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EURO DASS European Defensive Autonomous Submarine Systems

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Abstract:

Profoundly disrupting the way one can think and act, **unmanned assets are expanding and cannot be developed without any political and democratic oversight**, especially in an area as sensitive as defence. Europe, because of its geographic location, is very much exposed to the proliferation of autonomous military assets coming from the sea. Already, some national navies are moving forward to develop fleets of unmanned vehicles and, in the context of increasing cyber-attacks, the risk of an arms race here is too great. We thus consider it crucial that Europe sets an example by **adopting a comprehensive framework of action** that encompasses the legal, ethical, economic, environmental and political challenges brought by the advent of unmanned assets in the field of defence. We propose to do so with a three-step development program of **Defensive Autonomous Submarine Systems** - or EURO DASS - which will follow strict principles and hopefully will set a precedent for the making of unmanned systems in defence operations. These three steps complement each other. The first one enables mutual recognition of the issues and dilemmas that may arise. It legitimizes European intervention and provides **a better understanding of the operational expectations of end-users and the technical expectations of the industry**. The second and third steps are interconnected: the common certification reinforces the legal reflection conducted by the committee and vice versa. In fine, these three steps lead to a **precise doctrinal framework for the development of autonomous underwater vehicles** on the ethical and legal level, and a clear roadmap with a compliance monitoring system for the naval industry by 2025.

Keywords:

Defensive Autonomous Submarine Systems; European doctrinal framework; ethical dilemmas; operational expectations; technical expectations

Framework for the development of EURO DASS

Introduction

Unmanned systems have ‘silently’ gained military prominence and are now even compared to nuclear arsenals for their potential strategic contributions (Chamayou, 2015). They may provide sophisticated tactical war-fighting capabilities at different levels: land, air and **sea** (Payne, 2018). However their use can worry many and requires **coordinated expertise.** In order to publish European guidance on the use of autonomous and/or remote submarine vehicles, we interviewed two *capitaines de vaisseau* (C.V. or NATO OF-5 rank) from the French Naval Staff: **Audrey Hérisson**, Assistant to the Head of the MCO Office, who also holds a PHD in philosophy and specialized in contemporary war theory, and **Yann Briand**, Head of Strategy and Policy Office who previously worked for the EU Military Committee. We therefore propose here a **broad vision** of the use of unmanned submarine systems, both on a **philosophical** and **operational** level.

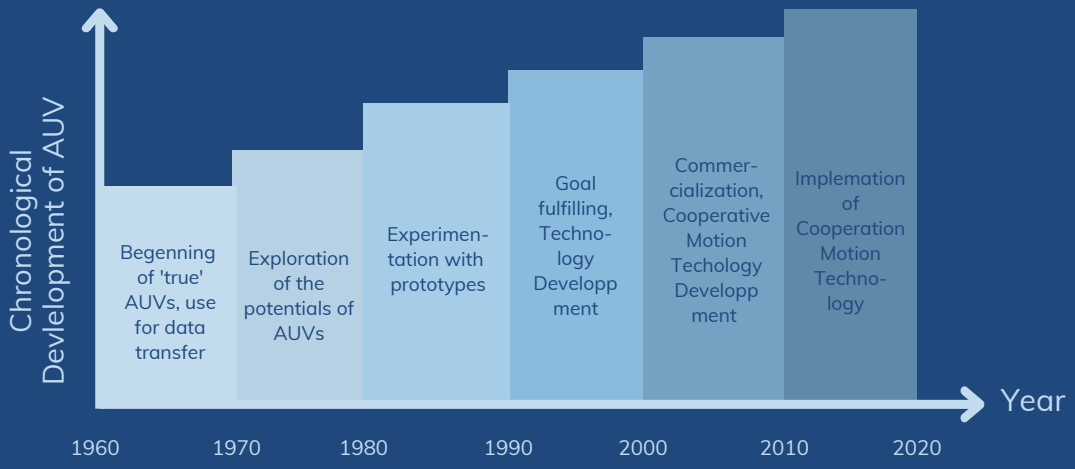
1. SUBMARINE ISSUES AND CHALLENGES

State of Technological Developments

Historical overview:
Innovation has always been an integral part of the crews’ working environment: ‘What a new technology might accomplish and how it should be employed has to be sorted out in advance of an actual engagement’ (Wirtz, 2020, 96).

The first **autonomous** underwater vehicles ('AUVs') were developed in the 1960s and 1970s, with the ‘SPURV’, or Self-Propelled Underwater Research Vehicle, in the United States, the first AUV of the American army, and the ‘Épaulard’ in France. In military applications, the term 'UUVs' (**unmanned** undersea vehicles) is generally used. The term "ROVs" refers to non-autonomous **remotely** operated vehicles, which are controlled from the water surface by an umbilical (Sahu and Subudhi, 2014).

There is therefore a difference between the notions of a vehicle controlled remotely by an operator and an autonomous vehicle, which can function without human control. If the term of ‘autonomy’ is frequently used, the French Defence Ethics Committee prefers to distinguish between automatism, with low artificial intelligence, and autonomy, i.e. decisions taken on the basis of parameterised information (Langloit, 2021). In fact, no device is entirely autonomous, and as C.V. Audrey Hérisson explained to us in an interview, the control of so-called autonomous devices is done upstream, during their programming (Hérisson, 2022).



Schematic view chronological developpment of AUV
(Sahu and Subudhi, 2014)

About thirty AUVs were being developed worldwide in 1990 in about ten countries, the most advanced countries being the United States, followed in Europe by France and the United Kingdom (Duranton and Michel, 1990).

Current situation:
The submarine systems market is currently dominated by American (40%), European (33%) and Japanese (7%) players (French Ministry of Armed Forces, 2022). At university level, Chinese and American research institutions and universities are top in international rankings in this area. Turkey has also been investing in the marine and underwater drone industry for the past few years. In military terms, three powers stand out from the rest: the United States, China and Russia. In March 2018, for instance, Russia announced the development of the Poseidon system, a nuclear torpedo with the range of a drone and the ability to carry a nuclear warhead, and capable of long-range submerged navigation (10 000 km announced) (Tass, 2019).

Futures perspectives:
The future prospects concern both the military (underwater sensor deposits, detection and delimitation of minefields, diver assistance, cleaning of toxic materials), commercial (search for new energy resources) and scientific (oceanographic measurements, exploration of the seabed) fields. Estimates indicate that the value of the underwater drone market will triple between 2021 and 2026, from €1.5 billion to €4.3 billion (French Ministry of Armed Forces, 2022).

Threats and Limits
However, there are a number of issues that make it very difficult for multi-vehicle systems to implement these complex operations, including autonomy, energy, navigation, sensor and communication management, especially in a dynamically changing environment. According to the Head of Strategy and Policy Office of the French Naval Staff, C.V. Yann Briand autonomous and remote devices also present a risk, ‘from a cyber point of view, these means are fragile compared to humans because they can be diverted".

Military Matters vs. Societal Concern

Societal and Political Concern:

In 2013, several non-governmental organizations, including Amnesty International and Human Rights Watch, launched the 'Stop Killer Robots' campaign. In November 2018, UN Secretary General António Guterres called for a ban on killer robots, claiming that they are 'politically unacceptable.' A letter warning against the dangers of an arms race in military artificial intelligence was signed the same year by several hundred experts and by well-known public figures such as Elon Musk and Stephen Hawking. Since 2013, 40 countries have called for a ban on weapons systems that are beyond human control, including South American countries (Argentina, Bolivia, Brazil, Chile, Colombia...), African countries (Algeria, Egypt, Ghana, Uganda...), or Austria, Spain and China, which does not want to stop their development or production (Human Rights Watch, 2021).

Interestingly, this media and political uproar mainly focuses on 'killer robots': 'several examples of killer robots are frequently put forward by militant organizations or think tanks', but 'the reality check can leave one sceptical about them' (Langlois, 2021). Some questions and dilemmas about remotely controlled devices seem however legitimate. Grégoire Chamayou for instance believes that the fact the operator can see without being seen 'facilitates the administration of violence', which can lead to 'a figurative reduction of the enemy' (Chamayou, 2015).

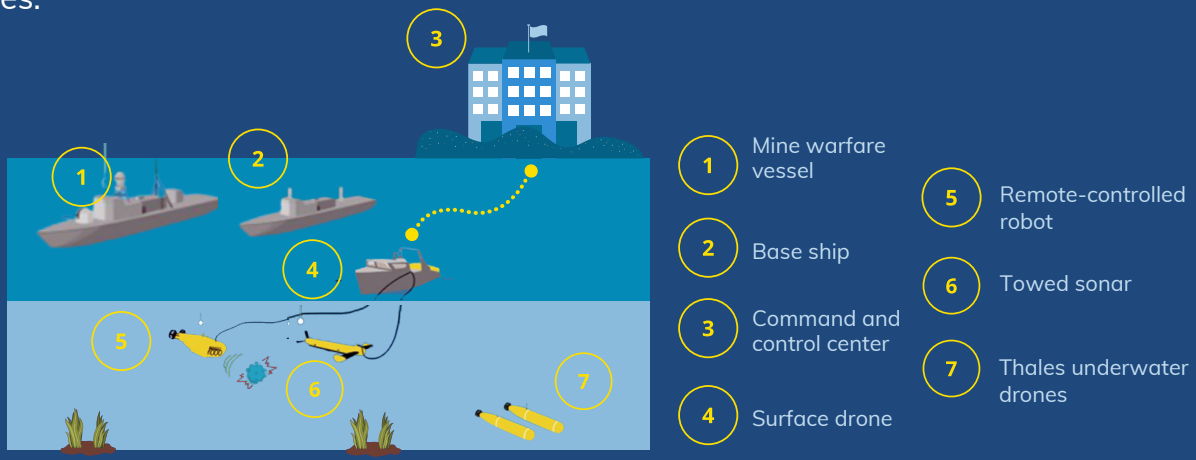
Industrial Interest:

On the industrial side, shipbuilders seem to have grasped the interest of these devices for their clients. Éric Papin, Naval Group's Technical and Innovation Director, explains for example that artificial intelligence and remote control can provide superior information and decision-making. These tools can be used in the field but can also be useful in the context of technical-operational simulation. The scope of application is therefore quite large for industrialists. In this respect, Naval Group has identified nine areas that are suitable for the application of AI and remote control, including training, cyber, surveillance, predictive maintenance and multi-milieu drones (Papin, 2019).

Military's Perspective:
Autonomous and remote devices have several advantages for the military, according to C.V. Yann Briand:

- They have no affect or emotion, 'the device will only conform to the lines of code, which is rather a reassuring feature';
- They offer a certain economic advantage and have a great interest in terms of sustainability: 'in anti-submarine warfare, using an autonomous means is quite advantageous, which can allow a frigate to be mobilized for another mission';
- They can save precious seconds ('millisecond matter'): 'the time parameter is very important, weapons move very fast, and you have to react at speeds that are sometimes beyond human intelligence', so 'autonomous means will undoubtedly have this capacity to react extremely quickly';
- They cause little or no collateral damage.

More generally, 'these vehicles provide incredible added values: they can operate for hours on end and they provide forward visibility which is extremely useful' (Briand, 2022). The military would use these devices alongside crews on operations, making them complementary instruments. The use of these vehicles seems particularly relevant in the context of mine action, as we can see from the Franco-British cooperation program MMCM ('Maritime mines counter measures'), which uses the French national program SLAM-F (French for 'Mine Countermeasures Systems of the Future'), developed with Thales.



MMCM Program (French Ministry of Armed Forces, 2020)

As a result of their scientific training and their knowledge of the field, the military has gone further what the C.V. Hérisson calls the 'normal technophobia' stage (Hérisson, 2022). Nevertheless, the military is aware of the possible risks that may exist, of cyber hacking as mentioned above, but also of misidentification (at the level of algorithms on the identification of a target or an element).

Yann Briand explained to us that in the end, there were always precise lines of engagement that were defined in the field, and that these lines should also apply to remote and/or autonomous devices. These guidelines for these types of devices have yet to be defined, and this is the aim of our project. Audrey Hérisson believes that the three phases of our framework make it possible 'to calm things down with regard to a certain technophobia, by ensuring that MEPs and members of this ethical committee are able to discuss with technical experts', in order to then resolve the real ethical problems.

2. EURO DASS ROADMAP

Step 1. Preliminary Discussions

Bottom-Up Approach

The first step of EURO DASS consists in a series of decentralised round tables and public consultations of various actors working on autonomous systems and their development. Our aim is to be holistic and thus to bring together representatives of national Defence Staff (through the Military Committee of the European Union), naval industry unions (CESA and SEA Europe), as well as academics and associations dealing with the subject of autonomous weapons (Stop Killer Robots, the Red Cross, etc.). Because we are aware of the plethora of approaches and preferences, this step ought to be driven by a bottom-up logic that relies on multiple streams of information to develop knowledge and eventually reach the formulation of common goals.

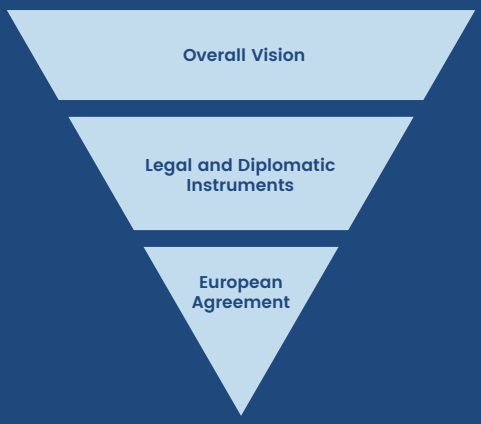
As previously described, Europe is the only appropriate scale to carry such a project. According to Audrey Hérisson 'It is inescapable to go through Europe. The question should not be raised, but of course that does not prevent us from doing things in parallel at national level.' (Hérisson, 2022). We recommend this step is organised by the European institutions. We acknowledge the strong intergovernmental nature of any European initiative related to foreign and security policy. The Council of the European Union chaired by the HR/VP should thus be the core agenda-setters here. Other organising bodies that should be involved are the European Commission and the European Defence Agency. The former can be associated in the prospect of benefiting from the European Defence Fund. The experience of the latter in terms of industrial and scientific integration through PESCO as well as its expertise in identifying lacunas and future potential cooperation through CARD can be highly valuable.

Taking example on the consultations organised by the European Commission for the DSA/DMA package, we estimate that four months should be enough to collect contributions from the civil society. However, since our initiative also includes academic works and preparatory meetings with all the national Defence Staff, we extended the length of the first step to six months.

By pooling expertise and affording each participant equal representation, this step should display the vast array of opinions on what should or should not be done in the development of autonomous submarine systems. The only guideline we provide for these consultations and discussions is that any reflexion and proposal should be based on one or more desirable or non-desirable consequence. This will then allow the categorisation of the contributions in different policy scenarri.

Step 2. Building up a suitable European Legal Policy

Drawing from the contributions and the various options they revealed, our goal at this step is to come up with a comprehensive framework for the development of autonomous submarine systems. Taking inspiration from the process which led to the European Security Strategy in 2003 and the European Union Global Strategy in 2016, we recommend the framework to be drafted internally, submitted to the European Council for adoption, and widely implemented at the European scale. We consider this centralised and top-down approach to be the most appropriate and effective to produce a unique paper of broad principles which will set the course for future evolutions of autonomous submarine systems.



Top-Down Approach

The drafters of this paper will operate in the format of a temporary ethics committee composed of members of the European parliament as well as technical and legal experts from the EEAS, and will be chaired by the HR/VP.

Over the last few years, the HR/VP and the EEAS developed capabilities and evolved in becoming a key player in European foreign and security policy-making because of its position at the junction between various institutional actors (Csernatoni, 2021). We thus consider that such a project cannot be properly articulated at the European level without the input of the supranational entrepreneur that is the EEAS. However, we also deem important to make this type of initiatives more accessible to the public, and want to depart from the 'behind-close-doors' sentiment that surrounds them. Therefore, we want to include members of the European parliament in the drafting committee.

As representatives of the European people in the institutional triangle they will bring an additional layer of democratic legitimacy and transparency to the process. Because the development of unmanned submarine assets is a crosscutting issue, the MEPs will have to be from the relevant parliamentary committees which are: AIDA (Artificial Intelligence in a Digital Age), ITRE (Industry, Research and Energy), SEDE (Security and Defence), DROI (Human Rights), and AFET (Foreign Affairs).

They will have to reach a balance between ethical concerns and risks on one side and operational necessities on the other. As the Head of the Strategy and Policy Office of the French Naval Staff, C.V. Yann Briand, told us in an interview: 'We cannot disarm ourselves through law. France's emergency is to avoid technological relegation' (Briand, 2022). At the same time, he acknowledged there could be both 'cyber fragilities' and a philosophical issue regarding the potential 'banalisation of war' given the lower human toll in conflicts with unmanned assets. The committee will thus need to go beyond the traditional technophobia and match realist expectations but without compromising on ethics.

Similarly to the European Union Global Strategy, we estimate that one year should be sufficient to present the last version of the document to the European Council for a final adoption vote.

Step 3. Outreach and Groundwork Program

The third and last step of EURO DASS has the ambition to create a common European certification for industrial groups. The main goal is to maintain cooperation between institutional and private actors and to create a real European hybrid expertise, both ethical and technological. This certification makes the first two steps concrete and reinforces their scope. It also ensures the armed forces and civil society that the industry is aware of ethical and legal issues.

European naval groups are currently in a competitive, complex and heterogeneous market, and naturally the European Union's desire for transparency must also respect the need to protect certain manufacturing processes and sensitive industrial data in order to be considered acceptable by the players involved. However, by making this certification conditional on access to European funds, such as the European Defence Fund launched in 2017 by the European Commission and with a budget of €8 billion for the period 2021-2027, we can hope to move towards bringing key players together (European Commission, 2021). The motive of our project is thus to unify the naval sector by building a European perspective on submarine autonomous and/or remote systems, which legitimizes a supranational intervention.

Main European naval groups include by alphabetical order: Damen (Netherlands), Ficantieri (Italy), Naval Group (France), Navantia (Spain), Saab Kockums (Sweden) and TKMS (Germany). The Quality division of each group will be particularly mobilised, since it is charged to conduct studies certifying the quality of the devices and to ensure more generally the conformity of the vehicles and the affiliated software compared to the specifications previously fixed. Quality managers are also in charge of training facilitation for the production and design staff; in other words, they have control over the entire production chain.

This outreach program will be done in three sub-stages. The Directorate-General Defence Industry and Space (DEFIS) of the European Commission, responsible for EU policy on defence industry and space and in the in charge of the implementation and oversight of the European Defence Fund, will first work on drafting precise criteria for the label by transcribing the principles voted during the second phase of our project. The Directorate General's certification proposal will then be made in the form of a regulation to be submitted to the European Parliament and Council of the European Union under the ordinary legislative procedure, as what has been done in the agricultural sector with PDO (Protected Designation of Origin) certifications. The DG DEFIS staff will finally be able to deliver the EURO DASS certification to the groups which take into account the defined criteria.

We estimate that a period of one year will allow the first two sub-stages of the project to be completed. At the same time, at the national level, the military also has the opportunity to develop similar groundwork programs to strengthen scientific literacy throughout the process (Hérisson, 2022).

Conclusion

The development of submarine unmanned assets and their application in the field of defence is a textbook case of a 21st century issue that can only be solved at the European level. It is at the crossroad of transnational military needs, societal concerns, and industrial prospects and therefore can only be tackled at this adequate scale. We recommend:

- A bottom-up, problem-solving orientated, comprehensive assessment of the challenges, nourished by the contributions of all the stakeholders;
- The drafting of a framework encompassing all the legal, ethical, and political challenges determined previously in order to set a precise course of action for any future development;
- The translation of the newly established European framework in a certification available for actors of the naval sector under a certain set of conditions.

Overall, our program provides a bond of trust between the civil society, the industry, and the military by acknowledging their point of view and moving forward on their reconciliation.

EURO DASS Timetable

Interviews

Hérisson, A. (March 7, 2022). *Capitaine de vaisseau* and Assistant to the Head of the MCO (Maintenance in Operational Condition) Office, French Naval Staff.

Briand, Y. (March 16, 2022). *Capitaine de vaisseau* and Head of the Strategy and Policy Office, French Naval Staff.

References

Chamayou, G. (2015). *A Theory of the Drone*. New York: the New Press.

Csernatoni, R. (2021). 'The Evolving Role of the European External Action Service in Security and Defence'. *European Foreign Affairs Review*, 26(1): 87-100.

Duranton, R. and Michel, J-L. (1990). 'State of the Art on Autonomous Underwater Vehicles, Key Technologies'. French Research Institute for Exploitation of the Sea.

European Commission (2021). 'Commission implementing decision on the financing of the European Defence Fund established by Regulation (EU) No 2021/697 of the European Parliament and the Council and the adoption of programme for 2021'.

French Ministry of Armed Forces (2020). 'Guerre des mines : Florence Parly annonce la commande de quatre systèmes de drones' [in French]

French Ministry of Armed Forces (2022). 'Seabed Warfare Strategy'.

Human Rights Watch (2021). 'Killer Robots: Military Powers Stymie Ban'. https://www.hrw.org/news/2021/12/19/killer-robots-military-powers-stymie-ban

Langlois, P. (2021). "Le SALA vaut-il mieux que le "robot tueur" ? Voyage au cœur de l'autonomie". *Défense & Sécurité internationale*, 81:26-31. [in French]

Papin, E. (2019). Chair 'Grands Enjeux Stratégiques Contemporains' of the Sorbonne (Paris 1) on 'Artificial Intelligence in Future Combats'. [in French]

Payne, K. (2018). 'Artificial Intelligence: A Revolution in Strategic Affairs ?'. *Survival*, 60(5): 7-32.

Sahu, B. and Subudhi B. (2014). 'The State of Art of Autonomous Underwater Vehicles in Current and Future Decades'. *First International Conference on Automation, Control, Energy and Systems*: 1-6.

TASS (2019). 'Key stage of Poseidon underwater drone trials completed, says Putin'. https://tass.com/defense/1042975

Wirtz, J. (2020). 'Innovation for seapower: U.S. Navy Strategy in an age of acceleration'. *Defense & Security Analysis*, 36(1): 88-100.