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REFERENCE DOCUMENT GUIDING DEFENCE INNOVATION

DrOID 2023

CONTENTS

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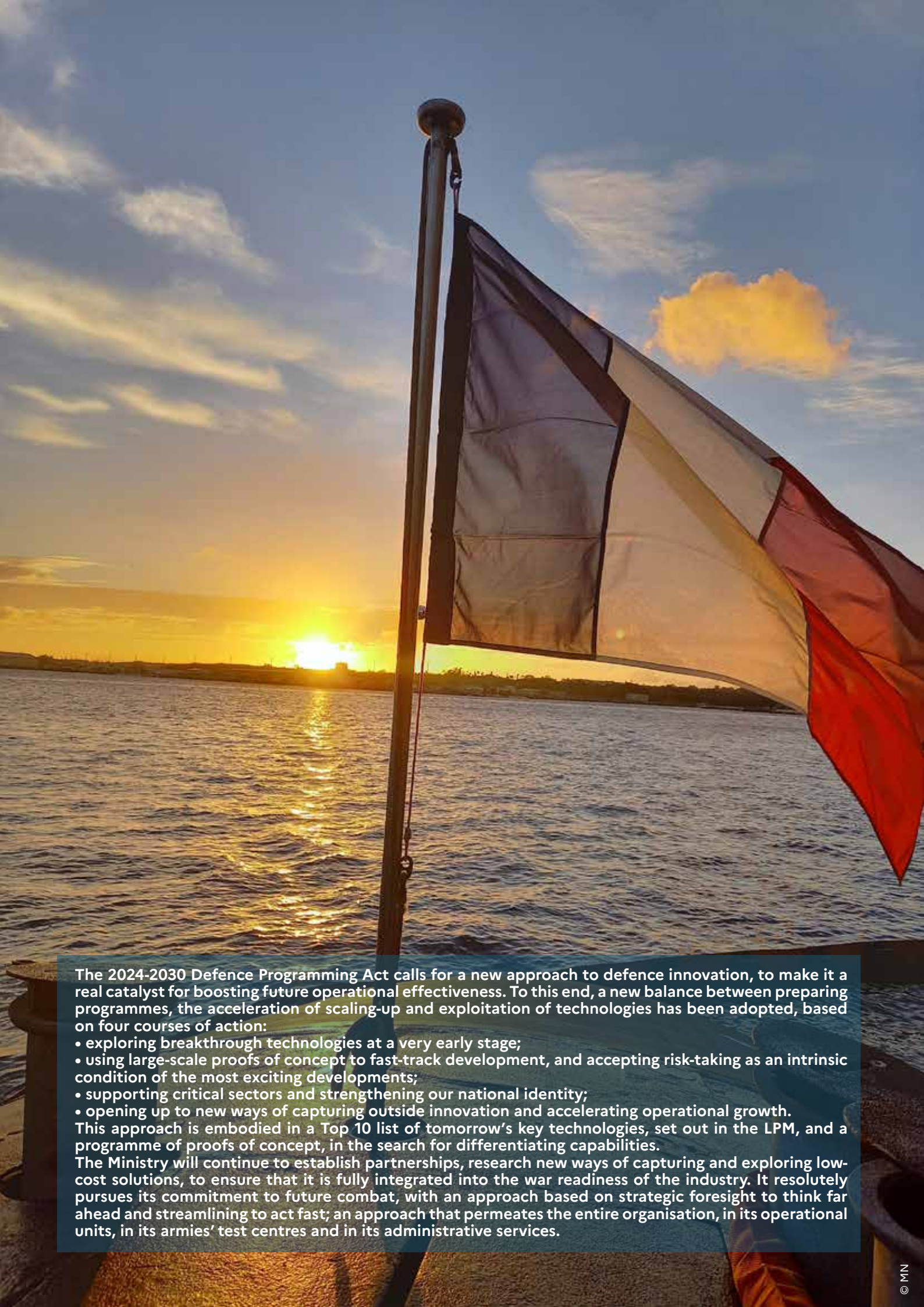
LPM 2024-2030 : A REAFFIRMED NEED FOR INNOVATION



The 2024-2030 Defence Programming Act calls for a new approach to defence innovation, to make it a real catalyst for boosting future operational effectiveness. To this end, a new balance between preparing programmes, the acceleration of scaling-up and exploitation of technologies has been adopted, based on four courses of action:

- exploring breakthrough technologies at a very early stage;
- using large-scale proofs of concept to fast-track development, and accepting risk-taking as an intrinsic condition of the most exciting developments;
- supporting critical sectors and strengthening our national identity;
- opening up to new ways of capturing outside innovation and accelerating operational growth.

This approach is embodied in a Top 10 list of tomorrow's key technologies, set out in the LPM, and a programme of proofs of concept, in the search for differentiating capabilities.

The Ministry will continue to establish partnerships, research new ways of capturing and exploring low-cost solutions, to ensure that it is fully integrated into the war readiness of the industry. It resolutely pursues its commitment to future combat, with an approach based on strategic foresight to think far ahead and streamlining to act fast; an approach that permeates the entire organisation, in its operational units, in its armies' test centres and in its administrative services.

1.1 Addressing new areas of conflict

In recent years, our competitors' actions in new areas of conflict have multiplied: deep space, cyber, the information battlefield and the seabed. What these spaces have in common is that they are complex, marked by power dynamics and conducive to the deployment of hybrid courses of action. Because of their specific characteristics, these actions are difficult to attribute and the distinction between the civilian and the military remains blurred; they fuel the dynamics of competition and conflict on a global scale. We therefore need to consolidate our know-how and knowledge and seize opportunities to consolidate our strategic autonomy in the face of our competitors.

Strategies have been published to this effect, and their implementation has been launched over the period of the LPM 2019-2025: Armed Forces Cyber Strategy and Space defense strategy in 2019; Cyber combat doctrine for influence in 2021; and Ministerial Strategy for seabed warfare in 2022. From a technological point of view, operational superiority in these new fields requires the most recent innovations and the creation and maintenance of defence industrial and technological base (BITD) at the highest level. The LPM 2024-2030 gives these strategies the means to be fully deployed.

Cyber defence

The acceleration of the digitisation of the battlefield and the extension of conflicts to the digital sphere are leading to new vulnerabilities, and therefore to an increase in the risks facing our armed forces, and on the other hand to new opportunities for action. The ambition of the 2024-2030 LPM is to continue to develop a first-rate cyber defence, robust and credible in the face of our strategic threats, capable of ensuring the long-term resilience of the Ministry's critical activities and interoperability with our allies. With this in mind, the main challenge for cyber defence is to develop a coherent multi-faceted tool, enabling all operational resources to carry out their missions despite aggressive elements operating in digital space (defensive capability), and to seize the opportunities offered by the development of a more offensive capability, either to achieve more effectively the effects already achievable by existing capabilities, or to complete the range of achievable effects.
The diverse range of courses of action will make it possible to adapt to technological developments, to support the most sensitive companies in the defence sector and to support the National agency for information systems security (ANSSI) in the event of a national cyber security crisis. Finally, efforts are also focused on the information technology fight for influence (L2I), the subject of the «information battlefield» paragraph.

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Space

Outer space is essential to the safety and security of our society. Today it is at the heart of strategic and industrial competition, affecting both civil ('New Space') and military applications (growing conflict between states) and threatening our freedom of movement and autonomy in space. New Space is a paradigm shift in the space industry and economy, characterised in particular by the emergence of private players bringing with them new working methods, innovative technologies and significant private investment.

Faced with these upheavals, France's national space strategy aims to strengthen our own autonomy, with two main challenges: - guaranteeing the control, availability, safety and security of national capabilities or capabilities of national interest, in order to maintain the supply of space services in support of military operations and government authorities. To achieve this, it focuses on three areas: strengthening military strategic intelligence and operations support capabilities (observation, listening, telecommunications, positioning/navigation, meteorology, geography); extending space situational awareness (SSA) capabilities to monitor activity in all orbits; and developing the capability to conduct in situ operations in space. This ambition, which received additional impetus in the 2019-2025 LPM, is fully developed in the 2024-2030 LPM. In terms of capabilities, this strategy is set out in a roadmap that focuses innovation work on subjects specific to military applications and aims to take advantage of the results of Research & Development carried out for civilian applications, by relying on the various innovation support mechanisms set up by the Defence Innovation Agency, on the projects supported by France 2030, of which space is one of the ten priorities, on those supported by the European Union, on the Research & Technology activities of the CNES and on French Competitive Clusters. In particular, the Ministry of the Armed Forces is closely monitoring the development of advances made by French start-ups in this field and supporting those that could lead to dual applications. Observing the evolution of the economic model sometimes associated with these innovative technologies, it is taking the liberty of supplementing the usual proprietary framework with a «service contract» model.

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Seabed

France is present in all the world's oceans except the Arctic, and occupies the second largest maritime area in the world, with economic exploitation rights. But its maritime issues extend to the common spaces crossed by the submarine cables and pipes for transporting data, electricity and hydrocarbons, which link all the territories of the French Republic to each other and to other countries. Of the 450 submarine communications cables currently in service (carrying 99% of intercontinental digital data exchanges), 51 are linked to French territories.

Recent years have seen the emergence of very broad legal interpretations of maritime law by certain States, for the purpose of appropriating resources or maritime spaces in the light of the geopolitical situation in the area. Our chief adversaries have turned this into a new area of conflict with:
• the rise of state and private exploration and exploitation initiatives ;
• the common practice of the unclaimed acquisition of common areas or areas under the responsibility of another State;
• the upsurge of activities to subvert the law.

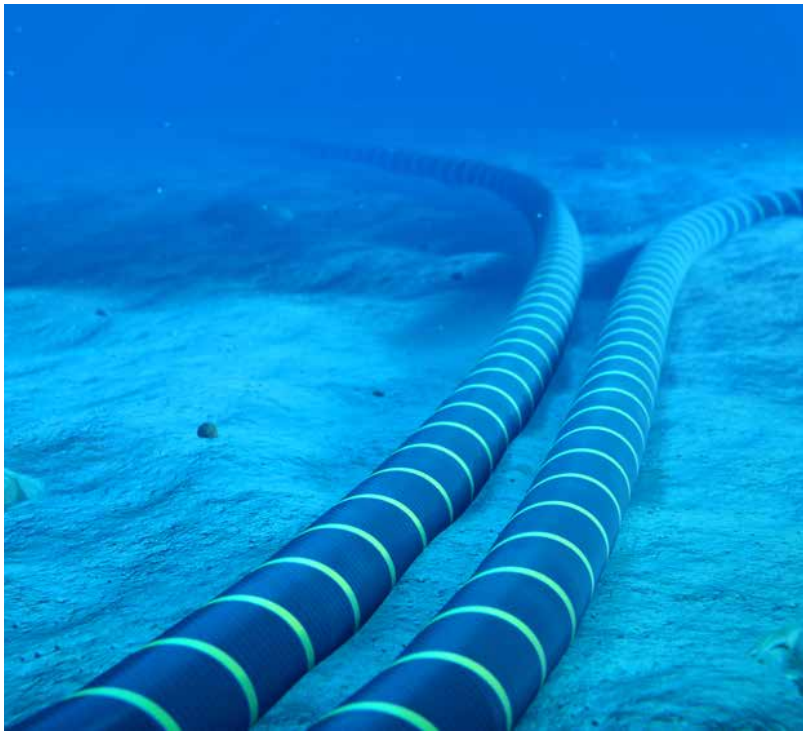
Developments in endurance (mobility), autonomy (navigation) and detection (sonar, etc.) technologies have given certain powers access to areas of the deep that were previously inaccessible on a long-term basis, creating threats to our infrastructures, our resources and our freedom of action.

In 2022, France has therefore adopted a strategy for controlling the seabed, designed to:

- guarantee the freedom of action of our forces
- protect our underwater infrastructures
- protect our resources
- be ready to act and pose a credible threat

The operations to be carried out with this objective range from hydro-oceanographic operations to underwater intervention and surveillance missions. The ministry will draw on its exploration and mapping capabilities, its current and future resources for intervention under the sea, and also its intelligence resources. The aim is to «know», «monitor» and «act», in particular by using drones (i.e. autonomous vehicles) and robots capable of operating at depths of up to 6,000 metres, with sensors designed for this environment. France will also be renewing its hydrographic capabilities by equipping itself with state-of-the-art sensors, measuring equipment, robots and operating systems. Finally, drone and robot technology will also benefit the new generation of mine warfare resources.

This strategy will take advantage of technological and industrial opportunities, as well as cooperation with our closest partners. Finally, it will be based on the «France 2030» plan, for which the President of the Republic has made the seabed one of his ten strategic objectives.



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Information battlefield

While war consists primarily of combat, it is also the clash of two competing wills that the protagonists try to impose on each other, through direct or indirect campaigns, in order to win support while at the same time seeking to reduce the support of their adversary. This is nothing new. However, the importance of social media in everyday life has led to a major paradigm shift: this technology reaches people on a massive scale, instantaneously, and weakens the ability to put information into perspective. In this dispersed space, any individual, group or State has the ability to acquire legitimacy within a network that it can then easily influence to rapidly mobilise violence and undermine the legitimacy of the various players in a crisis. The French armed forces are thus subject to informational attacks in cyberspace, orchestrated by groups or states hostile to their action.

Acting in the field of information and perceptions is therefore a necessity to explain the meaning of French operations, defend their image and even restrict the freedom of action of competitors. Controlling hostile actions in the sphere of information is therefore now a fully-fledged component of the cyber field. Action in the information battlefield requires a wide range of high-level skills: psychology, sociology, languages, computer graphics, etc. It also requires special technologies and specific tools that are constantly evolving: mass information processing and artificial intelligence, to monitor networks, detect and analyse content and the environment.

1.2 Key priority technologies

To avoid the surprise of a disruptive technology that would upset the strategic balance, and instead give our armed forces the upper hand, the Ministry has included in the LPM 24-30 a list of key priority technologies that will be the subject of dedicated efforts, with the aim of gradual application to armament programmes. These technologies are hypervelocity, directed energy weapons, artificial intelligence, autonomous systems (robots, drones, space), the electromagnetic spectrum and extended electronic warfare, sensors in the age of quantum technologies, the military adaptation of new energy technologies developed by civilian industry - in particular the engine hybridisation of land, naval and air vehicles, stealth and invisibility, quantum computing for sovereign capabilities such as intelligence and deterrence, and communications in all environments using new technologies (in particular lasers).

Hypervelocity

While hypersonics refers to speeds in excess of Mach 5, hypervelocity combines hypersonics and manoeuvrability. Historically, ballistic missiles fall into the first category, but new hypervelocity weapons are appearing on the battlefield or are the subject of major development efforts: hypersonic manoeuvring gliders and hypersonic propelled missiles.

Hypervelocity represents a breakthrough in terms of deep strikes and penetration of enemy anti-aircraft defences, particularly given the poor predictability of flight paths compared with ballistic weapons. Hypersonic glider technology therefore has the potential to break new ground, which needs to be assessed before it can be adopted.

In addition, in view of the emergence of threats that could arise from these technologies, we also need to invest in high-end air defence systems. The guidelines concern propulsion, manoeuvrability, thermics and protection against this threat.

Mastering manoeuvrability will involve modelling flows and physical and chemical properties linked to the ionisation and dissociation of molecules, ablation and their control. Increased computing capacity and AI will contribute to this. High thermal loads require the development of resistant materials and research into innovative technologies for controlling heat exchange.

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Directed energy weapons

Directed energy weapons offer a new, broad-spectrum capability that can be used in a variety of environments for offensive or defensive purposes. In terms of anti-drone warfare (ADW), they provide a diversified means of action in the face of emerging threats that are becoming immune to jamming. Increasing their power will open the way to diversified applications, such as self-protection of platforms against various threats. Advances in electrical power generation and management mean that high-power sources can be made more compact and lighter, for applications on anti-aircraft and land-based weapons systems. These capabilities offer major operational breakthroughs: unlimited bursts, high rates of fire, multi-targeting on overwhelming threats (swarms), gradually increased effects.

Two options are being explored: electromagnetic and laser weapons.

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In the electromagnetic field, the priority area of research is the development of compact high-power sources over a wide range, to generate long or sub-nano-second pulses. It is also important to conduct research into pulse shaping lines that can deliver monopolar or bipolar pulse trains (ULB), as well as high-power directional antenna systems (array antennas/dielectric-loaded antennas). In the field of lasers, the anti-drone experiment supported by the Defence Innovation Agency in 2020-2021 led to the order in mid-2022 of a first operational prototype, and upstream studies are continuing to improve its power, eye safety and sovereignty (of production).

Artificial intelligence

Artificial intelligence is a dual-use technology that performs tasks long reserved for humans, based on three factors: the availability of digitised information; accessible computing power; and algorithmic advances.
For the Ministry of the Armed Forces, this technology applies equally to weapons systems, operational information systems and day-to-day organic applications, each of which has a commonality with civilian technologies and variable production cycles. The Ministry's priority for AI is to master the issues of governance, security (risk management), on-boardability and robustness, along three lines of R&D, which could be the subject of shared efforts under the European Defence Fund:
- **Explainable AI:** its acceptability with regard to human interaction, hybrid AI systems combining symbolic and digital elements.
- **Frugal AI** (techniques for *small data*) and embedded AI, distributed AI, *edge computing*.
- **Evaluation**, **verification** and **qualification methods**. The Ministry's in-house expertise of algorithmic techniques will contribute to confidence in the AI systems employed by the Ministry.

For defence, the applicability of recent AI techniques is proving decisive in many areas of innovation, including the analysis of diverse, complex digital flows (image, video, text, sound, speech), the design of intelligent real-time sensors including Detection, Recognition and Identification (DRI) functions, multi-target tracking and pinpointing, and the analysis of situations such as the detection of changes, anomalies and singularities. AI thus contributes to cybersecurity and information superiority, particularly in terms of the fight against disinformation and digital influence.


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This posture is becoming increasingly necessary given the accessibility of techniques for creating «fake news». Indeed, among the most significant advances, 'transformers' and 'GAN' (generative adversarial network) architectures have made rapid progress from automatic language processing to other applications such as image processing. Designed to create content autonomously (data, text, video, images or sound), generative AI models represent an unprecedented advance in the field of artificial intelligence. Their popularity with the general public due to their accessibility and ease of use, combined with their growing development, are having a significant impact in various sectors. Defence has therefore naturally seized on the subject and will be using these models for a variety of purposes: drawing up fact sheets, assisting with IT development, helping with human resource management, generating geographical maps including features of interest, or even writing plausible scenarios. Their deployment will be based partly on the Ministry's internal capabilities, through experimentation with open-source models, and partly in collaboration with the national networks (start-ups, SMEs and major groups), which will enable them to be rapidly scaled up to serve the forces.
In addition, the increase in on-board computing capacity and advances in energy efficiency mean that complex algorithmic tasks can now be carried out as close as possible to operational environments. AI is used in its predictive and learning phases on sensors, embedded systems and, more generally, in the context of the Internet of (very) small objects. Today, these AIs respond to specific problems in a uniform way. More versatile embedded AI must be designed, capable of reconfiguring itself and interacting with the physical and digital environment. This is

particularly the case for interactions between AI instances, through opportunistic collaboration as connections arise, based on consensus and the search for globally or locally optimised solutions to improve system autonomy, resilience in the face of events and the achievement of mission objectives.

Finally, one of the conditions for the successful integration of AI into defence systems is the creation of the large quantities of data needed for machine learning. While massive data processing tools have now reached a good level of maturity and stabilised architectures, particularly with the rise of the ARTEMIS. IA platform and its software development kit, it will be necessary to consolidate the data sharing model for learning purposes, both within the Ministry and with the outside world (academia, industry). The use of AI for defence systems must rely heavily on the civilian, academic and industrial networks, while retaining a strong internal capacity to control and manage their production. In addition to a policy of calling for projects (ASTRID calls, calls associated with a particular subject, etc.), soliciting innovative civilian players and examining unsolicited proposals from these players, the Ministry of Armed Forces is preparing a project entitled «Animation and Stimulation of the Defence AI Ecosystem», the technical and financial management of which will be entrusted to a leading academic player, with initial work planned for 2024.

This work will be carried out in synergy with the roadmaps of the defence industry prime contractors, with whom exchanges have been set up, particularly on the mapping of trusted French players specialising in AI (SMEs).

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Autonomous systems

The use of military systems incorporating autonomy will contribute to the superiority of French forces in all environments (Land, Air, and Sea – both on the surface and under the sea). Operating in complex, unfamiliar or hostile environments, such systems must be equipped with capabilities for perception, orientation, multi-sensor data analysis, trajectory planning and navigation that are both efficient and robust to the constraints encountered.

Managing this increased complexity inevitably leads to an increase in the number and complexity of onboard sensors, in the resulting information density and in inter-system connectivity to meet mission requirements. In this context, advances in artificial intelligence are opening up new prospects in the field of robotics through advanced analysis, 3D understanding of the environment and navigation without GNSS, decision-making autonomy (for elementary functions that never remove humans from the lethal decision-making process) or assistance in optimising multi-constraint plans in real time.

While numerous innovations are being prepared in terms of electromechanical architecture, energy optimisation and location management to meet the constraints of different operational environments, the future of robotics and autonomous systems also lies in developing the ability to evolve in swarms or packs. In the near future, robotic systems will need to be able to organise themselves by dynamically allocating tasks thanks to the intelligence distributed between the agents making up the swarm. Considerable effort will also have to be devoted to securing such systems to make them resilient to cyber-attacks, which will be one of the main areas of attack on our independent systems (by taking control or inhibiting, for example, a swarm of aerial drones).

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Electromagnetic spectrum and enhanced electronic warfare

Mastery of the electromagnetic spectrum and electronic warfare (EW) in particular are key factors in informational and operational superiority in a field marked by digitisation and the miniaturisation of sensors. This digitisation of the battlespace and connected collaborative combat have resulted in an increased need for operational capabilities and functions, the growing complexity of systems using radio frequencies (RF) and an increasingly dense, contested and dynamic electromagnetic environment. These developments, together with the diversity of threats, such as the emergence of self-adapting radar systems, mean that we need to equip ourselves with precise and sensitive tools for mapping, analysing and using the RF spectrum.

In addition, the convergence of the ROEM, EW and Cyber domains is a fundamental development which, combined with profound changes in doctrine, organisation and employment concepts, could open up major capability developments. This extended electronic warfare contributes to essential capabilities such as self-protection against electronic attack (jamming, deception), surveillance and intelligence, as well as the fight in the information battlefield. In particular, the control of hostile actions in the field of perceptions has recently become a fully-fledged area of cyber ambition.

New energy technologies

The energy revolution is an ecological necessity, but it is also an opportunity for operational superiority (resilience, autonomy, discretion, etc.). The emergence of dual high-performance technologies means that systems can be envisaged with such autonomy and endurance that they open up new concepts of use, potentially breaking new ground. This is the case for aerial drones such as HAPS, or underwater drones with very long mission durations. Cross-development of armoured vehicles can provide other operational advantages such as acoustic or thermal discretion, and additional power. It will require the integration of high-energy-density batteries. The emergence of sustainable fuels must be supported, particularly in the aeronautical industry. We also need to study the opportunities for applying emerging civilian technologies to support the growing deployment of energy needs: hydrogen thermal generators, fuel cells, smart electricity grids, small jet engines, etc.

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Stealth and invisibility

The development of stealth and invisibility technologies is a major challenge for operational superiority in the years and decades to come, in various environments. The rapid development of threats in the electromagnetic and acoustic spectrums (self-adaptive, multi-static, low-frequency, broadband detection systems, etc.) means that stealth and invisibility technologies must evolve accordingly. France is therefore resolutely ambitious in this area.

Stealth is applied in a number of areas (passive and active stealth with respect to enemy radars or sonars, optical stealth, stealth of electromagnetic emissions such as communication, sensors) where France has launched several exploratory initiatives, alone and in cooperation.

In the air, stealth is a breakthrough and fundamental element in the definition of a SCAF generation fighter.

The techniques deployed will focus largely on absorbing materials and morphology for radar stealth, requiring work on the design of thin materials with effective absorption capacities over wide frequency bands and for multiple incidences. This work must include developments in experimental design techniques and incorporate multi-scale and multi-physical constraints.

In these areas, the Defence Innovation Agency is supporting or has supported the following projects in particular:

CARPE DIEM MAGIS

has enabled the development, on a semi-industrial scale, of anti-isotopic materials that absorb microwaves, are broadband and thin, and are composed of a polymer matrix loaded with ferromagnetic petals.

MOLIERE (in cooperation with AID/ CNRS)

For the development of meta-materials for acoustics and two-phase «polymer/ magnetic filler» composite materials and nanocomposites based on hydrocarbon fillers for electromagnetism.

PACIPHIQUE

whose objective is to produce an operational stealth system in both thermal infrared and visible light. Applications include thermal regulation for civil engineering (intelligent glazing), space (thermal control) and modulation of the thermal signature for the defence sector.

PTBE

This project aims to develop tents that meet a dual need, for:
- thermal protection for the civilian world
- for military applications: camouflage and stealth in the IR range.

Quantum technologies

Progress in understanding and controlling quantum phenomena is set to usher in a new technological revolution. The properties of quantum bodies, combined with photonics and nanotechnologies, provide capabilities that are unequalled to date. This potential breakthrough has an impact on several areas of interest to defence, including sensors, quantum computing and secure communications.

Sensors in the age of quantum technologies

This will involve identifying the potential of new inertial sensors for navigation and geolocation applications: ultra-stable quantum oscillators could offer a navigation or time distribution solution that is independent of GNSS. Quantum sensors will make it possible to see and engage further than the adversary and will play a key role in electromagnetic intelligence (ROEM), electronic warfare and cyber. Considerable leaps in performance are expected, by several orders of magnitude in terms of sensitivity.

Quantum computing

Quantum computing, exploiting the principles of overlay and intricacy, opens up a wide range of applications, including quantum cryptography.

Investment in this field is accelerating sharply, with a significant proportion of it focused on the various possible hardware technologies. The Defence Innovation Fund is supporting solutions in this area by investing in companies such as Quandela and Pasqal.

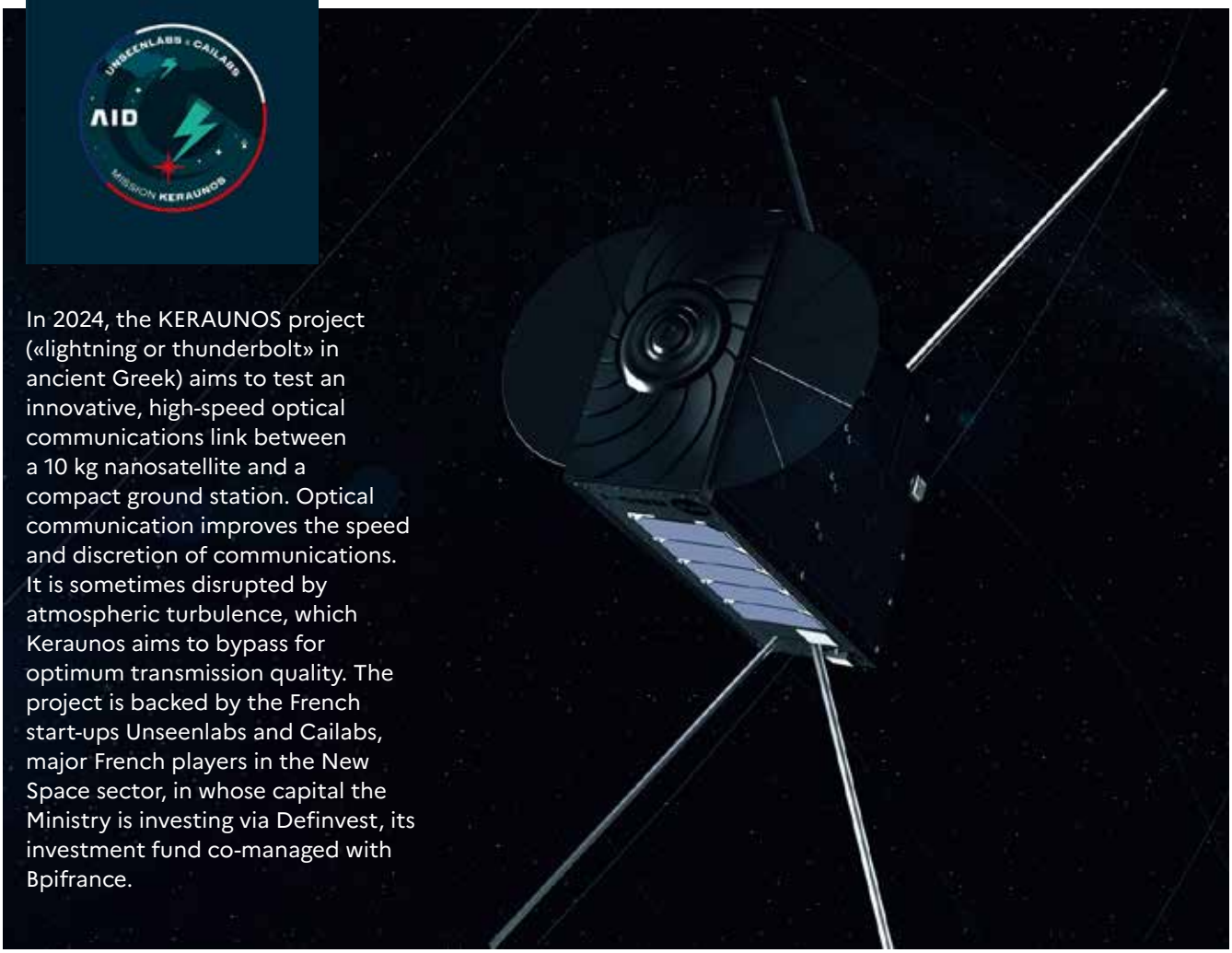
The areas of interest for quantum computing focus on the identification and validation of use cases, including the optimisation of the implementation of information and communication systems, mission planning, computational problems linked to the exploitation of intelligence of military interest or to learning, the resolution of linear problems, particularly in electromagnetism, or the modelling of physical systems in fluid flow or electromagnetic propagation, or quantum cryptography.

Communications

As mentioned above, the electromagnetic environment is increasingly dense, contested and dynamic, while the mass of data to be exchanged is constantly growing. The need for links themselves is growing, for both civil and military uses: the Internet of Things (IoT), constellations of low-altitude communications satellites, and so on. Technological innovation is therefore required to meet a number of challenges facing the telecommunications of the future: increasing data rates, overcoming electromagnetic spectrum congestion, reducing the risks of interception and obstruction, and adapting congestion to ever smaller and more numerous carriers. These innovations will involve both electromagnetic communications and research into new forms of communication:

- In the electromagnetic field, work will continue on waveforms and antennas, where significant progress has been made on drones, satellite constellations and the Internet of Things (IoT) with French companies such as Ternwaves, Greenerwaves and Anywaves;
- Among the alternative methods being developed to overcome the saturation and vulnerabilities of electromagnetic communications, the ability of lasers to transmit high data rates will be assessed, in particular through the Keraunos project for ground links with a nanosatellite.

In 2024, the KERAUNOS project («lightning or thunderbolt» in ancient Greek) aims to test an innovative, high-speed optical communications link between a 10 kg nanosatellite and a compact ground station. Optical communication improves the speed and discretion of communications. It is sometimes disrupted by atmospheric turbulence, which Keraunos aims to bypass for optimum transmission quality. The project is backed by the French start-ups Unseenlabs and Cailabs, major French players in the New Space sector, in whose capital the Ministry is investing via Definvest, its investment fund co-managed with Bpifrance.



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1.3 Courses of action

LPM 24-30 defines four main courses of action to give innovation the means to be deployed to meet the challenges of our time. What exactly do they cover?

Exploring upstream disruptive technologies

The first area of defence innovation in LPM 24-30 is the exploration of these potentially disruptive technologies, which we have just reviewed and whose advent would create new areas of threat and destabilise the balance of power. They will be explored and nurtured using all the mechanisms appropriate to their respective maturity: research projects, defence technology projects, innovation acceleration projects, investment in companies at the forefront of science.

Prototypes

Another way of supporting innovation is to set up large-scale prototypes to accelerate development, by taking technical risks to quickly assess the relevance of a technology. In this way, they will support the creation of capability roadmaps in the major emerging areas with the greatest potential and develop the government and industrial skills needed to integrate them into armament operations. Ultimately, they will make a tangible contribution to strengthening the armed forces' operational superiority capabilities. Some of them could be conducted in «agile» mode, following the example of the modes of action developed by the AID for open innovation. Others will provide an opportunity to forge strategic partnerships.
These prototypes will fall into two general categories. Some will be purely technological, such as the one that will integrate energy cross-development technologies on an armoured vehicle, or that will demonstrate the maturity of technological building blocks for underwater drones at the start of the LPM period. The others will take the form of prototypes with an initial service capability, if their effectiveness is demonstrated. This will be the case, for example:
- in the field of directed energy weapons, an operational prototype of an anti-drone laser weapon to be deployed in 2024;
- a low orbit space action vehicle, which will be put into orbit at the beginning of the LPM.

New ways of capturing innovation

The above efforts will be supplemented by even better ways of capturing innovation, by exploiting the technologies of companies supported via capital investment funds, by exploiting the leverage effect of an increased effort in research, by continuing to take advantage of international schemes (HEDI at European level and DIANA at NATO level, the first rounds of which were launched in June 2023, with the participation of French companies, which must continue to be encouraged): see § 4.3. The search for opportunities with strategic partners outside the EU should also be encouraged.

As technology is not the only form of innovation, a particular effort will be made to explore low-cost solutions, with a level of requirement adapted to the desired effect, in all areas. Issuing calls for projects, in the form of operational objectives rather than technical specifications, makes it possible in emerging fields to capture and retain more varied and innovative concepts, taking advantage of the wealth of ideas in the industrial fabric, ultimately in favour of building capabilities at the highest level. This is reflected in the results of the approach initiated in 2022 by the COLIBRI and LARINAE calls for projects, for research into low-cost target neutralisation systems. Finally, in the context of the war economy, support and projection will also be developed (digital twins for maintenance, advanced manufacturing, low-cost and rapid production tools).

In order to capitalise on successful innovations, scaling up will be accelerated. The creation of a dedicated financial stream from 2022, and the creation of the Scaling Up Governance Committee (CGPAE) co-chaired by the Defence Procurement Agency and the Armed Forces General Staff to decide on its use, have already enabled significant results to be achieved. For example, an anti-drone surveillance system known as «SAP», the result of earlier work supported by the AID, has been deployed to protect the ceremonies of 14 July 2023 and the Rugby World Cup. This example, among many others, encourages us to gradually increase the capability of the system.

Lastly, new purchasing methods will be studied, following the introduction of new provisions into the Public Procurement Code.

Supporting critical sectors to enhance sovereignty

To develop and protect sovereign sectors in critical technologies, France is adopting a deliberate and responsible approach. The aim is both to support the emergence of new sectors in future breakthrough technologies, and in existing critical sectors to support all the industrial players capable of conducting development and production independently of foreign supplies.
For example, the calls for projects launched in 2022 to develop remotely operated ammunition systems, followed by an initial armament operation currently being launched, are helping to create and structure a skilled manufacturing base. Other modes of intervention can provide more direct support for the consolidation or sustainability of a sector, such as the investments made by the Definvest fund and the Defence Innovation Fund.

1.4 Financial perspective

In support of these courses of action, the 2024-2030 Military Programming Law includes a €10 billion «innovation patch», covering upstream R&D studies, excluding deterrence, and operators, research organisations such as ONERA and ISL, but also schools under the supervision of the DGA. These include the Institut Polytechnique de Paris, Polytechnique, ISAE-SUPAERO, ENSTA Paris and ENSTA Bretagne, all of which are essential for providing a solid base for scientific research, but also for creating opportunities and partnerships between the armed forces and the academic world, which are key drivers of innovation in support of France's sovereignty.
Funding for preliminary research, including deterrence, has been maintained at over €1 billion (€1,017 billion in the Budget) and is set to rise sharply over the second half of the Military Planning Law. This level of funding for initial studies will enable us to continue our efforts to capture innovation from the civilian market in a short lifecycle, to invest in breakthrough innovation and to

build prototypes, as provided for in the Military Planning Law.
These budgets devoted to innovation, including within the framework of interministerial funds, in particular for quantum, space and seabed technologies, will strengthen our sovereignty but will not replace the necessary commitment of the DTIB to undertake innovative self-financed projects that may be of interest to the French armed forces and export partners. Particular attention will be given to small and medium-sized enterprises, especially the most innovative.

Finally, the European Defence Fund will obviously remain a major source of funding in the years to come, and since this year the creation of DIANA (Defence Innovation Accelerator for the North Atlantic), within NATO, offers a new funding opportunity through open innovation challenges.

1.5 Focus on capability areas

In addition to the above presentation of the new areas of conflict, a focus on two capability areas illustrates how innovation must be one of the founding pillars of the major development roadmaps for future weapon systems.

Space

The challenges of space as a new field of conflict, and the way in which innovation must be supported to consolidate our position there, have been explained above. Innovation work is focused on subjects specific to military applications and must take advantage of Research & Development results obtained for civilian applications. This should contribute, by 2030, to the following capability objectives of the LPM:

- our space capabilities of observation and listening will be renewed within high-performance and robust platforms;
- ommunications resources will be supported by a secure multi-orbital European connectivity consortium;
- our Space Domain Awareness capabilities will be enhanced to detect and assess suspicious or aggressive acts in space;
- a command, control, communication and computing centre for space operations (C4OS) will have the means to control actions to, in and from space; and
- differentiating technologies, strengthened on a sovereign basis or in partnership, will focus on active defence to protect our assets in low earth orbit, enhanced connectivity, intelligence and responsive launches.

Innovation in the space sector is therefore being worked on collaboratively and covers the entire spectrum of space-related activities and therefore covers action from space, to space and in space. This work can take several forms:

- bringing technological building blocks to maturity, in order to manage risks in major programmes;
- developing innovations for use by operational staff; and
- leveraging new approaches from emerging players: technology components from other application areas, innovative technology modules, service supplies.

For example, «New Space» has been one of the priority areas of innovation since 2021.

To carry out these actions, the Ministry has several resources at its disposal: dual research, the space component of France 2030, the European Defence Fund and, of course, the innovation budget allocation of the 2024-2030 LPM. The space sector and the contribution of New Space players lend themselves particularly well to the use of large-scale prototypes in the search for differentiating capabilities, such as the following projects provided for in the LPM:

- Action in space in LEO orbit;;
-Constellation of nanosatellites for the detection and positioning of GNSS jammers;
- Hyperspectral imaging satellites.

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Drone

Among the disruptive technologies described above, autonomous systems are paving the way for the evolution of UAVs into multiple fields of conflict: air, land, sea and seabed. Over the period of the LPM, the use of remotely operated systems will accelerate and the spectrum of their missions will be broadened, to increase the functions of detection and remote intervention. Some will be able to interact in packs or swarms, to carry out disruptive offensive actions. Tactical drone systems, with diversified payloads and weapons, will improve our operational effectiveness. Contact drones and remotely operated munitions (MTO) will provide performance, precision and lethality; they will be developed on a cost- benefit basis in line with the war economy and in an iterative fashion. The future marine mine countermeasures system will renew our mine warfare capability, while better control of the seabed will enable us to identify, monitor and act at depths of up to 6,000 metres. Finally, to reduce the exposure of our forces, the use of ground robots and systems capable of cooperating with the soldier and their environment, under their control, will be developed.

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2

INNOVATION AND STRATEGIC PLANNING AT THE FOREFRONT OF THE MINISTRY'S MODERNISATION

The innovation effort supported by the LPM cannot be an isolated initiative. It is part of a necessary overall adaptation of the Ministry, begun in 2018 with the creation of the Defence Innovation Agency, and which extends to all the armed forces and services, to better think about the future and accelerate our preparation for its challenges, by promoting cooperation between services, pragmatism and simplicity.

2.1 Innovation through experimentation

Support for the guidance of innovation by the armies Labs

In emerging fields where the expression of requirements cannot totally precede the development of technology, and where the technology being created must be underpinned by realistic concepts of use, cross-fertilisation on an experimental basis suitable for repetitive dialogue provides invaluable support for the proper development of innovations. Army Labs offer this opportunity to evaluate and compare innovations with a sufficiently realistic initial concept of use. The COHOMA II challenge, organised in mid-2023 by the "Battle Lab Terre" on the theme of man-machine collaboration, is an example of mutually beneficial cooperation for the operational and industrial teams taking part.

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From 11 May to 7 June 2023 at the Beynes camp, 15 teams representing 58 organisations (industries, start-ups, schools, etc.) implemented the technical solutions developed over a period of around 6 months, in order to carry out the «TAKEOVER» mission.
A combination of a master vehicle and automated ground (robots) and air (drones) systems had to cover a distance of around 1 km in depth in a limited amount of time, while locating and neutralising targets scattered across the terrain, and providing regular situation reports.
COHOMA is helping to shed light on the army's robotic ambitions (VULCAIN approach) using a bottom-up approach that complements the planned vision.

Evaluating innovations in an operational context

At a more advanced level of maturity, in order to fully exploit the opportunities created by open innovation, it is essential to be able to evaluate any new solution taking the form of a demo or prototype quickly, at a lower cost and in a representative operational environment. The armed forces are fully aware of this challenge, and naturally seek to develop and support all approaches that enable operational trials to be carried out, involving representatives of the Defence Procurement Agency (DGA) and the defence technology industry.

PERSEUS

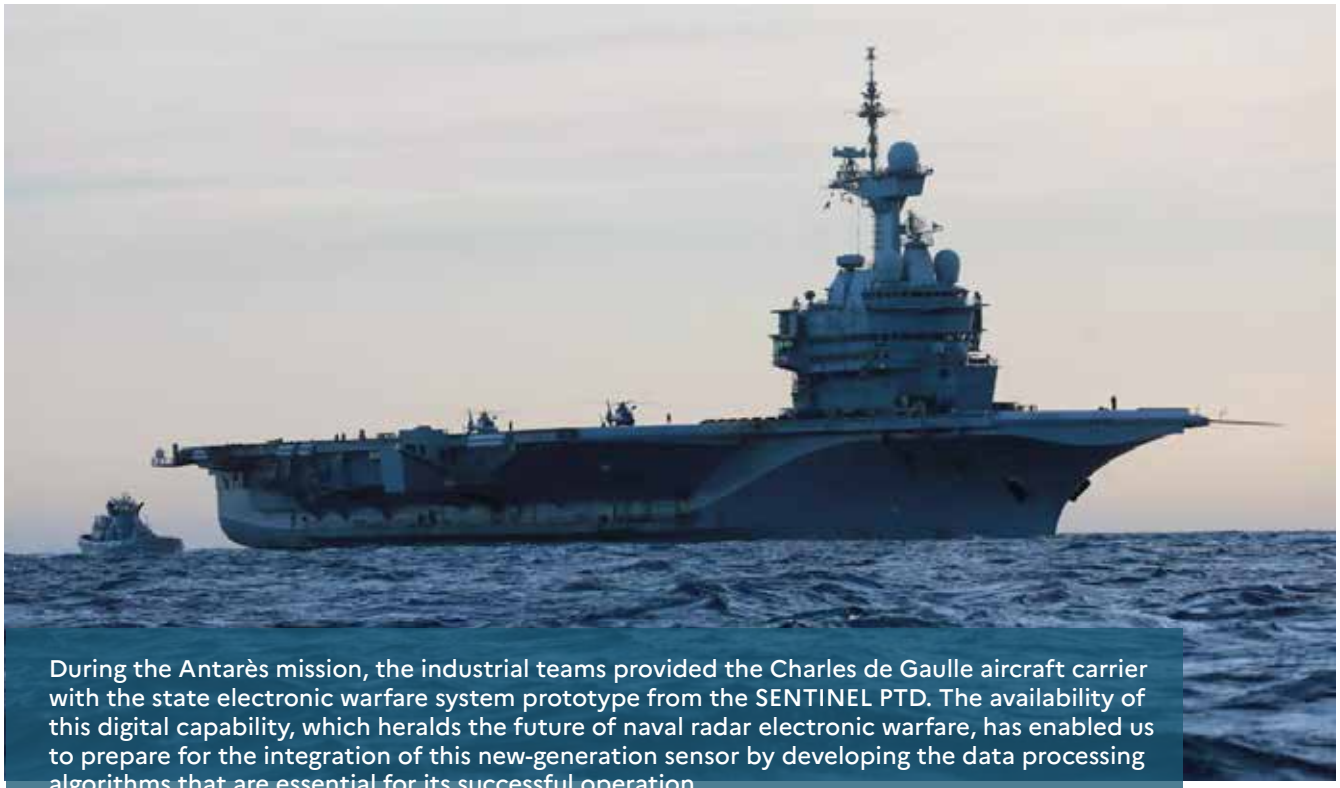
It takes many years to go from the first sketches to the first day of operation of Navy units, and thus to ensure high-performance, combat-efficient systems. However, just as POLARIS is the Navy's ambition to accelerate combat readiness, PERSEUS is helping to shorten the technical innovation lifecycle. By bringing together manufacturers, DGA engineers and sailors, this approach offers the opportunity to test promising innovations from expert and experimentation centres or labs under real conditions, during major exercises or deployments. In practical terms, this means putting innovative technologies on board units operating in typical operational environments.
The privileged collaboration between the Navy, the DGA and industry for testing onboard vessels offers multiple benefits: creativity for crews and industry is greatly stimulated, while reactivity and cost control are preserved. To be eligible, a manufacturer must propose a mature solution that can be tested, and at the same time benefit from government sponsorship to confirm the defence value of the innovative solution.

MARINE NATIONALE	DGA	GICAN
Operational platform Feedback Data On-boarding of technicians	Technical expertise Contractual expertise (Legal) Support and advice from the manufacturer throughout the project	MEO systems and short lifecycle support Self-financing and/or reasonable financial requirements

Perseus approach

Three industrial partners were rewarded in 2023 for the innovative spirit of their project:

THALES



During the Antarès mission, the industrial teams provided the Charles de Gaulle aircraft carrier with the state electronic warfare system prototype from the SENTINEL PTD. The availability of this digital capability, which heralds the future of naval radar electronic warfare, has enabled us to prepare for the integration of this new-generation sensor by developing the data processing algorithms that are essential for its successful operation.

© MN

ARKEOCEAN

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The Arkeocean teams carried out trials of the Proteus drones during the ORION 2023 exercise. These trials, which are a continuation of the work initiated by DGA Techniques Navales, demonstrated in particular the relevance of using coordinated underwater drones to act against surface vessels.

SAFRAN

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SAFRAN teams recently carried out trials of the NAZDAC autonomous navigation system on board an ECUME craft. These tests demonstrated the system's ability to maintain the right course in areas of conflict. They also contributed to its improvement thanks to the feedback provided by the sailors who used it.

ORION

ORION is an inter-service and inter-ministerial crisis management exercise, carried out in several stages, including major operational exercises. After a highly instructive first exercise in 2023, ORION 2026 promises to be a major milestone for the operational world and for innovation. These exercises represent a new generation of national and international operational preparation events. They give priority to inter-service and inter-allied training, mobilising a large volume of forces, centred on a major commitment and including an inter-ministerial phase, which constitutes an ideal environment for making the most of innovative approaches and testing novel solutions under realistic conditions.

They are thus part of an increasingly systematic approach to exploiting planned exercises by including test and experimentation sequences. This combination of two objectives increases the value of the training exercises and brings innovation project leaders and partner companies face-to-face with the realities of the field.

The preparation of ORION 2026 is based on the substantial feedback already gained from the 2023 exercise. From the outset, this first trial proved to be exceptional in terms of its ambition and scope, aiming for the high-intensity commitment of a divisional-level force, in a joint, multi-platform and multi-environment setting, and in an innovative form.

More than 25,000 military personnel, including nearly 3,000 from allied and partner countries, took part in the four phases of the ORION 2023 exercise, which took more than a year to prepare and involved the three services, the joint directorates and services, the inter-ministerial level via the SGDSN and a number of defence industrialists. This mobilisation enabled us to take stock of our armed forces in all areas of combat, from command posts to tactical units at all levels, from operational logistical support to operational information and communication systems, and in terms of inter-service and inter-allied interoperability.

In addition to its training role, ORION 2023 has enabled numerous field trials to be carried out: organisation of deployed command posts, internal communications of these posts, protection of installations, camouflage and concealment capabilities, methods of putting airborne units ashore, production of purified drinking water, etc.

The scale and demands of the ORION 2023 exercise highlighted the efforts that need to be made to remain relevant in the new strategic era that is dawning, and confirmed the areas of focus of the new military programming: in terms of logistics and support, to be able to act autonomously and at the pace imposed by a more demanding mission; in terms of connectivity of command and combat systems, to guarantee the interoperability of all players; in terms of integration of multi-environment and multi-field effects, (cyber, information warfare, space, or robotics); and in terms of means of acquisition and deep action to reach the enemy's critical capabilities. Moreover, it has been demonstrated to what extent space manoeuvres affect the balance of power in physical environments. In the general balance of power with an adversary, the effects in space are in fact reflected in the other environments.

While the first exercise illustrated the guidelines set by the LPM 2024-2030, the next one will be an opportunity to measure the progress made thanks to these efforts. Illustrating a collective desire to «do things differently», ORION is therefore a major opportunity to test future capabilities, outside any comfort zone.

The preliminary groundwork for the 2026 edition is based on the work logic of the Defence Red Team, in order to expose the participating forces to stressful situations in line with the demands and rapid changes of today's operational environment.
The general framework of the forthcoming exercise will enable more innovative concepts and innovative technological solutions to be integrated, on an exploratory basis. These test exercises will be carried out systematically in a complex multi-system and multi-field environment in order to obtain substantial, realistic and fully actionable feedback.

2.2 The contribution of open innovation

High-speed innovations driven by start-ups tended to escape the notice of large organisations such as the French Ministry of Armed Forces. In addition, the considerable influence of the civilian market in certain technologies (digital, space, etc.) now guides the progress of these technologies, and it is then up to the armed forces to adopt and adapt to their own needs. Capturing these innovations for the benefit of defence is one of the founding missions of the Defence Innovation Agency. The AID has put in place systems, which are constantly being improved, to detect these technologies of interest as early as possible, establish a relationship of trust with company directors and offer them the most suitable partnership at the most opportune moment.

Since the Agency was set up, its Open Innovation Unit has provided support for start-ups that could potentially be of interest to defence, but which do not yet have the technical and economic maturity to meet the eligibility criteria for major defence projects. By structuring an exhaustive vision of the players involved and initiating a continuous and regular cycle of mock-ups and prototypes, AID's open innovation action simplifies the integration of these innovations and their transition to the market, and scales them up within the armed forces and services.

These identification and tracking activities are structured into priority themes, along which the AID teams conduct their proactive research. These are defined and regularly reviewed in consultation with the Staffs, Directorates and Services. In 2023, technological developments have led to the merging of two previous themes, «Autonomous vehicles and fleets of autonomous vehicles» and «Robotics», into a new theme «Autonomous vehicles and their fleets».

There are now 8 themes:

Autonomous vehicles and their fleets

Information superiority

Human augmentation

Health

New Space

Energy

Cyber

Maintenance, Repair and Operations

THE «AUTONOMOUS VEHICLES AND THEIR FLEETS» OPEN INNOVATION THEME

The development of autonomous vehicles with increasingly sophisticated functions, and their growing use in both the civilian and military sectors, has led to a growing interest in innovative companies offering global solutions. This is why it has been decided to merge the «Autonomous Vehicles and Fleets of Autonomous Vehicles « and «Robotics» open innovation themes into a single one called «Autonomous Vehicles and their Fleets». This new theme includes the following topics of interest:

- **Autonomous vehicles on land, in the air, on the surface and underwater;**
- **Control modes of automated systems (remotely operated, autonomous);**
- **Technologies associated with automated systems (AI, Telecommunications, Cyber etc.);**
- **4D («dirty, dull, dangerous and difficult») environment capabilities, hardened for operational environments (without access to satellite positioning signals), critical environments (explosive, CBRN, space, etc.);**
- **Resilience of positioning, navigation and mobility in dense environments (proximity of piloted vehicles, individuals, autonomous systems, etc.);**
- **Hybrid systems, modular systems, convertible systems;**
- **Management of fleets of autonomous vehicles and swarms (piloting, autonomy, sensors, etc.);**
- **Collaborative actions by potentially diverse agents (moving in packs);**
- **Robot/drone/manned platform integration;**
- **Rustic and low-cost approaches;**
- **Aids to prepare and conduct operations.**

2.3 Simplification

The simplification of the Ministry's actions is a recurring theme of the 2024-2030 military programming law. Standards, processes and procedures must be simplified, in a spirit of trust that encourages delegation, so as to free up additional room for manoeuvre and achieve even greater efficiency in experimentation, procurement and deployment. The next chapter illustrates this in the area of procurement; let's take a look at the regulations governing the airworthiness of UAVs, which could slow down defence innovation.

Action taken since 2021 by the DGA technical authority, the DSAé and the seven employment authorities led to the publication in March 2023 of a new order on the use of drones in state aeronautics. Replacing the 2013 order, which was essentially based on a weight approach, this new text significantly eases the testing conditions for systems acquired or developed at the request of the armed forces. The principle of reasonableness ensures flight control measures on the risks arising from the characteristics of the aircraft, the flight scenario envisaged and the conditions of use. Certification is now reserved for large UAVs and the riskiest missions. In less dangerous cases, the operating authority is now given autonomy of decision, within a framework pre-established by the technical authority, in favour of the agility of the armed forces and their test centres. The first generic acts were issued by the DGA a few weeks after publication of the decree, and the steady flow of applications bears witness to the interest shown by the armed forces and services in this simplified process.


Décrets, arrêtés, circulaires

TEXTES GÉNÉRAUX

2.4 Purchasing innovation

On a regulatory level, Decree no. 2021-1111 dated 23 August 2021 amending certain provisions of the French Public Procurement Code has made it possible to relax certain procurement procedure rules in favour of harnessing innovation, in particular to make it possible to contract out tests, and for the first time by raising the thresholds for contracts awarded without competitive tendering, for small production volumes. A significant number of procedures have already benefited from this. However, there is still progress to be made, particularly as these thresholds are generally still too low to make genuine structural purchases and to encourage scaling up.

The Ministry's Procurement Mission and the DGA are therefore continuing their work to extend the possibilities for purchasing experiments and initial batches of innovative capabilities that have been validated in this way, within the framework set by European directives. Other options are also being explored, such as simplifying the «innovation partnership» (with the publication of a simplified specification). These measures to simplify public procurement will be implemented from 2024.

2.5 DGA transformation: strategic planning

Strategic planning became DGA's second objective in 2023. A major transformation effort initiated by the «Impulsion» plan launched in September 2022 to create a modern, responsive DGA, able to adapt to major changes in the international, technological and economic context.

As our societies prepare to face up to unprecedented challenges, the French armed forces must be able to respond quickly and effectively to new opportunities and needs. In particular, and without being exhaustive, confrontation in the fields of information, common spaces, cognitive warfare or the computerised fight for influence must be integrated into the development of future armament operations. The hybrid nature of future conflicts is becoming a central issue, requiring us to better anticipate future strategic competition and new threats.

According to the Délégué général pour l'armement, their role is to provide «a strategic technological and industrial planning capability that contributes to national defence and security». This is essential if the Ministry of Armed Forces is to remain capable of planning for the long term, despite the instability and uncertainty inherent in these issues. The aim of this approach is to ensure that we take better account of the rapid changes in our environment, the threats in all their forms, but also the opportunities, in order to prepare for the future and to avoid strategic surprises.

The DGA, through its Deputy Director for Strategic Planning and a Strategic Anticipation (Planning) Cell (CAST) integrated into the Defence System Architecture Department, is thus putting itself in a position to take action to build governance and provide the means for global thinking.

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"If we are to look ahead, it is essential to identify the next technological breakthroughs that are likely to represent geostrategic breakthroughs and to understand the associated threats. The military applications of artificial intelligence and autonomous systems, the mastery of directed-energy weapons, the convergence of nanotechnologies, bio-technologies, computer science and cognitive sciences, hypervelocity and the world of quantum physics are illustrative of these possible breakthroughs. Because of its specific expertise, it is the DGA's role to provide the Ministry of Armed Forces with technological and scientific insight into potential breakthroughs and the means of responding to them. Alongside the Ministry's other strategic players, it offers additional analysis skills. This capability should also be a catalyst for action in response to hybrid threats and the challenges of the 'Influence' strategic function newly described by the National Strategic Review."

Ludovic Chaker, Director, Strategic Planning, DGA.

Strategic foresight at DGA is responsible for all aspects of the 'knowledge-understanding-planning" and 'influence' strategic functions (intelligence, knowledge of theatres of operation, diplomacy, foresight, projection, information management etc). Its missions include setting up multi-sector analysis capabilities and proposing, in the spirit of «doing things differently», new initiatives to imagine the threats of tomorrow.

Following the launch of the Conseil d'Anticipation Stratégique (CoAS), which has been active since April 2023, the initial work carried out is contributing to the strengthening of the strategic planning community within and outside DGA (knowledge of resources, coordination, implementation, optimisation), with in particular the implementation of strategic planning cycles for the benefit of the Communauté Interarmées Prospective et Anticipation Stratégique (CIPAS) bringing together EMA, DGA, DGRIS and SGDSN under DGA project management.

2.6 Transforming the Land Forces: future combat command

With the aim of aligning land forces to a profoundly altered strategic landscape, in spring 2023 the Chief of Staff of the French Army announced his new modernisation policy under the title «Towards a Combat Army». This remodelling is based on four operational goals: to stand and endure; to protect; to act; and to innovate.

To achieve this fourth objective, «to innovate», a dedicated structure has been created as of 1 August 2023: the Commandement du combat futur (CCF). The CCF's development is based on the current capabilities of the Command Doctrine and Education Centre (CDEC).

The CCF is tasked with informing the Army about future commitments, understanding the challenges of modern warfare and boosting the operational development of units. The role of the CCF is to be the innovation pillar of the French Army by developing three dimensions:

ENLIGHTENING
a centre for strategic studies with a role as a trailblazer for military thinking and the development of the French Army.

INNOVATE/EXPERIMENT
a centre for innovation and capability operational testing, translated into doctrine and delivered to units.

OPERATE/EXPLOIT
a command that guarantees the leadership and consistency of the Army's operational functions and its modernisation.

The CCF is therefore responsible for contributing to the modernisation and adaptation of the Land Forces to the future operational environment. The characteristics of this environment are constantly evolving, in line with innovations in emerging or disruptive technological fields such as artificial intelligence, quantum computing and hyper-velocity. The consequences of these technological breakthroughs are greater transparency on the battlefield, the exponential use of robotic systems, major challenges in the cyber domain and the need to counter increasingly robust, fast or stealthy attack capabilities.

At the very heart of the worlds of planning, doctrine and capabilities, the Future Combat Command offers unique opportunities for synergies to capture innovation with responsiveness, experiment with it, formalise it, and facilitate its uptake by the land forces while promoting the Army's military thinking.

2.7 Seeing and thinking differently: the end of the exploratory phase of the Red Team

On 29 June 2023, the scripts for season 3 of the Red Team Defence programme were officially unveiled, marking the end of the exploratory phase of a project of unprecedented scope launched three years before by the Defence Innovation Agency.

At the heart of this initiative was a team of science fiction scriptwriters, authors and cartoonists, whose mission was to design stories of conflict in the 2030-2060 timeframe. The Red Team Defence programme, whose activities are partly confidential, has helped to guide innovation and strategic thinking efforts in close collaboration with the armed forces and the Armed Forces General Staff, the Defence Procurement Agency and the Directorate General of International Relations and Strategy. It has been an ideal place to test planning and forward-thinking methods and tools for innovation purposes, and an opportunity for the Ministry of Armed Forces to explore new imaginary worlds that highlight unusual risks and threats of major interest for future operational and strategic thinking.

After this exploratory period, 2024 will mark the start of a new, permanent format for this programme, which will continue to imagine «beyond» to see and think differently about tomorrow's threats and challenges.

RED TEAM

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2.8 Transforming through innovation at the SGA

In accordance with his remit, the Secretary General for Administration is responsible for the general modernisation of the Ministry's administration. To this end, and in a spirit of economy and centralisation, he acts as a catalyst for innovative projects supported by the Delegation for ministerial transformation and performance (DTPM).

This delegation is dedicated to supporting and accelerating the digital, organisational and managerial transformation of public policy. To this end, it implements innovative technologies and tools for the benefit of armies, directorates and services in the fields of artificial intelligence and user innovation

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Innovation in artificial intelligence

The Big Data & AI Lab of the DTPM within the SGA is an incubator for the armies, directorates and services of the Ministry of the Armed Forces. It specialises in data science and artificial intelligence, and carries out experiments (from proof of concept to minimum viable product) based exclusively on open access solutions for the development of artificial intelligence models. More specifically, it works in several areas of AI such as computer vision, automatic language processing, topological data analysis and enhanced learning. Its expertise is used for a wide range of projects and use cases, such as those of the French Army Health Service for analysing health data, in particular for predicting loss of consciousness in flight crews or detecting post-traumatic stress states during sleep phases in military personnel.
In addition, the Big Data and AI Lab is also investing in the field of autonomous and remote AI (not connected to any network) at the service of the armed forces with, as part of its 'resIstAnce' initiative, concrete and operational achievements in off-line translation on mobile phones covering 19 languages, enhanced with voice synthesis and recognition tools, as well as analysis and recognition of off-line objects of military interest (vehicles, weapons etc). In the same way, the underlying artificial intelligence model can be transposed from mobile phones to other platforms, including drones or other devices adapted for operational use..

To strengthen this field of development, in August 2023 the Big Data and AI Lab created «FabIA», a collaborative AI design workshop. By being physically located within the Lab, it aims to bring together staff wishing to prototype their ideas with the Lab's skills, thereby promoting a culture of innovation, collaboration and do-it-yourself from start to finish, in line with the Lab's DNA.

This desire for in-house, controlled creation (which is in line with the DTPM's strategy of internalising its skills) is also embodied in the launch of the Beta-IA experimental platform dedicated to the use of artificial intelligence functionalities. «GenIAL» is the first module in the test phase; since August 2023, it has been experimenting with document analysis, the use of an intelligent assistant, a question/answer system based on a submitted document, translation and, in the near future, image generation. Hosted on Intradef, the tool is not dependent on the Internet, so its services can be used securely.

3

TALKING TO OTHERS

3.1 DGRIS

The Ministry of Armed Forces, a long-standing partner of strategic research

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Faced with an increasingly uncertain and volatile strategic environment, the Ministry of Armed Forces wishes to base its strategic and long-term planning work on high-quality, independent and internationally recognised strategic research[1].

To this end, the Ministry of Armed Forces has long supported the training of a national pool of experts and researchers who are aware of defence and security issues in all fields.
The context of information warfare and the «battle of ideas and opinions» makes this need even more acute.

Strategic research for defence innovation

The ministerial support scheme for strategic research implemented by the Directorate General for International Relations and Strategy (DGRIS) aims firstly to train the researchers and experts of tomorrow - our «strategic next generation» - and then to ensure the long-term survival of a network of excellence of French researchers in defence and security studies by making the economic model of the various centres that contribute to it more robust. This support covers a wide range of subjects, both geographical and sector-specific, including international relations, capability issues, industrial and technological issues and environmental strategies.

Several new initiatives have been designed to stimulate defence innovation, while encouraging closer links between research in the humanities and social sciences and 'traditional' technological research:

- A three-year strategic research orientation document, which will identify priority areas of study that address the problems and needs of the Ministry of Armed Forces.

- A specific «Centre of Excellence» scheme will fund multi-disciplinary strategic research combining the humanities and social sciences with the technological dimension.

- Part of the annual budget dedicated to outsourced studies will be devoted to calls for «innovative» projects aimed at identifying new fields of study.

For more information :
https://www.defense.gouv.fr/dgris
under «soutien à la recherche»

1 The DGRIS is working to promote French strategic research on defence issues internationally. In 2023, this ambition will result in the creation of a branch of the Strategic Research Institute of the Ecole Militaire in Brussels

3.2 Ministry of Armed Forces Procurement Mission

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The commitment to innovation by the Ministry's procurement departments and services is a major challenge for optimising the efficiency of the procurement function in capturing innovation. This action is carried out as closely as possible by the network of innovation purchasing advisors at the Ministry of the Armed Forces («ref'innov»). This community brings together around forty players from the Ministry of the Armed Forces, as well as from public establishments under the Ministry's authority. The multidisciplinary composition of this network encourages reflection on technological aspects, the acquisition of innovation and the difficulties encountered by each player at each stage of the purchasing cycle.

The biannual meetings organised as part of the 2021-2024 innovation purchasing action plan have two objectives:

Anticipating innovation through better sourcing: by organising "speed-meetings" once a year between the innovation purchasing advisors and companies from the main networks supporting innovation.

Educating and informing innovation referees about the latest trends in technical and legal innovation.

To this end, the 10th day of the ref'innov network, held on 17 November 2022, provided an opportunity to organise speed-meetings with companies from CNRS innovation. Some forty companies were welcomed to the Innovation Defence Lab and around sixty meetings were organised. The companies were able to present innovative technologies and solutions in a range of fields, from asbestos recycling to exoskeletons and personal equipment for the military.

The 11th day of the network brought together innovation advisors from outside the Ministry of the Armed Forces, from the Ministry of the Interior, the Ministry of Ecological Transition and Territorial Cohesion, as well as speakers from ArmaSuisse, and provided an opportunity to exchange best practice in capturing innovation.

The day's discussions covered a wide range of topics, including:

- The DECLIC internal innovation learning and development platform.
- The hAPPI application, which is an ideas box that allows anyone in the ministry to submit an idea via the application and receive end-to-end support in implementing their innovative project. The ref'innov network will also be involved as experts to support innovative projects on purchasing issues.
- The contractual engineering of the CENTURION project, which is preparing the follow-up to the «Felin» equipment for combatants: its process consists of involving the prime contractors in any innovation that could benefit the combatant.
- The challenges of voluntary and mandatory standards.
- Legal design: in the age of «infobesity» and marketing, the transmission of information must focus on the end user. For SMEs with few human resources and limited time, it is important to simplify their access to public procurement. This simplification also requires a better understanding of the information transmitted in the context of public procurement. In this sense a legal design is an asset for public procurement, as it makes it possible to work on the transparency and access of contractual documents (in particular making consultation documents clearer and more easily understandable). The development of this approach could make it easier for small organisations (eg SMEs, start-ups) to access public contracts and offer innovative solutions to the Ministry of the Armed Forces.
- Lowtech: this is an approach to innovation that results in technologies of lower complexity and universal accessibility. This approach takes into account environmental issues and the ecological transition, from the extraction of the raw material to the energy consumed in manufacturing the solution, right through to the end of the product's lifecycle.

The lowtech soldier (ArmaSuisse and the «le coup d'après» collective):

© Le Coup d'Après

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These regular exchanges with the main networks supporting innovation have led to the establishment of partnerships with:

- CNRS innovation. The Defence Procurement Mission and the Defence Innovation Agency have joined forces to build a partnership with CNRS innovation, whose main objective is to support the development of innovations, from research carried out in university laboratories to a viable product that can be used by the armed forces
- Mission FrenchTech. As Mission FrenchTech has a regional network of FrenchTech hubs, it is important to take this territorial network into account when preparing ministerial public contracts.

The consolidation of these partnerships is also part of the «I choose FrenchTech» plan announced on 16 June 2023 by the Minister for the Economy, Finance and Industrial and Digital Sovereignty, and the Minister Delegate for the Digital Transition and Telecommunications. In particular, these partnerships will enable start-ups to be given greater consideration in the acquisitions made by the Ministry of the Armed Forces.

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4

SHARING

The considerable scope for developing innovation means that we need to work with partners to share the effort and multiply the action: detection and assessment, support, adaptation to military needs. This is the purpose of the network developed and maintained by the Defence Innovation Agency with, in particular, the academic research network, State civilian players, industrial trade associations, economic and State players in the regions (including the innovation clusters set up around the DGA's centres of expertise and testing), operators of start-up seed and acceleration programmes, investors and our foreign partners. This openness is complemented by closer links with the Ministry's Army Labs and digital factories.

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4.1 Strengthening partnerships

Several objectives are pursued through these partnerships:

INFORMATION

This involves informing economic players about how AID works and the terms and conditions of support for innovation. The partners then act as relays of this information to the companies, enabling AID to be as close as possible to them in order to understand their difficulties or expectations, and assist them in setting up their innovation projects and seeking support from the Agency.

DETECTION
of innovative companies and projects

The Agency's network of partners has good visibility of all companies, whether they are suppliers to the defence or civil sectors, or whether they offer dual-use solutions. It enables us to assess their potential interest for defence and, if necessary, to direct them towards the Ministry of Armed Forces. The network thus contributes to the Agency's work in identifying innovative projects and companies likely to meet the needs of the armed forces or to present opportunities for technologies or solutions capable of offering the forces new possibilities for action

SHARING EXPERTISE
or even conducting projects of common interest

The Agency seeks to collaborate with players in certain sectors in order to share strategic orientations and expertise. This involves drawing on all the expertise available within the Ministry or from industrial, scientific and institutional partners (chairs, partnership agreements, etc.). Joint actions can thus be envisaged to lead, support and develop projects that meet the challenges of the ministry's various headquarters, directorates and departments.

The choice of all these partners also reflects a strategy of territorial networking, of representing the issues and the players as comprehensively as possible (whether or not they belong to the DTIB) and of making the most of the areas of expertise.

Ministry of Armed Forces players, partners of the Agency

Coordination between the innovation clusters of the DGA's Technical Directorate and the Defence Innovation Agency, which has already produced good results in terms of detecting and supporting projects, will continue to be strengthened. The themes for future calls for expressions of interest are defined jointly with the clusters. They support the Agency's approach by actively participating in the submission and appraisal of innovation acceleration projects. Ongoing exchanges between the Agency and the clusters help to strengthen the link with innovative French companies.

Partners outside the Ministry

To consolidate its support for defence innovation, the Agency is implementing a partnership strategy with the players and networks that structure the BITD and the world of civilian innovation: professional groups, start-up accelerators, associations, business networks, competitiveness clusters, research centres, etc.

RESEARCH:
In terms of research, six framework agreements have been established with major organisations, to take advantage of their expertise on themes of common interest: the CEA, the Institut Polytechnique de Paris (CIEDS), INRIA, the CNRS, the ANR and the ANRT.

THE REGIONS:
The Defence Procurement Agency is keen to strengthen its links with the regions, as it has done with the Nouvelle-Aquitaine Region with the signature in June 2023 of a partnership contract for the development of the defence industry and dual research activities in Nouvelle-Aquitaine.

INDUSTRY:
The Ministry of the Armed Forces must be able to rely on a high-performance, long-term national industrial base with a strong capacity for innovation. This base is made up of major defence industrial groups and several hundred SMEs, VSEs and start-ups that the Ministry supports in their innovation and development projects. To encourage the capture of innovation from industry, the AID implements a number of measures enabling manufacturers to apply for aid for their innovation projects of potential interest to defence. The Agency provides support, for example financial support, to selected approved projects with the aim of accelerating their development. To this end, the Agency has a «Guichet Unique» (one-stop shop) which enables all innovators to easily initiate a dialogue with the Ministry, in order to quickly assess the potential interest of their solution and, if necessary, to guide them towards the most appropriate support mechanism.
The competitiveness centres are invaluable relays for the Agency to regional and thematic industrial networks, thanks to their expertise in setting up innovation projects and applying for support. This expertise is also of benefit to AFD, as it helps to identify emerging players in the civil sector and the markets likely to open up to them. In this way, the Agency establishes and maintains partnerships with competitiveness clusters in areas of interest (e.g. Aerospace Valley, Systematic, ASTech, the Ceramics Cluster). Links are also forged with various professional federations and networks: GICAT (see box), GICAN and GIFAS, Comité Richelieu (agreement signed in May 2023), Cercle de l'Arbalète, La Place Stratégique, French Tech Méditerranée and the Blast acceleration programme.

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GICAT

GICAT (Groupement des industries Françaises de Défense et de Sécurité terrestres et aéroterrestres), with its 435 members, including 70 start-ups, works actively to promote research and innovation. It capitalises on its network and its ability to coordinate in order to encourage and help create synergies within the defence and security communities, from innovation projects to the monitoring of equipment in service.

To this end, GICAT has set up a Research, Technology and Innovation (RTI) committee, which brings together the innovative players in the BITDS, from start-ups to major industrial contractors. This committee, which is responsible for forward planning and preparing for the future, carries out specialised work in two working groups:

The working group on robotics brings together manufacturers keen to offer forces operational solutions for tomorrow's commitments. It is working on both the technological roadmap and the future use of robots.

The working group on operational energy, for its part, is focused on thinking about and proposing solutions for tomorrow's mobility, infrastructures and energy-efficient technical solutions.

GICAT has also played its role as a network facilitator and disseminator of strategic information by running the GENERATE programme since 2017. This start-up accelerator and innovation hub, detects and supports for 3 years young start-ups whose solutions demonstrate strong potential among the forces, with a view to accelerating their commercial opportunities. The hub also helps start-ups to raise funds. The return of high-intensity warfare to Europe's doorstep, the strong involvement of industry in discussions with the Ministry of Armed Forces on the Economics of Warfare, and the increase in power provided by the LPM, are all factors that are driving GICAT and AID to strengthen their discussions and partnerships in the service of defence innovation, the robustness of our BITDS and meeting operational requirements. For example, the AID and GICAT are exchanging information on the need for, and facilitation of, trials of aerial drones, with a view to improving the responsiveness of their development.

4.2 A dual approach sought with France 2030

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On 12 October 2021, the French President presented «France 2030», a €54 billion investment plan designed to:

- continue the transformation of key sectors of our economy through technological innovation, by supporting major investments to catch up in certain sectors; and
- ncourage the emergence of new industries in these strategic sectors, while exploring new areas where France is already at the forefront of technology.

This ambitious plan supports projects of excellence across the entire production value chain and continues the Government's strategy to promote investment, innovation and redevelopment. The methods, objectives and timetable of France 2030 are fully in line with the thrust of the defence innovation policy, which aims to open up to civilian innovation opportunities for integrating high value-added technologies, to allow the start-up networks to bring some of their technologies to Defence, and also to identify and optimise the development of dual technologies.
It is with this in mind that the Ministry of the Armed Forces has joined in the governance of France 2030 and is actively participating in several aspects of the investment plan.

For the Ministry of the Armed Forces, 2023 was marked by two major events:

Accelerating the roll-out of France 2030.
By the end of September 2023, €22.2 billion had been committed. France 2030 has 4,500 beneficiaries and 2,900 projects funded. This acceleration is stimulating innovation networks, including those relating to defence.

Strengthening the role of the Ministry of Armed Forces in the France 2030 strategy.
On 24 August 2023, the DGA and the General Secretariat for Inverstment signed a management agreement covering the France 2030 funds dedicated to the implementation of the «space», «quantum» and «deep sea» components. DGA has been designated as the «specialist lead» and has been delegated the following responsibilities:

• Space: the procurement of detection, surveillance and crisis management services using advanced processing of open satellite data, as well as the adaptation of DGA's resources to achieve the France 2030 objectives.
• Deep sea: the development and acquisition of an autonomous deep sea underwater vehicle, a deep sea remotely operated robot and associated services.
• Quantique : Le développement et l'aQuantum computing: the development and acquisition of prototype fault-tolerant quantum computers.

These facts demonstrate the value of working together with the various players in France 2030 and justify the continued full involvement of the Ministry of the Armed Forces in the investment plan.

French Tech 2030, an example of how to stimulate the innovation networks

Against a backdrop of particularly strong international competition, on 20 February 2023 the President of the French Republic announced the introduction of an initiative designed to strengthen support for around a hundred particularly innovative companies developing breakthrough technologies across all the France 2030 objectives. The creation of the «French Tech 2030» support programme is designed to achieve this objective: the companies selected will receive tailor-made, extra-financial support from Mission French Tech, in coordination with the General Secretariat for Investment, the coordinators of the France 2030 strategies and all the ministries and agencies concerned. The call for applications received 842 applications. The selection was made by a selection committee chaired by Bruno Bonnell, General Secretary for Investment in charge of France 2030, and made up of representatives from the Directorate General for Enterprise, the Directorate General for Research and Innovation, the Defence Innovation Agency and the General Commission for Sustainable Development. The appraisal was carried out by the various government departments represented on the committee, with the close involvement of the France 2030 coordinators.
Examination of the 125 prize-winners confirms the diversity of the different sectors of France 2030 and the natural place of emerging players in subjects that concern Defence.

4.3 International cooperation in innovation

Continuing to develop methods of international innovation

Both in Europe and within the Atlantic Alliance, France contributes to collective Science & Technology and Innovation work. Within NATO's S&T Organisation (STO), the effort covers a wide spectrum, from working groups to reflection on the governance of the STO, following the 2030 plan adopted at the Brussels Summit in June 2021. In particular, consideration is being given to the need to update research topics as a result of the emergence of disruptive technologies and the extension of areas of conflict. This effort is being made in parallel with the development and support of projects under the European Defence Fund, and participation in the various S&T projects coordinated by the European Defence Agency (for example, the EPICURE and DEBELA projects, dealing respectively with the encapsuling of 'Defence' components and the use of imagery for the self-protection of military platforms). In terms of innovation, the European Defence Innovation Network (EDIN), an initiative of the French Presidency of the Council of the European Union (FPEU), is the forum for increasingly concrete exchanges, co-led by France, and which the EDA's Hub for European Defence Innovation (HEDI) will soon be able to translate into innovation projects. This approach is in line with France's involvement in the rapid build-up of the Atlantic DIANA (Defence Innovation Accelerator for the North Atlantic), which launched its first three Challenge Programmes («Information Sharing Security», «Sensing and Surveyance», «Energy resilience») in June 2023, while at the same time setting up its organic and geographical structure.

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Strengthening bilateral links

Participation in the work of multilateral organisations is directly linked to bilateral exchanges with most of France's partners, with one directly enriching the other.

In particular, several areas are the result of ongoing relations with the USA, the United Kingdom (academic exchanges, innovation), Germany (materials, components, CBRN, etc.) and, more recently, Italy (on the defence aspects of the Quirinal Treaty).

More specifically, our relationship with the Netherlands has led to the launch of a series of meetings designed to encourage cooperation between French and Dutch industrialists and academics (the first session was attended by around a hundred people), with a view to potential European projects.

The strengthening of relations with Poland and Sweden (CBRN, energy materials) also augurs well for cooperation opportunities in the very near future.

Lastly, our cooperative relationship with Singapore will soon be illustrated by an additional project, with the establishment of a joint R&D laboratory in the field of artificial intelligence for defence, scheduled for April 2023 and supported by the CNRS and the National University of Singapore.

4.4 Investment

The Agency's «project mode» organisation means that each project can be addressed according to its purpose, for example: research projects to detect and bring out future strategic technologies; fast-track innovation projects to capture innovation from the civilian world so that they can be adapted and deployed as early as possible; collaborative projects to support innovative solutions from Ministry staff; and defence technology projects to bring to maturity the technologies required for military needs
The final step is deployment to end-users, the transition to market. To achieve this, it is necessary to be able to support the variety of innovation projects through various subsidy and public procurement schemes, and to know how to link them together, as the following success stories illustrate:

In addition to supporting projects, there is the challenge of meeting the financing needs of innovative companies in a growth phase and developing dual technologies.
It is with this in mind, and in particular to leverage investment in defence-related sectors and deep tech that the Ministry has set up the Defence Innovation Fund (see box) and is developing partnerships with players pursuing the same goal, such as industrial groups and the Défense Angels association.

The Ministry thus has a range of support resources at its disposal (eg matchmaking, subsidies, public procurement, capital investment) to support a high-performance national industrial base with a strong capacity for innovation.

DEFENCE INNOVATION FUND

Created in 2021 and operated by BPI France, the Defence Innovation Fund invests in innovative growth-stage companies, start-ups, small and medium-sized enterprises (SMEs) and mid-sized companies (MSEs) developing dual and cross-disciplinary technologies of interest to defence. The €200m fund can be supplemented by up to €400m of institutional or private sector funding. It complements public initiatives and private investment in support of innovative companies of interest to defence. Complementing the DEFINVEST fund (designed to support critical and strategic BITD companies), it focuses on companies offering dual or even civilian technologies with innovative products/services that could be of interest to the Ministry of Armed Forces. It is organised in conjunction with the «French Tech Souveraineté» fund under the future investment programme.
It also relies on close relationships with financial players in the innovation ecosystem, such as BPI funds, as well as private funds active in France and Europe.

The investments made since the creation of the Defence Innovation Fund cover strategic sectors for the Ministry of Armed Forces: quantum, space, telecommunications and AI. In 2022, for example, the fund participated in financing rounds for OUTSIGHT (3D space intelligence), DUST Mobile (secure mobile communications technologies) and a new financing round for PASQAL, a company specialising in quantum computing. Since January 2023, it has also participated in financing rounds for Exotrail (space), XXII (computer vision) and MICRO OLED (miniature high luminance screens).
In 2024, up to €35m of investment is planned. Investments will continue to expand into new strategic sectors such as energy and healthcare, while providing support for portfolio companies.
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5

ADDING VALUE

5.1 Promoting innovation projects

The aim of the Defence Innovation Agency's value-creating actions is to facilitate the securing, scaling-up and deployment of technologies and innovations developed by the Ministry of Armed Forces and its partners, for the benefit of staff, directorates and services.

This deployment is a lengthy process, the seamless flow of which is guaranteed by:

SCREENING ACTIONS

upstream of development projects (assessment of the issues associated with intellectual property, identification of potential threats and development of appropriate protection strategies)

SUPPORT

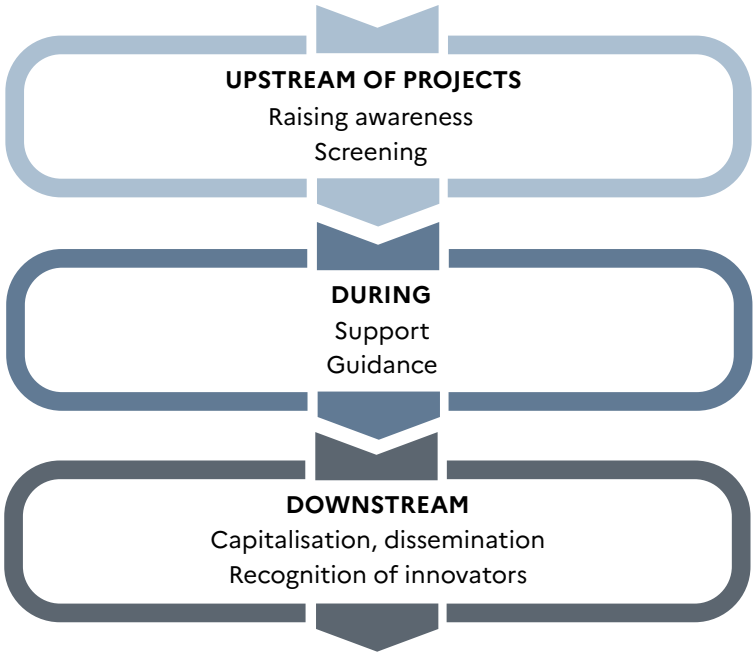
stakeholders throughout the duration of the project in their work to secure intellectual property in favour of preserving national sovereignty.

DIRECTING

the results towards the most strategic path by exploring the possibilities of licences, partnerships or internal developments.

INFORMATION AND DISSEMINATION

to staff, directorates, departments and partners to facilitate synergies and the sharing of best practice between companies, research institutions and government bodies.



As these actions can only be guaranteed through the collaboration of all stakeholders, several solutions will be implemented to ensure that technological developments are successful:

- The theme days, which have been organised internally since 2022, could be opened up to industry to encourage links between the emergence of new operational concepts and new technologies;
- Increased support to the Bureau de la Propriété Intellectuelle in preparing for the transfer of technologies from the Ministry of Armed Forces to the defence industry.

5.2 Promoting innovators

In an effort to reward innovators within the Ministry of Armed Forces, the Defence Innovation Agency organises the Defence Innovators Awards, in conjunction with the Boldness Prize ('prix de l'Audace'). These awards honour civilian and military personnel for innovative projects that deliver a significant improvement in the operational or functional performance of the systems and units to which they are applied:
:

The 2023 Trophies were awarded to the winners at the Defence Innovation Forum on 4 themes:

- **NAVAL AIR OPERATIONS**
- **AIR-LAND OPERATIONS**
- **AIR AND SPACE OPERATIONS**
- **COMBATANT SUPPORT**

In addition, since the publication of a decree in 2022, Ministry of the Armed Forces employees responsible for non-patentable innovations can be financially rewarded. The final awards jury will be chaired by the Director of the Agency. In addition, in 2024, the Agency will continue its deliberations on intrapreneurship and the special role of reservists in the collaborative innovation processes.

TROPHÉES DES INNOVATEURS 2023

5.3 Continuing to develop awareness of innovation and its methods, spearheaded by the Defence Innovation Agency

While the Defence Innovation Agency promotes its projects and innovators, it must also promote its own activities in support of innovation, so as to increase their impact. Whether digitally or face-to-face, the Agency is raising awareness of defence innovation issues within its networks and describing the « who, what, where, when, why, how, and how much» of its missions. This is reflected, for example, in the «IP tours», visits to military units aimed at presenting the Agency's activities and the role of participative innovation, as well as raising awareness of intellectual property issues. In the same way, the Agency works with schools under the authority of the Ministry of the Armed Forces, explaining the specific features of defence innovation and illustrating it by making available practical operational projects and case studies, which are instructive for students and useful to our armed forces. When the initiative has to become reality, the Juniors Enterprises can be called on to take things further.

As part of its promotional activities, the Agency takes part in most defence and/or innovation-related trade fairs and events.

On the one hand, this enables us to highlight the most promising projects at the most opportune moment in their development lifecycle, while protecting them from disclosure where necessary, and thus maintaining confidentiality or encouraging synergies beneficial to their continuation and deployment in the forces. On the other hand, through contact with the players in the networks, each with their own desires and needs, exchanges are created around possible packages combining the different types of funding and support offered by the Agency. Finally, the Defence Innovation Forum, which is organised every two years by the AID and the Defence Information and Communication Delegation (DICoD), is a unique opportunity for defence innovation players to meet, through the presentation of technological, operational and managerial projects illustrating the diversity of areas in which the Ministry is innovating, and a programme of conferences, round tables and professional meetings.

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Knowledge is also disseminated and shared internally:

- **The DECLIC project**, which includes an intranet site that will go online in 2023, should enable the entire Ministry of Armed Forces community to become acquainted with defence innovation through educational presentations. It will provide general information, a library, a video library, online courses, a specific and detailed glossary, as well as a calendar of events on the theme of innovation. In 2024, this project will be extended to include the training initiatives that need to be put in place to continue the adoption of methods of innovation within the Ministry.

- **The Innosciences conferences, reserved for Ministry of Armed** Forces staff, are presented by high-level scientists and deal, in an accessible way, with a theme that may be of interest to Defence (such as science fiction, biomimicry, science and sport, global health, space weather, etc.).

In a less visible way, the promotion also supports its main missions, through the implementation of procedures, the updating of clauses included in standard agreements, the drafting of guides such as the participative innovator guide, or the administration of its digital spaces, which are all activities that contribute to the Agency's continuous improvement. It deploys an evaluation strategy to encourage this ongoing development of the organisation and maintain a high level of performance.

Finally, the Agency is putting in place a brand strategy, with the aim of proposing its own distinctive and clear identity, in order to establish the Agency, its systems and its know-how, within the Ministry and the innovation network.

ACRONYMS AND ABBREVIATIONS

AED	European Defence Agency
AID	Defence Innovation Agency
ANR	National Research Agency
ANRT	National Association for Research and Technology
ANSSI	National Agency for Information Systems Security
ASTRID	Specific support for defence-related research
BITD	Defence Industrial and Technological base
BITDS	Defence and Security industrial and Technological Base
BPI	Public Investment Bank
C4OS	Space Operations Command, Control, Communication and Computing Centre
CAST	Strategic Planning Unit
CEA	French Atomic Energy and Alternative Energy Commission
CCF	Future Combat Command
CDEC	Doctrine and Education Command Centre
CGPAE	Scaling-up Governance Committee
CIEDS	Interdisciplinary Centre for Defence and Security Studies
CIPAS	Joint Strategic Foresight and Planning Community
CNES	French Space Agency
CNRS	French National centre for Scientific Research
CoAS	Strategic Planning Council
COHOMA	Human-machine collaboration
DECLIC	Disseminating and encouraging a culture of innovation for the benefit of the defence community
DGA	Defence Procurement Agency
DGRIS	Directorate General for International Relations and Strategy
DIANA	Defence innovation accelerator for the North Atlantic
DRI	Detection, reconnaissance and identification
DSAé	Directorate of State Aeronautical Security
DTPM	Delegation for Ministerial Transformation and Performance
ENSTA Bretagne	National Higher School of Advanced Techniques - Bretagne
ENSTA Paris	National Higher School of Advanced Techniques - Paris

ETI	Mid-sized company
GAN	Generative adversarial network
GE	Electronic warfare
GICAN	French maritime industry association
GICAT	French land defence and security industry association
GIFAS	French aerospace industry association
GNSS	Global Navigation satellite systems
HAPS	High Altitude Platform Station
HEDI	Hub for European Defence Innovation
IA	Artificial intelligence
Inria	National institute for research in computer science and control
ISL	Franco-German Research Institute of Saint Louis
L2I	IT warfare for influence
LPM	Military Programming Law
LAD	Anti-drone warfare
MEO	Medium Earth Orbit
MTO	Remotely operated munition)
NAZDAC	Navigation in a Denied Access Zone
NRBC	Chemical, Biological, Radiological, Nuclear
ONERA	National Aerospace Research Agency
ORION	Large-scale operation for resilient, interoperable, high-intensity combat-oriented and innovative armies
OTAN	North Atlantic Treaty Organisation
PFUE	French Presidency of the Council of the European Union
PTD	Defence Technology Project
R&D	Research and Development
RETEX	Feedback
RF	Radiofrequencies

ROEM	Space-based electromagnetic intelligence
RTI	Research Technology and Innovation
SAP	Shared Air Situation
SCAF	Future Air Combat System
SGA	General Secretariat for Administration
SGDSN	General Secretariat for Defence and National Security
SSA	Space Situational Awareness
STO	Science and Technology Organisation
S&T	Science and technology
TRL	Technology readiness level
ULB	Ultra large band

AGENCE INNOVATION DEFENSE

« Our objective is clear: to facilitate innovation and consolidate France's position »

Sébastien Lecornu, Minister for the Armed Forces.
Defence Innovation Forum 2023

The point of contact for companies with defence-related innovation projects:

www.defense.gouv.fr/aid