D-3CA
12. Force protection and mobility			EDF-2021-PROTMOB-D	EDF-2021-PROTMOB-D-SS EDF-2021-PROTMOB-D-DMM
13. Naval combat	EDF-2021-NAVAL-R	EDF-2021-NAVAL-R-DSSDA EDF-2021-NAVAL-R-SSHM	EDF-2021-NAVAL-D	EDF-2021-NAVAL-D-MMPC
14. Underwater warfare				
15. Simulation and training				
16. Disruptive technologies	EDF-2021-DIS-R	EDF-2021-DIS-R-QSENS EDF-2021-DIS-R-NLOS EDF-2021-DIS-R-OTHR EDF-2021-DIS-R-AMD		
17. Open calls for innovative and future-oriented defence solutions	EDF-2021-OPEN-RDIS EDF-2021-OPEN-R	EDF-2021-OPEN-RDIS-open EDF-2021-OPEN-R-SME	EDF-2021-OPEN-D	EDF-2021-OPEN-D-SME

APPENDIX 2: 2021 ANNUAL BUDGET PER CATEGORY OF ACTIONS

Categories of actions	Budget								
	Research		Development		Research and Development				
	Total		Total		Total				
1. Defence medical support, CBRN, biotech and human factors	18,5 M€		50 M€		68,5 M€				
2. Information superiority	-		70 M€		70 M€				
3. Advanced passive and active sensors	38 M€		-		38 M€				
4. Cyber	13,5 M€		20 M€		33,5 M€				
5. Space	-		50 M€		50 M€				
6. Digital transformation	18,5 M€		40 M€		58,5 M€				
7. Energy resilience and environmental transition	-		133 M€		133 M€				
8. Materials and components	40 M€		-		40 M€				
9. Air combat	40 M€		41 M€ (complemented up to 109 M€*)		81 M€ (complemented up to 109 M€*)				
10. Air and missile defence	-		28 M€ (complemented up to 72 M€*)		28 M€ (complemented up to 72 M€*)				
11. Ground combat	10 M€		41 M€ (complemented up to 109 M€*)		51 M€ (complemented up to 109 M€*)				
12. Force protection and mobility	-		50 M€		50 M€				
13. Naval combat	43,5 M€		60 M€		103,5 M€				
14. Underwater warfare	-		-		-				
13. Simulation and training	-		-		-				
16. Disruptive technologies	60 M€		-		60 M€				
17. Open calls for innovative and future-oriented defence solutions	27,5 M€		36 M€		63,5 M€				
Other actions	0,6 M€		1,2 M€		1,8 M€				
TOTAL	310,10 M€	Among which		620,20 M€ <i>(+290 M€*)</i>	Among which		930,30 M€ <i>(+290 M€*)</i>	Among which	
		Disruptive	SMEs		Disruptive	SMEs		Disruptive	SMEs
		70 M€	17,5 M€		-	36 M€		70 M€	53,5 M€

* From 2022 appropriations, subject to the adoption of a separate financing decision

APPENDIX 3: MULTINANNUAL INDICATIVE BUDGET SUMMARY PER CATEGORY OF ACTIONS

Categories of actions	2017 (PADR)	2018 (PADR)	2019 (PADR & EDIDP)	2020 ⁵ (EDIDP)	2021 ⁶ (EDF)	2022 ⁷ (EDF)	Total	
	in M€	in M€	in M€	in M€	in M€	in M€	in M€	in %
1. Defence medical support, CBRN, biotech and human factors				13,50	58,50		72,00	4,13%
2. Information superiority			107,35 ⁸	85,90 ⁶	70,00		263,26	15,10%
3. Advanced passive and active sensors			10,00		38,00		48,00	2,75%
4. Cyber			21,64	14,30	33,50		69,44	3,98%
5. Space			43,97	22,50	50,00		116,47	6,68%
6. Digital transformation			1,55	5,70	58,50		65,75	3,77%
7. Energy resilience and environmental transition					133,00		133,00	7,63%
8. Materials and components		11,98			40,00		51,98	2,98%
9. Air combat			15,98	22,00	41,00	109,00	187,98	10,79%
10. Air and missile defence				13,50	28,00	72,00	113,50	6,51%
11. Ground combat		5,40	40,05	16,00	41,00	109,00	211,45	12,13%
12. Force protection and mobility	6,55		1,53		50		58,08	3,33%
13. Naval combat	35,48		14,29	20,00	103,50		173,27	9,94%
14. Underwater warfare				22,50	-		22,50	1,29%
15. Simulation and training				3,50	-		3,50	0,20%
16. Disruptive technologies			4,33		60,00		64,33	3,69%
Undefined categories, including SME calls & other actions	0,95	1,88	10,32	10,00	65,30		88,45	5,07%
TOTAL	42,98	19,26	271,02	249,40	930,3	200 /300	1742,956	100,00%

⁵ Budget per call

⁶ Indicative budget per call

⁷ 2022 budget complements for actions funded with 2021 and 2022 appropriations. These 2022 budget complements are subject to the adoption of a separate financing decision

⁸ Including direct awards