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Multinational Cooperation Formats for Air and Missile Defence

Comparative Models and Implications for European States

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The bitter reality of an unprovoked war of aggression in Europe brings us back to the realisation that our security cannot be taken for granted. A strong and capable air defence posture is an essential contribution to the successful deterrence of existing and evolving threats. Multinational execution of an Air and Missile Defence mission generates synergetic effects for the overall operational performance that exceed the sum of national contributions. Several formats of multinational cooperation in NATO and the EU will be analysed in this article to eventually deduce that settings with higher integration potential generate the best capability gains for European nations within the domain of Air and Missile Defence.

KEYWORDS: Air and Missile Defence, Ground-Based Air Defence, Multinational Cooperation, Capability Development, Interoperability

Többnemzeti lég- és rakétavédelmi együttműködési formák

Összehasonlító modellek és következmények az európai államok számára

Egy kiprovokálatlan agressziós háború keserű valósága Európában visszavezet minket ahhoz a felismeréshez, hogy biztonságunkat nem lehet magától értetődőnek venni. Az erős és hatékony légvédelmi fellépés alapvető fontosságú a meglévő és fejlődő fenyegetések sikeres elrettentéséhez. Egy lég- és rakétavédelmi küldetés többnemzeti végrehajtása szinergikus hatásokat generál az általános műveleti teljesítményre, amelyek meghaladják a nemzeti hozzájárulások összegét. Ebben a cikkben a NATO és az EU többnemzetiségű együttműködésének számos formáját elemezzük, hogy végül arra a következtetésre jussunk, hogy a nagyobb integrációs potenciállal rendelkező környezetek generálják a legjobb képességnövekedést az európai nemzetek számára a lég- és rakétavédelem területén.

KULCSSZAVAK: Lég- és rakétavédelem, földi telepítésű légvédelem, többnemzeti együttműködés, képességfejlesztés, interoperabilitás

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"The best hope for peace in our time is the development of some form of collective security."

(Dwight D. Eisenhower as SACEUR, 1951)

Introduction

When Russia launched its unprovoked invasion of Ukraine in February 2022, it set off the largest armed conflict in Europe since World War II. Since then, Putin's ruthless and illegal war of aggression and the continued support by other regimes that despise the Euro-Atlantic way of life and conception of democracy have led to ongoing insecurity in Europe and North America. Not only Dwight D. Eisenhower's advice above from more than seven decades ago, but also recent research and empirical evidence underscore that the most promising and efficient way to guarantee stability and peace is to do so collectively with allies and partners.[1]

Sadly and ironically, Putin's ongoing provocation and testing of NATO's Article 5 seemed to be necessary for European nations to realise that the famous rule of deterrence still applies: Si vis pacem, para bellum – If you want peace, prepare for war. A strong air defence structure in the Alliance is vital to prevent the situation of being forced into collective defence and to contribute to the essence of successful deterrence, namely capabilities, political will and cohesion amongst partner nations.

Strategic Context and Analytical Objectives

The military development in the Russo-Ukrainian war clearly proves that an effective air and missile defence (AMD) and in this case particularly the ground-based air defence (GBAD) posture does matter and make a difference. While the media coverage focused on tanks, artillery and specifically the development in drone warfare, the GBAD coverage has shaped the course of the conflict more quietly. In the first phase, the large Ukrainian fleet of legacy Soviet systems, later the mix of US and European systems delivered to Ukraine has prevented Russia from attaining air superiority and from air power playing a decisive role in the conflict. Some authors even argue that Ukraine's GBAD capabilities have hindered the success of the Russian invasion more than any other single factor due to their shaping effects onto the rest of the battlefield. Fast jet operations, attack helicopter missions as well as airborne deployments were rarely observed in offensive operations close to the frontline due to the GBAD posture on both sides which has significantly limited the utility of manned aviation in the course of this conflict.[2]

What does this observation mean for the requirements of a capable and deterrent AMD posture for NATO and EU nations? Even though a certain level of multinationalism has been a continuous reality for many European armed forces since the establishment of NATO's integrated command structure in the mid-1950s, the

1 Dowd, Flanagan 2025.

2 Cazalet 2025, 19–24.

above-mentioned situation forces allied nations in today's security environment to rethink national borders to a wider extent and to strive more for integrated, layered, multinational considerations in AMD. The core dilemma of contemporary air and missile threats is characterised by saturation, hypersonic systems, and an unfavourable cost-benefit ratio. Attackers use cheap, numerous drones or missiles in swarms or waves, while those air assets move faster, thus making defensive measures more costly and complex. A shift from "somehow connected" single-system national models to cooperative, multi-domain approaches is therefore surely required. Consequently, building an effective AMD for the Alliance is less a question of optimising national systems than a challenge to integrate a nation's own capabilities into a multinational approach.

In this article, I will analyse which multinational cooperation models provide the greatest and most sustainable benefits within the domain of Air and Missile Defence, with a special focus on GBAD capabilities. To this end, I will examine how NATO and EU cooperation frameworks differ in terms of economies of scale, interoperability, doctrinal convergence, and capability integration potential. Respecting which structural, political or organisational constraints can determine the depth of multinational AMD cooperation efforts, I will deduce which cooperation format will be the most suitable to achieve operational gains for a robust European posture against contemporary aerial threats.

Parameters of AMD Capability Development

The constraints of the previously described new global political situation with its perceived current and future threats, such as ballistic missiles, hypersonic systems, and drones, provide sufficient political justification for building up powerful AMD capabilities. However, AMD capability development rarely follows purely military rationality. Several factors play an important role in the decision-making and procurement processes in the respective nations. AMD capabilities create resilience and act as a visible deterrent and reassurance both for the public and allies. The high investments can thus be politically justified due to the vulnerability of the population and critical infrastructure to threats from the air.

Other aspects such as defence industry market structures and dependencies also play a key role. In many countries, existing systems have already created a certain degree of path dependency, as a complete changeover often makes little economic sense. At the same time, fundamental decisions must often be made in European nations as to whether they want to remain dependent on US technology in the future or they want to underpin European sovereignty claims with their own products or even their own weapon system landscape.

US suppliers continue to dominate the production of upper-layer AMD systems, while in the medium-range air defence (MRAD) sector, several highly competitive European products exist which have proven their combat effectiveness in the Ukraine conflict and could naturally all serve regional industrial interests.[3] Extremely high lifecycle costs for AMD systems in terms of procurement, operation, ammunition, and

3 E.g.: IRIS-T SLM, SAMP/T and systems from the CAMM family.

upgrades provide strong incentives for multinational procurement and pooling. Of course, the question of fair burden sharing – who pays for what and who benefits most? – is usually a politically sensitive issue within the Alliance framework.

Finally, all these aspects – in addition to the urgent need for effective deterrence as well as the capabilities for collective defence – inevitably lead to multilateral approaches in AMD. Multinational solutions are often firstly a strategic and military necessity rather than a political choice. Since cooperation does not automatically equal integration, the challenge for allied nations is quite obvious: How can the air and missile defence capabilities rapidly be enhanced and appropriately integrated while heterogeneous system configurations are developed and procured?[4]

Typologies of Multinational AMD Cooperation

I will use a threefold typology for the analytical framework, distinguishing between coordination-based, capability pooling-based, and integration-based formats of multinational AMD cooperation. This idea is based on established distinctions by several authors in the literature on defence cooperation models. In this context coordination-based means that political, strategic, and operational coordination amongst allied nations and military formations takes place without joint leadership. Integration-based formats refer to deeper military integration, i.e. shared planning and command, including joint command structures. It potentially includes mutual subordination of units under the command of another nation's leadership. Understandably, this approach results in a completely different level of synchronisation.[5] Pooling and sharing describe various forms of defence cooperation in which states either provide capabilities on a shared basis (sharing) or jointly develop, procure and operate them in multinational structures (pooling). The obvious goal is to reduce costs and increase efficiency. While sharing is based on the permanent assumption of specific tasks or the provision of national capabilities to partners, pooling enables access to capabilities through joint structures and programmes that individual states would not be able to provide on their own, either financially or organisationally.[6]

As additional structural determinants, the consideration of three interoperability layers will be added to my analysis. They provide an important analytical reference in this context, but without further clarification they often remain abstract. Out of numerous layers which could be considered, I will reflect on the technical, procedural and organisational interoperability. Their political and strategic significance is particularly evident in situations where timing is critical and operational uncertainty is high. Technical interoperability will manifest itself in the ability to generate and share a common picture of the situation in a timely manner. Procedural interoperability could be considered as the coordinated interpretation of this picture and the synchronisation of national decision-making processes. Organisational interoperability refers to the willingness and ability to make politically

4 Kaushal 2025, 48.

5 cf. inter alia Howorth 2014, 61–64.

6 Mölling 2012, 1–2.

legitimate leadership decisions across institutional or national boundaries. Interoperability should therefore be less understood as a static condition, but more as a factor that depends on the specific context and that significantly determines the capacity to act in multinational arrangements. Consequently, interoperability cannot be treated as a binary condition. It has to be understood as a multi-layered phenomenon along these – in this analysis three – dimensions, which must be aligned for multinational forces to operate effectively together. Interoperability thus determines the actual integration value of multinational cooperation. Only the combination of those separate but interconnected layers enables effective integration of sensors, Air Command and Control (Air C2) and effectors within a multinational AMD formation.

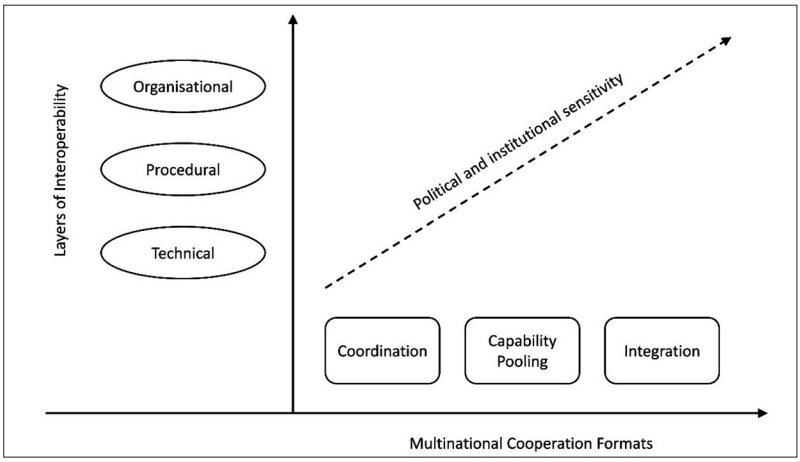

Chart 1:
Schematic illustration of the analytical framework's logic
Source: Author's own elaboration

NATO Frameworks for IAMD Cooperation

In light of the evolving security environment, there is obviously a strong consensus amongst NATO Allies about the importance of Integrated Air and Missile Defence (IAMD) and especially on an urgently needed expansion of the ground-based AMD posture. Therefore, it is considered to be the top priority within the Alliance and the capability area with the strongest intended growth in the near future. Accordingly, on 9 June 2025 NATO Secretary General Mark Rutte placed his striking quote: "NATO needs a 400% increase in air and missile defence".[7]

NATO IAMD has historically evolved from NATO's Cold War Integrated Air Defence system (NATINADS) which was mainly static, designed in belts with air defence systems of different ranges and directed eastwards against a then well-defined threat of manned bomber aircraft. Since then, given the new challenges and threats,

7 Watts 2025.

the approach has changed to today's NATO IAMD Policy,[8] which substantiates the continuous air defence mission in peacetime, crisis, and conflict. It addresses the full spectrum of air and missile threats from all strategic directions and is designed to be flexible, deployable, and responsive. The interconnected national and NATO air defence assets form today's NATO Integrated Air and Missile Defence System (NATINAMDS), consisting of weapon systems, sensors, effectors, and Air C2 capabilities. Since potential and actual adversaries might aggressively threaten the Alliance through various air assets and missiles, IAMD is an essential element of NATO's deterrence and defence posture in the current strategic environment. In order to demonstrate the cohesion of the Alliance, supplementary IAMD capabilities have been deployed to NATO's eastern flank in response to Russia's war against Ukraine. After Polish airspace violations by Russia in September 2025, the posture has been further reinforced by additional assets and activities through operation 'Eastern Sentry'.

NATO IAMD is integrative by nature. In order to coordinate all available air and missile defence capabilities throughout the Alliance, procedural, technical, and human interoperability is crucial and a key prerequisite for the overall deterrent effect. This centralise but geographically dispersed NATINAMDS architecture results in a powerful and resilient organisation, comprising AMD systems, and interconnected sensors in all layers.[9] It can be deduced that while the IAMD Policy sets the political and conceptual framework and emphasises integration as a core requirement, NATINAMDS serves in practical terms as NATO's 'integration engine' in IAMD.

Due to the foreseeable increase of complex multi-domain and far-reaching operational challenges, the Alliance is committed via the IAMD Policy to further strengthening its longer-term deterrence and defence posture. Developing the full range of combat-ready forces and capabilities necessary to maintain credible deterrence and defence will be the prerequisite for denying any potential adversary any possible opportunities for aggression.[10] This means in conclusion that IAMD capabilities among the allied nations – surveillance, interceptors, C2 elements – should continuously be adapted and improved, mainly through the existing framework of the NATO Defence Planning Process (NDPP).

The NDPP, with its long-established and optimised steps, defines binding capability targets for the Alliance member states. However, mainly because it has not been its defined task, it has never been able to effectively overcome existing reservations in most European capitals regarding a determined consolidation of defence markets. It was therefore beneficial for European allies to focus on intergovernmental forms of cooperation, such as the structured collaboration of smaller groups of states with similar interests. The NATO Framework Nations Concept (FNC), proposed by Germany and adopted by NATO in 2014, serves this motivation with providing an implementation mechanism for efficiently achieving the NDPP capability goals through multinational, cluster-based cooperation. The FNC thus translates NDPP requirements into concrete, coordinated capability

8 NATO 2025a.

9 NATO 2025b.

10 NATO 2025a, paragraph 2.

development without replacing the formal and highly structured character of the NDPP. In the area of IAMD, the FNC primarily acts as an organisational and conceptual integration vehicle. It allows national GBAD contributions (sensors, effectors, C2 elements) to be harmonised in thematically or regionally focused groups under the leadership of a framework nation.

NATO's Modular GBAD High Visibility Project (Modular GBAD) strives for joint development and procurement of a flexible and scalable solution responding to air threats along the entire very short, short, and medium-range spectrum with an ambitious acquisition timeline by 2028.[11] It was launched in October 2020 and entered its Concept Stage in February 2023.[12] The idea is to facilitate the acquisition of a versatile, scalable GBAD system that is designed modularly around a Fire Distribution Centre (FDC) as the C2 backbone. Modular GBAD is based on a developed, common set of requirements, by which every participating nation can compose its individual threat- and budget-tailored solution.[13] It can be considered as a very positive aspect of Modular GBAD that the adopted approach clearly supports the subsequent goal of seamlessly integrating national elements into multinational GBAD force packages which in itself can then contribute to larger multinational formations.

One further and very important element of multinational cooperation in AMD is the exercise landscape. The Joint Project Optic Windmill (JPOW) exercise series can serve as a very prominent and extremely useful example. Originally set up in the mid-90s as a US-German-Dutch approach to maximise interoperability and integration in Theatre Missile Defence (TMD), JPOW has developed to become a leading IAMD exercise for both the tactical and the operational level throughout Europe. According to its concept, JPOW facilitates adequate room for experimentation and is shaped for knowledge enrichment and the so called 'knowledge cross-fertilisation', all of this with a special focus on interoperability and integration of AMD elements. Overall, the exercise scenario seems highly effective in improving the planning and C2 procedures in the IAMD domain through the combination of live exercise and simulation elements as well as the integration of academics and flexible Concept Development & Experimentation (CD&E) phases. It is a remarkable note and signal that actually a considerable part of NATO's IAMD procedures and command structures were developed and assessed during JPOW exercises.[14]

There are many more initiatives, activities and formats within NATO contributing to cooperation, interoperability and integration which cannot be examined further in this article. Not only standardisation manuals and existing multinational C2 models but also other exercise series like Ramstein Legacy (RALY) or preparation programmes for AMD Task Forces prior to deploying to missions under the eVA umbrella serve the important goal of achieving an interoperable and ideally truly integrated but still flexibly deployable multinational IAMD posture.

11 Machi 2022.

12 Participating nations in Modular GBAD are currently: Denmark, Germany, Greece, Hungary, Italy, the Netherlands, Norway, Romania, Slovenia, Spain and the United Kingdom

13 NATO 2025c.

14 Bronk 2021, 23.

European Frameworks for IAMD Cooperation

One could feel that next to the EU as a supranational organisation, there are – especially in the defence sector – 'different kinds of Europe'. These various collaboration constellations in smaller groups arose from similar motives as the described motivation drivers for the FNC logic in NATO. The assortment of many EU cooperation initiatives, of which the European Sky Shield Initiative (ESSI) and the Permanent Structured Cooperation (PESCO) are only two examples, sometimes seems like a confusing alphabet soup. But might this patchwork of coalitions in smaller groups in reality be the EU's and the European pillar of NATO's true strength?[15]

Although this section will focus on the PESCO and ESSI instruments, it is important to briefly discuss a few other terms used in the EU context that are crucial to the overall functioning and understanding of the processes. The Capability Development Plan (CDP) is the EU's strategic capability reference document. It identifies priority military capability gaps and requirements of the member states based on threat analyses; lessons learned from operations and long-term trends. It thus functions as a framework for national planning and cooperative armament projects, thereby providing input for PESCO. The Coordinated Annual Review on Defence (CARD) is a regular coordination and transparency mechanism that systematically compares national defence plans. The aim is to identify potential areas for cooperation, redundancies and capability gaps at an early stage. CARD thus represents a procedural link – without binding effect – between national planning and multinational capability development. The European Defence Agency (EDA) is the institutional body responsible for these instruments. It supports EU member states in capability development, armament cooperation, standardisation, research and technology, and military interoperability. The EDA thus acts as an enabler and coordinator, operates CDP and CARD in a technical capacity, and translates political priorities into projects that are suitable for cooperation.[16]

The EU's flagship foreign and security policy document, "A Strategic Compass for Security and Defence" (EU Strategic Compass),[17] serves as the political and strategic control lever that aligns, prioritises and legitimises the content of the aforementioned instruments. It translates threat analyses into political objectives for European security and defence policy and defines which capabilities are politically prioritised, e.g. integrated air and missile defence, including the timeframe and the level of ambition. In summary, within the EU defence capability ecosystem, the Strategic Compass provides political direction, CDP and CARD translate it into capability logic, and the EDA enables practical cooperation. Considering this framework more critically, one has to admit that these EU tools and entities as CDP, CARD and EDA are not set up to work as granular plans or even as one big idea, but rather aim to identify cooperation opportunities based on already existing national capabilities and plans.[18]

15 Everts 2025.

16 European Parliamentary Research Service 2024.

17 Council of the European Union 2022.

18 Scazzieri 2025.

Undoubtedly, the main framework for long term capability development in the EU is PESCO. It currently encompasses 74 projects[19] and aims to strengthen the EU's overall military potential. After a general consensus among member states had emerged that measures were required to ensure the EU's security without relying on the US in the medium term, in 2017 the German approach for PESCO which insisted on more inclusiveness and taking into account positions of ideally all EU members finally prevailed. PESCO has since then evolved as a product of a complex bargaining process between EU member states and their rationales. It has served as a natural laboratory for differentiation, and combines selectivity in membership, project-based clustering, compatibility with non-EU organisations – especially with NATO initiatives – and access for third countries. PESCO embodies therefore also compromises that have facilitated a diversity of choices.[20] Since then one could observe many discussions if the plethora of different projects works towards a single objective and if the 2017 long-term vision of PESCO – namely to achieve a coherent full spectrum force package in complementarity with NATO as the cornerstone of European collective defence – has potentially slipped out of sight.[21] Not properly linking PESCO projects to the CDP or to the NDPP of NATO carries the risk of de-coupling these efforts from purposeful capability development and of procuring equipment as an isolated end in itself.

Facing the increased urgency of achieving true capabilities along the full DOTMLPFI[22] spectrum, it would benefit PESCO's acceptance if the focus shifted away from pure research, development and procurement activities to clearly target-oriented capability development. With accepting one of the conclusions of its Strategic Review 2024, to be the "centre of EU defence efforts",[23] PESCO could even become the central hub of the EU in which cooperation intentions of member states would be translated into concrete initiatives within an EU defence cooperation framework. At the same time, the duplication stemming from parallel PESCO, EDF and even double-labelled projects could be eliminated.[24] The complicating bit includes synchronising the NDPP capability targets of European NATO allies with the CDP requirements. Complementing, but not duplicating those efforts should be the self-imposed demand for PESCO as a steering instrument.

The requirement of achieving an effective AMD for Europe has been clearly emphasised in the White Paper for European Defence, which also recognises an 'integrated, multi-layered, air and missile defence that protects against a full spectrum

19 Each of the projects is carried forward by varying group of PESCO participating Member States (project members) and is coordinated by one or more PESCO participating Member States (project coordinators). The project members may agree among themselves to allow other participating Member States to join as a project member or to become observer to the project. Project overview: https://www.pesco.europa.eu/#projects (Accessed 3 January 2026)

20 Martill, Gebhardt 2023, 115–116.

21 Biscop, Murillo 2024, 1.

22 DOTMLPFI = Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities, Interoperability

23 Council of the European Union 2024.

24 Biscop, Murillo 2024, 3.

of air threats (cruise missiles, ballistic and hypersonic missiles, aircraft and UAS)' as a priority capability area for development.[25]

In order to rapidly build up AMD capabilities within the Alliance, Germany launched ESSI in the margins of the NATO Defence Ministers' meeting in October 2022. In total, 24 nations are participating in the initiative (as of January 2026). The initiative does not aim to replace NATO structures, but rather to strengthen the European pillar of NATO's AMD posture in Europe. The core element is the joint procurement of GBAD systems. This offers three advantages. Firstly, larger order volumes reduce procurement costs. Secondly, the use of the same systems enables joint training, logistics and maintenance, which has a positive effect on operating and lifecycle costs. The intended interoperability further increases the operational value of the systems and thus of the European AMD umbrella. Thirdly, ESSI is intended to boost the European defence industry. A further special characteristic and advantage is that it is also open to non-members of the EU or NATO.[26] Yet the most prominent fly in the ointment of ESSI is the absence of important allies and capable air defence nations as France and Italy, neither joining the initiative due to industrial policy considerations, in this case specifically because the French-Italian SAMP-T system had not been incorporated.

Germany's attempt to close the existing gaps in AMD with ESSI must be welcomed, because protection for Europe can only be significantly improved by combining efforts. However, in parallel and in conjunction with the initiative, realistic solutions for the strategic balance in NATO and the EU, the development of the European defence industry and ideas for adequate multinational capability development in the full DOTMLPFI spectrum as well as the integration of the system elements must be provided. The separate development of individual air defence capabilities will definitely not suffice to enable a European Sky Shield.[27] Critics have furthermore noted that the implemented weapon systems, particularly choosing Arrow 3 for exoatmospheric BMD, may not be suitable to counter the Russian missile threat[28] and that there has been no concept for integrating the ESSI components into NATO IAMD structures.[29]

Evaluation and comparative Assessment

What can be deduced within the chosen analytical framework from the NATO and EU formats and activities that have been presented and discussed in this article?

The FNC has experienced ups and downs since its foundation, but it is still alive and helpful. It was originally seen as a tool for capability development in the first instance, in the sense of harmonising capability requirements and joint procurement. Later, a more operational context was added, for example with the creation of larger

25 European Commission 2025, 7.

26 Fritz, Kleiber, 2025.

27 Arnold, Arnold 2024, 10.

28 Lawrence, Zandee, Gasper 2025, A-6.

29 Loss 2024, 6.

formations. The FNC initially used the pooling approach to bundle resources and offered smaller armed forces, the option of integrating their units into a larger framework nation via a plug-in. It then aimed to support the creation of larger, deployable force structures that are strengthened by joint logistics and a shared C2 system.

In IAMD capability development, the FNC forms a bridge between national contributions and NATO-wide integration. FNC formats lower the entry barrier for countries to make their systems interoperable in advance, before they are fully integrated into NATINAMDS or Air C2. This 'pre-integration' instead of immediate full integration is particularly relevant for countries with limited resources. This enables the development of a common doctrine, coordinated training standards and initial C2 links without the need for immediate, full NATO certification. From a political-strategic perspective, the possibility of differentiating contributions represents real added value, especially for smaller or medium-sized countries. Selective participation, e.g. only with short range air defence (SHORAD) forces or only with sensor technology, is possible without the requirement for full-spectrum IAMD contributions. In conclusion, FNC creates integration spaces in which IAMD interoperability is pre-structured – technically, procedurally, and in terms of organisation.

The JPOW exercise complements this structural approach as an operational-tactical testing and validation format for multinational IAMD, as it focuses on the practical implementation of interoperability by testing C2 connections, engagement procedures, and the integration of national GBAD forces into NATO Air C2 processes.

Trying to weave together these NATO strands, the processes and activities of NDPP, FNC and JPOW form a graduated, functional link between national capability development and gradual integration into NATO-wide IAMD structures. The NDPP sets binding requirements, the FNC provides the organisational and conceptual framework, and JPOW, as a military 'reality laboratory', tests the operational readiness of multinational formations.

PESCO is institutionally strongly focused on long-term capability development and future architectures. The emphasis lies rather on conceptual convergence among EU member states with a longstanding perspective than on a role as an operational integration mechanism. Although PESCO projects contribute to future C2 and structural system-of-systems designs, their impact on near-term readiness and high-intensity conflict operational performance remains quite limited. In addition, some critical voices have argued that politically, a culture of non-compliance has permeated the PESCO framework, because defence has always remained an intergovernmental EU policy area with no strict enforcement mechanism.[30]

ESSI's goal of coordinating procurement and capability pooling of AMD systems in Europe mainly addresses the economic inefficiencies of the fragmented national system landscape by exploiting economies of scale and reducing duplication.

30 Bergmann, Svendsen 2023: 33.

The well-known rationale behind it is to acquire this capability as a lower cost and more efficiently than if every single nation procures expensive and highly complex systems. Therefore, the initiative focuses on interoperable, commercial off-the-shelf (COTS) or military off-the-shelf (MOTS)[31] solutions which are comparatively quickly available and scalable in accordance with the national ambitions and the financial resources of each participant. ESSI thereby also refers to the spirit of the Modular GBAD efforts. However, it aims to bridge the existing gaps by even more pragmatic solutions within shorter timelines. While ESSI contributes significantly to technological harmonisation, it does not directly aim on establishing integrated C2 structures and therefore remains dependent on NATO frameworks to increase the operational effectiveness of the overarching AMD posture.

Transferring the findings so far into the chosen analytical framework, I will assign the discussed examples to the format categories and assess them along the presented three interoperability layers. Eventually, a table will be used to provide an overview and to illustrate the results of the analysis.

Coordination-based cooperation enhances mutual understanding and some interconnectivity awareness, but rarely enables true integrating effects. It offers maximum political flexibility and minimum sovereignty restrictions, making it attractive in politically sensitive constellations. However, its limited integration level significantly confines operational AMD performance against contemporary aerial threats. Capability pooling delivers the highest efficiency gains in procurement, training, and sustainment. By creating technological homogeneity, it sets a necessary precondition, but does not automatically result in procedural and organisational integration required for effective multinational AMD. Integration-based formats achieve the best operational effectiveness across all interoperability layers. Integrated C2, shared tactics, techniques, and procedures (TTPs), and organisational embedding of AMD elements significantly improve responsiveness and resilience. These benefits come at the cost of higher political complexity and sovereignty trade-offs, especially regarding engagement authority issues and force employment decisions.

It is obvious that participating in NATO AMD activities without further integration as well as longer-term capability development under the NATO FNC and via today's form of PESCO provides some benefits through coordinating the otherwise purely stove-piped activities. But naturally, this form of multinational cooperation lacks numerous integration advantages. Capability Pooling like Modular GBAD or ESSI guarantee common logistics and training as well as shared sustainment through the joint procurement of identical system configurations. The economic-industrial dimension is adequately accommodated and technical compatibility is directly facilitated. Both formats surely enable integration by setting the preconditions, but cannot truly integrate AMD forces. It should not be surprising that the true integration of multinational AMD forces as GBAD formations who are fully dedicated to the NATO IAMD C2 architecture shows the greatest benefits. Being part of NATO's IAMD structures and task forces on a continuous basis will

31 COTS and MOTS describe products or weapon systems that are available on the market and can be used without further adaption or customisation.

result in a maximum level of performance in time-critical and high-intensity collective defence missions.

The following table provides an overview on the comparative assessment of the examined multinational cooperation formats:

Table 1.

Comparative assessment of multinational cooperation formats – Overview

Source: Author's own compilation based on the analysis findings

	Coordination-Based Formats	*Capability-Pooling Formats*	*Integration-Based Formats*
Examples utilised	NATO posture (Coordination without integration) PESCO / FNC (Focus on Capability Development)	Modular GBAD ESSI	NATO IAMD (including participation in AMD Task Forces and exercises like JPOW and RALY)
Technical Interoperability	Low-Medium (Basic C2 connections, but limited system integration)	Medium-High (Homogeneous systems, C2 partly harmonised)	High (Shared C2-structure with integrated sensors and effectors)
Procedural Interoperability	Low-Medium (Shared TTPs and experience via common exercises)	Medium (Standardisation of training and logistics and sustainment)	High (Common planning and operational execution of AMD missions)
Organisational Interoperability	Low (no integrated military formations, national C2 remains authoritative)	Low-Medium (limited/no obligatory force integration)	High (Multinational integrated C2 in force and engagement operations)

This analysis clearly substantiated the thesis that only integration-based arrangements within NATO IAMD enable the synchronisation of sensors, decision-making, and engagement under time-critical conditions, thereby generating effects that exceed the sum of national contributions. The adequate level of resilience urgently needed to cope with high-intensity conflict scenarios also emerges primarily from integrated command structures and shared situational awareness rather than from coordination efforts alone.

The pure argument based heavily on a military perspective and operational superiority will not achieve the desired result, because the overall situation is naturally more complex. Especially integration-based frameworks are strongly subject to political constraints. The deeper a multinational integration of C2, sensor–effector architectures or common engagement procedures will proceed, the more it will inevitably collide with sovereignty apprehensions and consequently with imposed national caveats. Questions on engagement authority or political accountability for the use of military force have been national issues for a long period of time. And it is

fair to say that truly reaching for deeper technical and procedural integration as well as transfer of decision-making authority to multinational structures without any veto right requires substantial political courage from every government. From an analytical perspective, this means that integration should not be viewed as a universally superior end state, but rather as a desirable military objective, whose degree of achievement depends on the convergence of threat perception, mutual trust, and the respective domestic policy control mechanisms of the allies.

Conclusion

In Russia's war on Ukraine, the massive use of bullets, missiles and aircraft by both sides – and their respective efforts to counter them – have produced new insights on the use and effectiveness, benefits, and limitations of modern air and missile defence systems and operational concepts.[32] We can therefore surely agree that – facing the contemporary aerial threat spectrum – the development of a significantly enhanced and highly integrated AMD architecture is not a luxury, but a necessity. Some authors argue that a radical redesign is necessary to achieve this.[33] In my opinion, this interpretation is debatable. The analysis so far has clearly shown that duplicated efforts and initiatives have to be streamlined and smartly connected. The overall capability status achieved in terms of AMD weapon system elements in Europe as well as the technical options to interoperate are already promising. Therefore, by using the existing capabilities and in parallel advising a politically harmonised way forward, European nations will have a sound starting point. The most pressing need for radical steps might occur in the C2 landscape on different layers.

The actual degree of integration of multinational AMD results from the combination of interoperability layers with the appropriate choice of a suitable cooperation format – not from political declarations of intent. Successful approaches to delivering a European AMD capability need to be well-balanced. As I could deduce above, true integration of military formations is extremely important for operational performance and resilience and thus a sine qua non in general. However, parallel ways and levels of integrating AMD capabilities, each linked and adapted to a specific threat or a specific procurement area might counter the overall threat better than a 'one size fits all solution'. Particularly with regard to the political situation and the conflicting imperatives among European allies, every way forward must be carefully consented. Evidently, the tools and formats at EU level as PESCO and ESSI can play an important role, namely ensuring the conversion of NATO capability gaps into industrial capacities and priorities in Europe.

From a geopolitical perspective, it seems obvious that the EU and the European pillar of NATO are often viewed as comparatively weak players in the field of security and defence. This is where principles derived from European integration come in useful, conventions that are inherent in the logic of the EU's functioning.

32 Loss 2024, 1.

33 Lawrence, Zandee, Gasper 2025, 9.

Adequate differentiation is always important and, in this context, also offers creative solutions for moving forward with military integration, even among disparate allies and under the many difficult conditions that characterise today's security environment.[34] Differentiation is therefore not a transitional phenomenon in NATO or the EU, but rather a prerequisite for the ability of heterogeneous alliances to act, and eventually a valuable link between national sovereignty and collective defence capabilities. Without differentiation, there would be no effective EU defence projects, no realistic NATO capability clusters and, above all, no effective deterrent against the threats we face.

A prominent problem in many European countries remains the threat perception among the population. The psychological strain caused by the perceived danger to personal safety and the restriction of prosperity is often not significant enough yet. In times when the threat of war in Europe has unfortunately become a bitter reality once again, it is therefore particularly important to 'para bellum', to be prepared to fight and thereby deter the threat originator effectively. In the context of AMD capabilities, being prepared for a European ally entails having the best possible military solutions 'out-of-the-box' available from the strategic down to the tactical level, based on the cooperation toolkit outlined in this article.

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34 Martill, Gebhardt 2023, 116.

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