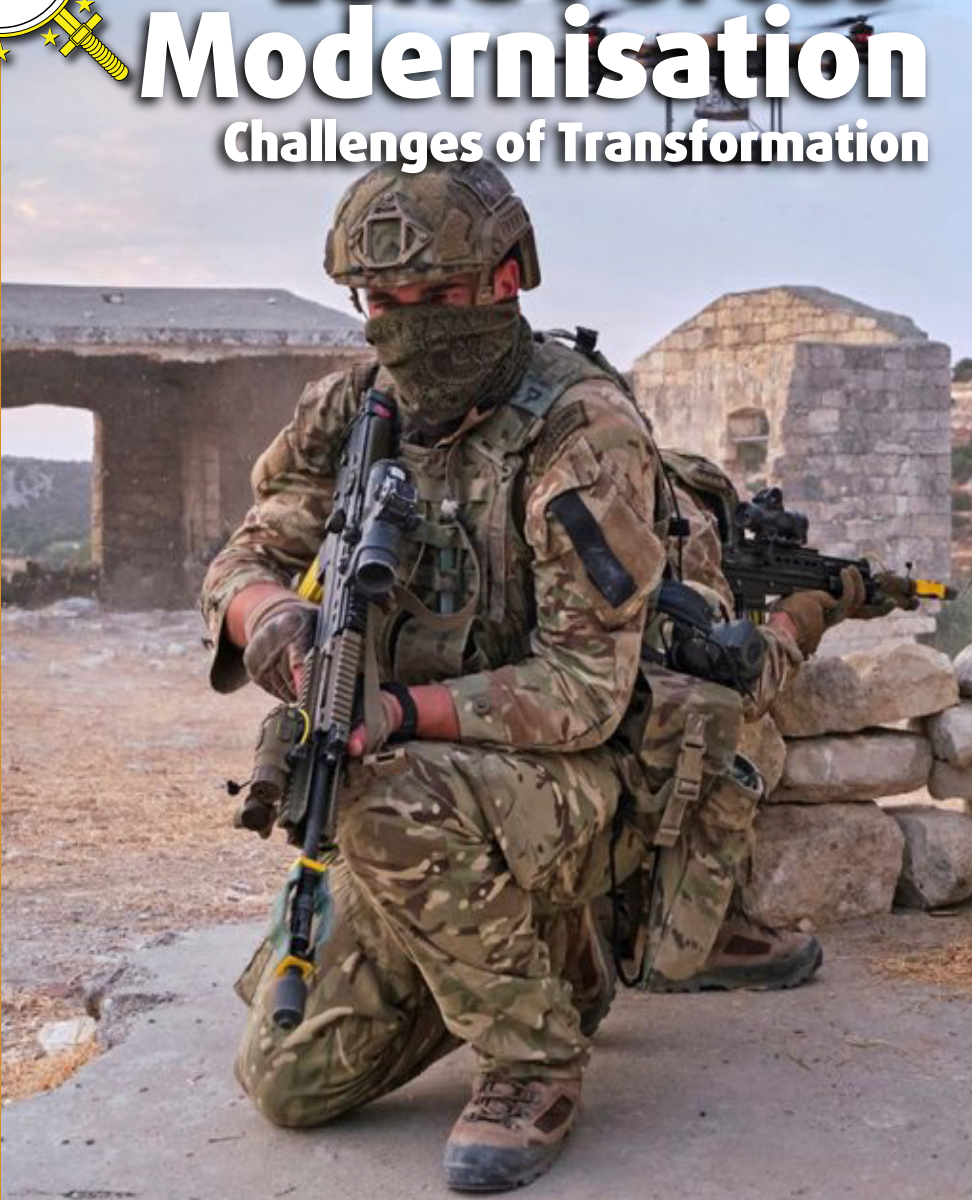


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# Land Forces Modernisation

## Challenges of Transformation



AN EXPERTISE FORUM CONTRIBUTING TO EUROPEAN  
ARMIES INTEROPERABILITY SINCE 1953



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European Army Interoperability Center

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This paper was drawn up by Miguel Gonzalez Buitrago, Lucia Santabarbara and Simone Rinaldi under the supervision and guidance of Mr Mario Blokken, Director of the Permanent Secretariat.

This Food for Thought paper is a document that gives an initial reflection on the theme. The content is not reflecting the positions of the member states but consists of elements that can initiate and feed the discussions and analyses in the domain of the theme. All our studies are available on [www.finabel.org](http://www.finabel.org)

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## INTRODUCTION

Land Force Modernisation is a process that entails changes of military equipment and capacities at the strategic, operational, and tactical level. It seeks to enable a force to become more efficient and better prepared to tackle new challenges. Technology plays a key role in this process, along with the character of the military.

In recent years, EU and NATO Member States have planned significant medium and long-term changes and innovations in their national defence agendas. These aim at preparing and equipping forces for unconventional, asymmetric, and hybrid conflicts. The reorganisation of national military doctrines regarding future scenarios should lead to new equipment in terms of vehicles, personal armaments and communication technologies. Furthermore, a key role will be played by technologies like AI and unmanned or auton-

omous systems. These may shape the nature of conflict and facilitate ground forces operations in challenging contexts. Finally, to improve military personnel's capacity for action and reaction, numerous computer systems have been developed to guarantee simulated training. Ingenious platforms offer tools to manage mission performance more effectively; simulation and training allow the perception of combat sensations that offer the user the possibility to learn and correct their skills through their own experience.

This paper aims to examine land forces modernisation in Europe and NATO, identify the main necessities and the core markets and industries involved in this process. The study will utilise case studies and analyse current European national defence programmes to upgrade national military apparatuses.

## CHAPTER 1: MILITARY DOCTRINE AND WARFARE SCENARIOS

From 1792 to 1815, and in the first half of the twentieth century, waves of violence swept across Europe, bringing death and suffering to millions of people; this moved borders and changed societies. In the aftermath, men (for it was always men) wrote their experiences to provide lessons for future generations. There was little interest in digging beneath the surface of tactics and strategy, to explore the very phenomenon of war, to study its structure, its internal dynamics, its links with other el-

ements which could be identified as causes or those that were altered or destroyed by it. One of the most important works realised in this regard during the nineteenth century was *On War* by Carl Von Clausewitz, in which he stated:

“Tactics are the use of armed forces in a particular battle, while strategy is the doctrine of the use of individual battles for the purposes of war.”<sup>1</sup>

1. Carl Von Clausewitz (1832). *On war*. Book 1, Chapter 1. Berlin. [Online] Available at: <https://www.clausewitz.com/readings/OnWar1873/BK1ch01.html>.



From a military perspective, a doctrine is a statement of fundamental principles, tactics, techniques, procedures, terms, and symbols aimed at guiding the military through peacetime and war. The statements and propositions are dynamic, and they change with lessons learned during operations and training. They must consider the nature of the enemy, the force structure, technology, and social values. Thus, the transition requires a simultaneous examination and elaboration of doctrine, which establishes the need for combined arms and command. It must also consider the need to adhere to the law of war and the vagaries of joint operations. Of course, the creation of doctrine is not universal, it differs in every state.<sup>2</sup> Considering current scenarios and national decisions to undertake processes of land force modernisation, an extensive and generic analysis of military doctrines in unconventional, asymmetric and hybrid contexts is detailed below:

## 1.1 Unconventional Warfare

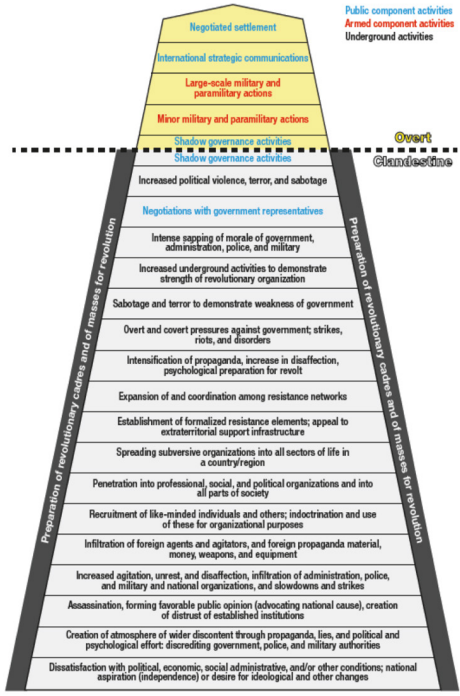
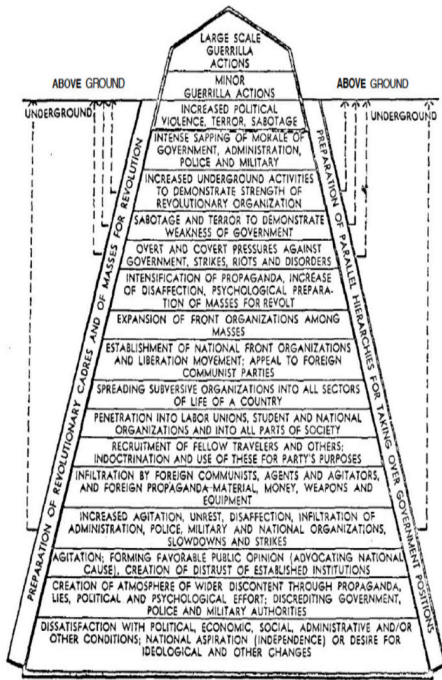
According to the National Defense Authorisation Act for FY 2016, the concept of unconventional warfare involves all the “activities conducted to enable a resistance movement or insurgency to coerce, disrupt, or overthrow a government or occupying power by operating through or with an underground, auxiliary, and guerrilla force in a denied area”.<sup>3</sup>

An early attempt to solidify unconventional warfare (UW) experiences gained during the second half of the twentieth century into doctrine was the Resistance Pyramid, also known as the SORO Pyramid, developed in 1966 by the US Special Operations Research Office (SORO). The pyramid was updated in 2013 under the Assessing Revolutionary and Insurgent Strategies (ARIS) to include the “public component”, which operates openly alongside the underground, auxiliary, and guerrilla force, and it includes leaderless resistance

2. “ADP-1-01 Doctrine Primer” Department of the Army. Washington, DC, 31 July 2019. [Online] Available at: [https://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/pdf/web/ARN18138\\_ADP%201-01%20FINAL%20WEB.pdf](https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN18138_ADP%201-01%20FINAL%20WEB.pdf)

3. “National Defense Authorization Act for Fiscal Year 2016”. PUBLIC LAW 114-92—NOV. 25, 2015. [Online] Available at: <https://www.congress.gov/114/plaws/publ92/PLAW-114publ92.pdf>





[Figure 1: Original version of the SORO pyramid. 1966. Source Kilcullen,2019]

[Updated version of the SORO pyramid -2013, SOURCE: Kilcullen,2019]

theories derived from terrorist and militia thinking.<sup>4</sup>

David Kilcullen states that the United States UW doctrine solidified by the 1970s into a seven-phase model with the aim to “[...] enable a resistance movement to move quickly through an organic growth process from a clandestine underground to covert auxiliary networks, then overt guerrilla groups and eventually mobile forces, before demobilisation”.<sup>5</sup> The seven-phase structure is characterised as follows<sup>6</sup>:

- Steady State: The status quo between nations is maintained by instruments of

national power as well as regional and international relations. In this phase, conditional norms or default settings remain unchanged. This will continue.

- Phase 1 - Preparation: Psychological preparation to unify the population against a government or occupying power, and prepare them to accept external assistance.
- Phase 2 - Initial contact: UW teams or sponsoring agencies contact resistance groups or governments-in-exile to develop joint plans and agree on support arrangements.
- Phase 3 - Infiltration: UW teams infil-

4. Kilcullen, D. (2019). The Evolution of Unconventional Warfare. *Scandinavian Journal of Military Studies*, 2(1), pp. 61–71. [Online] Available at: DOI: <https://doi.org/10.31374/sjms.35>  
 5. Kilcullen, D. (2019). The Evolution of Unconventional Warfare. *Scandinavian Journal of Military Studies*, 2(1), pp. 61–71. [Online] Available at: DOI: <https://doi.org/10.31374/sjms.35>  
 6. Adapted by D. Kilcullen from Box, G. E. P., Hunter, J. S., & Hunter, W. G. (2005). *Statistics for experimenters*, (2nd edition). London, United Kingdom: John Wiley & Sons.

trate the area of operations (AO), contact local resistance groups, and establish communication links back to the external sponsor.

- Phase 4 - Organisation: UW teams organise, train, and equip local resistance cadres, focus on developing resistance infrastructure and building the underground, then auxiliary networks and ultimately a guerrilla force.
- Phase 5 - Build-up: UW teams help cadres expand into an effective resistance movement, focusing on organisational development of the resistance and conducting limited combat operations only.
- Phase 6 - Employment: UW teams support the resistance as it conducts combat operations until a conventional force arrives or hostilities end.
- Phase 7 - Transition: UW teams assist as the resistance movement, and its guerrilla forces demobilise or are absorbed into

a post-war regular government structure and armed forces.

## 1.2 Asymmetric Warfare

The expression asymmetric warfare indicates an armed conflict between two or more parties. Force and equipment have significantly diverged and where atypical or irregular actions substitute the conventional battle. The aim of the transformation of symmetry into asymmetry is to deny an opponent the ability to act effectively. This requires the adoption of new strategies and tactics to deal with the nature of low-intensity combat. Considering the imbalance between parties, doctrines regarding this kind of conflict state that one of the main challenges is the reduction of a response from the opponent. The transition to this kind of war has led parties to<sup>7</sup>:

- Accept the disproportionality and possibility of failure.



7. Mihai-Marcel NEAG (2018). Redefining Doctrine Concepts in Modern Military Actions. Land Forces Academy Review Vol. XXIII, No 1(89).

- Re-launch arms races and re-allocate resources for strategic, tactical, and operational developments in the military domain.
- Identify the opponent's vulnerabilities to reduce the possibility of technological advantage.
- -the consideration of the civilian population, an important actor in the conflict equation.

### 1.3 Hybrid Warfare

These factors have led land forces to undertake long processes of transformation and modernisation of equipment, plans, and tactics and adopt more comprehensive approaches in identifying and comprehending potential scenarios and opponents. The doctrine has been reviewed over the years to account for new technologies, changes in organisational abilities, the duration of conflicts, the average risk, and the resistance of material and psychological components.<sup>8</sup> Gheorghe Văduva notes that: “asymmetric actions are complex, usually by non-state actors, carried out in a hostile operational environment, with long-term consequences and seriously eroding the institutions and values of modern societies”. For this reason, dilemmas are continuously generated, such as<sup>9</sup>:

The necessity to adapt strategies to opponents' methods and procedures and be ready to respond to asymmetrical processes.

- -the adoption of conventional and unconventional forces to neutralise asymmetric actors.
- -the flexible use of diplomatic, economic, informational, and military instruments of power.

Hybrid warfare is commonly indicated as the future war, which combines conventional, unconventional, cybernetic, and asymmetric strategies, tactics, methodologies, and processes to achieve military ends. This kind of war empowers civil-military engagement and shifts attention to a trinomial environment, characterised by troops-population-opponent.<sup>10</sup> Both the European Union and NATO acknowledge the threats generated by this type of conflict and have developed policies and strategies to counter them. However, they focus on different aspects of the threats, even if both acknowledge the presence of state and non-state actors in these conflicts. The European Union, for example, focuses on hybrid operations that are multidimensional: a combination of coercive and subversive measures to defeat adversaries. NATO focuses on hybrid threats posed by opponents, who employ conventional and non-conventional means.<sup>11</sup> Furthermore, Jacobs and Lasconjarias note that NATO sees the purpose of hybrid warfare as a mean “to keep war below the radar of traditional collective defence, meaning below the threshold of a reaction from traditional defence institutions and organisations [...]”.<sup>12</sup> Over the years, states have interpreted the concept of hybrid warfare differently: for ex-

8. Conference “Hybrid Threats and Asymmetric Warfare: What to do?”. The Swedish Defence University. Stockholm 14-15 November 2017. [Online] Available at: <http://fhs.diva-portal.org/smash/get/diva2:1186265/FULLTEXT01.pdf>

9. Ghigiu, A. M. (2011). Cine va domina secolul XXI? Noua structură de putere, *Impact Strategic*, 3(40), 45-48.

10. Ibid 7

11. Daniel Frott and Roderick Parkes (2019). Protecting Europe – The EU's response to hybrid threats. European Union Institute for Security Studies (EUISS). [Online] Available at: [https://www.eiss.europa.eu/sites/default/files/EUISSFiles/CP\\_151.pdf](https://www.eiss.europa.eu/sites/default/files/EUISSFiles/CP_151.pdf)

12. Andreas Jacobs and Guillaume Lasconjarias (2015). NATO's Hybrid Flanks- Handling Unconventional Warfare in the South and the East. Research Division – NATO Defense College, Rome – No.112 – April 2015. [https://www.files.ethz.ch/isn/190786/rp\\_112.pdf](https://www.files.ethz.ch/isn/190786/rp_112.pdf)

ample, the Baltic states and Poland use it to describe Russian actions against them; France uses the same concept to explain jihadist operations in the Sahel.<sup>13</sup> Certain scholars and politicians identified the cyber-attack on Estonia's government (2007) as the first real hybrid attack<sup>14</sup>.

In general, doctrines for hybrid war involve

national capabilities, strategies, and political purposes. They also consider agreements aimed at building interoperability and cooperation in different sectors. Therefore, the doctrine is different according to each state, even if some states share common concepts, terminology, and standard procedures.<sup>15</sup>

## CHAPTER 2: LAND FORCES MODERNISATION PROJECTS

The Norwegian Ministry of Defence, while announcing a plan to increase military spending and strengthen the capabilities of the Norwegian Armed Forces, noted that: “a challenging strategic environment constantly reminds us that we cannot take our freedom and security for granted”.<sup>16</sup> This statement

and the announcement in general highlight how nations have been concerned with remaining relevant in terms of defence in recent years. These concerns have generated various security threats, such as terrorism, drug trafficking, illegal immigration and dangers represented by non-democratic states. Con-



13. Ibid.10

14. Hills, M. (2019). Hybrid Threats A Strategic Communications Perspective: 2007 Cyber Attacks on Estonia. In B. Heap (Ed.), Hybrid Threats: A Strategic Communications Perspective (Vol. 2, pp. 52-53). NATO Strategic Communications Centre of Excellence. [Online] Available at: <https://www.stratcomcoe.org/hybrid-threats-strategic-communications-perspective>

15. MAJ Kurt R. Grimsrud Canadian Army (2018). Moving into the Future: Allied Mobility in a Modern Hybrid Warfare Operational Environment. School of Advanced Military Studies US Army Command and General Staff College Fort Leavenworth, KS.

16. Regjeringen, (2020). 'Norway increases defence spending to strengthen its capability and readiness'. Press releases. [online] Available at: <https://www.regjeringen.no/en/aktuelt/norway-increases-defence-spending-to-strengthen-its-capability-and-readiness2?id2770724/> (Accessed: February 8, 2021)



sequently, certain nations are improving both how they detect and fight these threats. Undoubtedly, technology is part of this process. It has been deeply integrated into the classic tools and systematic functions, increasing the probability of favourable results while at the same time prompting improvements and innovation. Because of this, armies are currently upgrading their assets. Militaries and their supporting industries continuously pursue increases in lethality of systems, yet “lethality does not guarantee strategic effectiveness.”<sup>17</sup> The modernisation of armies should be a holistic project, micro- and macro-managing features that allow combat forces to be more effective. Increasing scientific and technological development to offer more and better tools for national defence is important. A strong industrial base may be important, but it is also essential to strengthen the human dimension, the organisational factors, coordination, as well as adaptation to conflict environments.<sup>18</sup> In Europe, several nations have initiated ambitious projects to modernise their land forces. They seek to ensure that their capabilities are optimised and to have the best possible equipment to respond to competition and challenges. This enables armed forces to fulfil their role in national security and to preserve their freedom and independence in an increasingly complicated world where the adversaries have become diffuse and irregular.

## 2.1 Denmark’s Defence Agreement 2018-2023

In January 2018, the Danish Ministry of Defence presented its latest defence project (reformed in 2019), the “Defence Agreement 2018-2023”, which commits the government to a 20% increase in military spending. The agreement aims to redefine the role of the Royal Danish Army within NATO and to contribute more actively to joint operations; it also seeks to strengthen its ability to protect its territorial integrity and security. The Danish Government intends to create a centre dedicated to cybersecurity with the aim of strengthening knowledge, and the prevention of cyberattacks.<sup>19</sup>

The modernisation of Danish Land Forces began with the acquisition of 19 French CAESAR 8x8 artillery systems in mid-2017 to replace the M109 howitzers.<sup>20</sup> The advantages of this vehicle include a fully armoured crew cab, a firing range of up to 40 km, and a rate of fire up to 6 rounds per minute: double that of the M109.<sup>21</sup> In the same vein, the Leopard 2A5 tank, in operation since 2005, has been replaced by a new and improved model, the Leopard 2A7. Furthermore, the Royal Danish Army has procured 36 Eagle V wheeled armoured vehicles to replace the previous version, the Eagle IV, these will be used for training purposes. Finally, an acquisition of 309 Swiss-produced Mowag Piranha 5 (infantry fighting vehicles) to be delivered by 2023 to replace the M113 after more than 50 years of

17. Bernard F W Loo, (2020). ‘The Challenges Facing 21st Century Military Modernization’. Prism (Washington, D.C.), 8 (3), 146–156.

18. International Institute for Strategic Studies IISS, (2020). ‘The Military Balance 2020, Vol. 120. [Online] Available at: <https://doi.org/10.1080/04597222.2020.1707964>

19. Danish Ministry of Defence, (2020). ‘Agreement for Danish Defence 2018 - 2023’. Press releases. [online] Available at: <https://fmn.dk/en/topics/agreements-and-economical-agreement-for-danish-defence-2018-2023/>. (Accessed: February 7, 2021)

20. Army Recognition, (2019). ‘Denmark purchases 4 additional Nexter CAESAR 8x8 self-propelled howitzer’. [Online] Available at: <https://www.armyrecognition.com/october-2019-global-defence-security-army-news-industry/denmark-purchase-4-additional-nexter-caesar-8x8-self-propelled-howitzer.html> (accessed: February 8, 2021)

21. Global Brief, (2019). ‘Denmark orders additional Caesar 8x8 artillery systems’ [Online] Available at: <https://delbrief.com/2019/11/06/denmark-orders-additional-caesar-8x8-artillery-systems/> (accessed: February 8, 2021)

service.<sup>22</sup> There is also an intention to configure light infantry units to act quickly and in traditional and special forces tasks, both nationally and internationally. To achieve this, the plan aims at increasing the number of people participating each year in the voluntary four-month military service, refraining in principle from forced conscription.

Denmark still has a way to go to hit the target of spending 2% of GDP on defence, and it is unclear if this will happen in the next three years. Yet the latest upgrades represent a major change for Danish Armed Forces.<sup>23</sup> The project focuses the country's attention on security policy to increase its capabilities for action – a benefit for both Denmark and NATO – and it shows a willingness to take greater responsibility for regional security in Europe, especially in the Baltic and the Arctic.

## 2.2 Hungary's Zrinyi 2026

Hungary launched in 2017 the most ambitious military modernisation project of its recent history Zrinyi 2026. Named after the prominent poet and soldier, Miklós Zrínyi, and adopted amid the refugee crisis and the ongoing crisis in Ukraine, this plan sets high targets for the transformation of the Hungarian Armed Forces, revitalising its character and its capabilities to meet national and international objectives in coordination with

its allies.<sup>24</sup> One of the most important aspirations of this plan is to increase the number of personnel in the armed forces from 27,800 personnel in 2020 to 37,650 personnel by 2026.<sup>25</sup>

The programme aims to replace Soviet-era equipment and reinvigorate Hungary's military industry to meet domestic demand and produce high-quality equipment for export. In 2019 the Hungarian Government bought the Austrian company Hirtenberger Defence Systems, a specialist in the production of mortars and artillery. Likewise, the country has established an agreement with the Czech company Česká Zbrojovka (CZ) to produce up to 200,000 BREN 2 rifles under license in Hungary.<sup>26</sup> Furthermore, the Soviet RPG-7 will be replaced by the Swedish-produced Carl-Gustaf M4, which constitutes a major advance for the Hungarian Army by giving its infantry greater power to counter modern armour.<sup>27</sup>

Additionally, the transformation process has a strong focus on vehicles. The German company, Krauss-Maffei Wegmann, will supply 44 Leopard 2A7 tanks to replace the Soviet-era T-72s, which have been in service since 1978. Furthermore, 12 Leopard 2A4 tanks will be delivered for training purposes. The program also includes broader considerations such as the development of the infrastructure and hangars to be used for the newly acquired ve-

22. Forsvaret, (2019). 'Storre kampkraft til fremtidens Forsvar'. [Online] Available at: <https://forsvaret.dk/da/nyheder/2019/storre-kampkraft-til-fremtidens-forsvar/> (Accessed: February 7, 2021)

23. Szymański, P. (2018). 'Overstretched? Denmark's security policy and armed forces in light of the new Defence Agreement', OSW. [Online] Available at: <https://www.osw.waw.pl/en/publikacje/osw-commentary/2018-04-27/overstretched-denmarks-security-policy-and-armed-forces-light> (accessed: February 8, 2021)

24. Balogh, O., (2019). 'The Importance of the Zrinyi 2026 Defence and Military Development Program'. *Vojsenské rozhledy* 28, 55–70. [Online] Available at: <https://doi.org/10.3849/2436-2995.28.2019.03.055-070>

25. International Institute for Strategic Studies IISS, (2020). 'Chapter Four: Europe' in IISS, *The Military Balance 2020*, Vol. 120, 64–165. [Online] Available at: <https://doi.org/10.1080/04597222.2020.1707964>

26. Komuves, A. (2019). 'Orban Spent €67 Million On Reviving Hungarian Weapons Manufacturing', VSQUARE, [Online] Available at: <https://vsquare.org/orban-spent-e67-million-on-reviving-hungarian-weapons-manufacturing/> (accessed: February 9, 2021)

27. Balogh, O., (2019). 'The Importance of the Zrinyi 2026 Defence and Military Development Program'. *Vojsenské rozhledy* 28, 55–70. [Online] Available at: <https://doi.org/10.3849/2436-2995.28.2019.03.055-070>

hicles.<sup>28</sup> In mid-2020, Hungary announced it would establish a joint venture with the German company Rheinmetall to produce Lynx infantry fighting vehicles (IFVs) and acquire a total of 20 PzH 2000 self-propelled howitzers replacing the 2S1 Gvozdika, which was retired in 2004.<sup>29</sup> <sup>30</sup>

After a long period of inactivity, these changes represent a great leap forward for the Hungarian Armed Forces and demonstrate the government's attitude to reaffirm its commitment to its security and allies by striving to obtain the latest military equipment technology and to enhance its readiness. This could undoubtedly revitalise and strengthen Hungary's position in Central Europe and further improve its ability to respond to challenges on Europe's eastern and southern borders.

### 2.3 The United Kingdom's to the Future and Beyond.

The United Kingdom has one of the most technologically advanced armies in the world. This is due to its commitment to the continued development of its capabilities. In 2020 the British Ministry of Defence published the Integrated Operating Concept 2025 (IOPC25), a concise document that reviewed some of the most remarkable transformations in warfare in recent years; it also established guidelines for the future. It specifically aims

at setting out “a new approach to the utility of armed force in an era of persistent competition and a rapidly evolving character of warfare”.<sup>31</sup> Acknowledging cybersecurity and threats posed by non-state actors such as violent extremists, the report points out how warfare's usual means and methods have become insufficient. It notes that warfare will continue to change even more with the improvements in computer systems and artificial intelligence technologies. It is, therefore, necessary to adapt and improve the Army's capabilities to compete against adversaries “who do not distinguish between peace and war”.<sup>32</sup>

The equipment at the disposal of UK land forces has been subjected to a considerable revision, resulting in the acquisition of diverse assets. The Ministry of Defence has ordered 500 Boxer mechanised infantry vehicles (MIVs) in four configurations: personnel carrier, ambulance, command vehicle and specialised transport. These new vehicles will be modified with the Protector RS4 remote weapon station from the Norwegian company Kongsberg. This allows soldiers to operate weapons systems from within the vehicle and thus in maximum safety.<sup>33</sup> The Boxer class of vehicles will enter service in 2023.<sup>34</sup> In the same vein, the British Army will acquire more than 500 General Dynamics Ajax armoured fighting vehicles (AFVs) offering enhanced firepower, with a 40 mm cannon

28. Balogh, O., (2019). 'The Importance of the Zrínyi 2026 Defence and Military Development Program'. *Vojenské rozhledy* 28, 55–70. [Online] Available at: <https://dbi.org/10.3849/2386-9995.28.2019.03.055-070>

29. Andras, C. (2020). 'Modernization and Rearmament – Hungary's Zrínyi 2026 Program', OVERTDEFENSE. [online] Available at: <https://dailynewshungary.com/hungary-purchases-a-brutal-military-beast-that-can-eliminate-targets-from-over-60-kilometres/> (accessed: February 9, 2021)

30. Licskay, P. (2019). 'Hungary Purchases a Brutal Military Beast that Can Eliminate Targets from Over 60 kilometres', VSQUARE. [online] Available at: <https://dailynewshungary.com/hungary-purchases-a-brutal-military-beast-that-can-eliminate-targets-from-over-60-kilometres/> (accessed: February 9, 2021)

31. UK Ministry of Defence, (2020). Introducing the Integrated Operating Concept. [online] Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/972969/20200930\\_-\\_Introducing\\_the\\_Integrated\\_Operating\\_Concept.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/972969/20200930_-_Introducing_the_Integrated_Operating_Concept.pdf) (Accessed: February 15, 2021)

32. UK Ministry of Defence, (2020). Introducing the Integrated Operating Concept. [online] Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/972969/20200930\\_-\\_Introducing\\_the\\_Integrated\\_Operating\\_Concept.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/972969/20200930_-_Introducing_the_Integrated_Operating_Concept.pdf) (Accessed: February 15, 2021)

33. Navarro, J. (2020). 'Kongsberg remote employment towers for the British Army's new 8x8', DEFENSA. [online] Available at: <https://www.defensa.com/otan-y-europa/torres-empleo-remoto-kongsberg-para-nuevo-8x8-erector-britanico> (accessed: February 15, 2021)

34. The UK Army, (2029). Boxer for the British Army. [online] Available at: <https://www.army.mod.uk/news-and-events/news/2019/11/boxer/> (Accessed: February 15, 2021)

providing its crew with offensive capabilities with high lethality.<sup>35</sup> Finally, the British military has shown an interest in developing laser weapons to be integrated on ships and land vehicles. Trials will begin in 2023, and if successful, this would undoubtedly represent an important leap forward for the British Armed Forces.<sup>36</sup>

British Armed Forces will continue to transform according to the plans laid and the actions taken. The UK's vision of defence is not only focused on present threats but also the future. Thus, it intends to innovate and create new tools to facilitate and improve capabilities while recognising the need to continue to respect the conventions and protocols of war

without undermining democratic values. As such, the leadership of the British Army seeks to continue playing a leading role in NATO and reaffirms its commitment to its allies as it understands that European security is inherent to British national security.

## 2.4 Greece's Future Force Structure 2013-2027

The Hellenic Republic is one of the few nations that has striven to maintain its commitment to spend 2% of GDP on defence, even during the days of the severe crisis that hit the Greek economy in the early 2010s.<sup>37</sup> This is due to the enormous challenges the nation



35. Army Recognition, (2020). 'General Dynamics UK has performed Reliability Growth Trials with AJAX tracked Armoured for British army', [online] Available at: [https://www.armyrecognition.com/april\\_2020\\_news\\_defense\\_global\\_security\\_army\\_industry/general\\_dynamics\\_uk\\_has\\_performed\\_reliability\\_growth\\_trials\\_with\\_ajax\\_tracked\\_armored\\_for\\_british\\_army.html](https://www.armyrecognition.com/april_2020_news_defense_global_security_army_industry/general_dynamics_uk_has_performed_reliability_growth_trials_with_ajax_tracked_armored_for_british_army.html) (accessed: February 15, 2021)

36. Frangoul, A. (2019). 'UK to develop electric-powered lasers that don't need ammunition', CNBC, [online] Available at: <https://www.cnbc.com/2019/07/09/uk-to-develop-electric-powered-lasers-that-dont-need-ammunition.html> (accessed: February 15, 2021)

37. NATO (2018), Defence Expenditure of NATO Countries (2011-2018), [online] available at: [https://www.nato.int/nato\\_static\\_fl2014/assets/pdf/pdf\\_2018\\_07/20180709\\_180710-pr2018-91-en.pdf](https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2018_07/20180709_180710-pr2018-91-en.pdf) (accessed February 11, 2020)

faces in achieving security and protecting its national interests. Firstly, the instability in the Mediterranean as a result of the conflicts in the Middle East and North Africa has led to a massive influx of refugees and illegal immigrants and exposed the nation to a range of unconventional threats. Secondly, there is the threat posed by Turkey to its sovereignty and territorial integrity, coupled with Greece's commitment to the protection of Cyprus.<sup>38</sup> The current modernisation plan began with a major restructuring of the Hellenic Army away from its Cold War organisation to a new configuration more in line with current geopolitical circumstances and security issues. Various units and bases have been reorganised to strengthen their capability to react rapidly.<sup>39</sup> Additionally, taking a keen interest in improving its army's readiness, Greece has actively participated in defence-related initiatives in coordination with its allies in the EU and NATO. It is also active in the Greek-Israeli-Cypriot intelligence sharing, joint training, and cybersecurity initiative.<sup>40</sup> In January 2021, the island of Velopoula in the Aegean Sea was the stage for an innovative training exercise called 'Eddie's Odyssey', where the Greek and US armies jointly practised the transport and evacuation of troops. The operation was considered a success as it helped strengthen interoperability between both armies.<sup>41</sup>

In terms of material changes, the Hellenic Army has been equipped with new assets. Opting for the United States as its main supplier, the Greek Ministry of Defence has purchased a total of 350 M2A2 Bradley infantry fighting vehicles and more than 1000 M1117 Guardian armoured wheeled vehicles. The latter provide "greater ballistic protection than any other wheeled vehicle of their size in the world".<sup>42</sup> As a result of Greek-Israeli strategic cooperation, the Hellenic Forces have adapted to new trends in military technology by acquiring Heron, an Israeli-produced unmanned aerial vehicle. Heron enables faster and more efficient patrolling of Greece's borders.<sup>43</sup>

Overall, Greece has not only worked on its economic prosperity but has also put great effort into maintaining the readiness of the Hellenic Armed Forces, reasserting its leadership in the EU Balkan Battlegroup and silently rising "as a Mediterranean power".<sup>44</sup> The geostrategic position of the Hellenic Republic exposes it to a wide range of threats. Therefore, the modernisation and readiness of its army and the support and interoperability with its allies are of utmost importance not only for Greek security but also for the EU, the Balkans, and the stability of the Mediterranean.

38. Kollias, C. et al. (2016). 'Military expenditure in Greece: Security challenges and Economic Constraints'. *The Economics of Peace and Security Journal*, [S.I.], v. 11-1. available at: <https://www.ejpsjournal.org.uk/index.php/EPSJ/article/view/244> (accessed February 11, 2020)

39. Defence Point. (2013). 'Μελλοντική Δομή Δυνάμεων: Επιτέλους συμπάξεμα, τα στοιχεία', available at: [www.defence-point.gr/news/μελλοντική-δομή-δυνάμεων-επιτέλους-σ](http://www.defence-point.gr/news/μελλοντική-δομή-δυνάμεων-επιτέλους-σ) (accessed: February 11, 2021)

40. AP News. (2020). 'Cyprus, Israel, Greece agree to boost defence cooperation', [online] available at: <https://apnews.com/article/europe-armed-forces-nicosia-greece-cyprus:279c4c8d8b074b25ca26b331110697> (accessed: February 11, 2021)

41. Dipuma, G. (2021). 'The Army's 101st Airborne teamed up with Greek special operators for a first-of-its-kind island-assault exercise', *Business Insider*, [online] available at: <https://www.businessinsider.com/us-army-greek-special-operators-helicopter-island-assault-exercise-2021-1?r=US&IR=T> (accessed: February 11, 2021)

42. Army Recognition. (2020). 'Greek army to receive 350 Bradley M2A2 IFVs and M1117 4x4 armoured from US', [online] available at: <https://www.armyrecognition.com/october-2019-global-defence-security-army-news-industry/denmark-purchase-4-additional-nxster-casuar-3x8-self-propelled-howitzer.html> (accessed: February 11, 2021)

43. Reuters. (2020). 'Israel signs deal to lease drones to Greece for border defence', [online] available at: <https://www.reuters.com/article/us-israel-greece-drones-idUSKBN2211UY> (accessed: February 11, 2021)

44. Karagiannis, E. (2020). 'The Silent Rise of Greece as a Mediterranean Power', *RUSI*, [online] Available at: <https://rusi.org/commentary/silent-rise-greece-mediterranean-power> (accessed: February 9, 2021)



## 2.5 Finland's Total Defence

Finland, characterised by its military neutrality and its contributions to global peace missions, is one of the world's most peaceful nations.<sup>45</sup> However, the Finnish Defence Forces continue preparing to protect their territorial sovereignty against potential adversaries, threats, or even the outbreak of regional conflict. The Finnish defence approach since the Cold War has been based on total defence, which implies military and civilian participation in national defence in war. This approach is "intended to deter a potential enemy by raising the cost of aggression and lowering the chances of success".<sup>46</sup> This strategy has focused on developing tactics and equipment optimised for Finland's particular geographical and natural conditions.<sup>47</sup> Nonetheless, the Finnish authorities have recognised that most of the current and future challenges are somewhat diffuse or irregular and that it is essential to adapt accordingly. Therefore, Finland has invested considerably to protect itself and lead efforts in Europe against what have been labelled as "hybrid threats", namely, cybersecurity, disinformation, and data theft, among others.<sup>48 49</sup>

In the conventional realm, Finnish Ground Forces have received new equipment: In

2019, the Ministry of Defence purchased 100 Leopard 2A6 tanks from the Netherlands and 48 K-9 Thunder self-propelled howitzers from South Korea.<sup>50 51</sup> The land forces have also acquired the Crotale-NG short-range air defence system, integrated with the Thales Catherine compact thermal imager, which provides the operator with support in the event of an imminent air threat. This increases the performance of the system, which also benefits from infrared photo-detection, and its small size makes installation possible on light armoured vehicles.<sup>52</sup> Moreover, Finland is promoting the growth of its military industry and has commissioned the national company Sako Ltd to develop a family of home-grown rifles.<sup>53</sup> Furthermore, the Finnish and Latvian Ministries of Defence have established an agreement with the Finnish company Patria, for the joint development of an armoured artillery vehicle.<sup>54</sup> In recent years the Finnish Ministry of Defence has taken steps to ensure its security and peace through its ground forces able to defend the nation independently. At the same time, it has sought to deepen cooperation with its EU partners and the Nordic neighbourhood. It has participated in both training exercises and operations with NATO, despite not belonging to the organisation.<sup>55</sup>

45. Finland Abroad, (2019). 'Finland remains committed to UN Peacekeeping'. [online] Available at: [https://finlandabroad.fi/web/un/current-affairs//asset\\_publisher/TMz3SoX45f0K/content/finland-remains-committed-to-un-peacekeeping-read-more-about-today-s-statement-at-unhq/384951](https://finlandabroad.fi/web/un/current-affairs//asset_publisher/TMz3SoX45f0K/content/finland-remains-committed-to-un-peacekeeping-read-more-about-today-s-statement-at-unhq/384951) (Accessed: February 12, 2021)

46. Ibid.

47. Ibid.

48. EU 2019.FI, (2019). Common Action to Counter Hybrid Threats, [online] Available at: <https://eu2019.fi/en/backgrounders/hybrid-threats> (accessed February 12, 2020)

49. Maavoimat, (2020). Character of Battlefield in the 2030s, [online] Available at: <https://maavoimat.fi/en/land-defence-in-the-2030s> (accessed February 12, 2020)

50. Maavoimat, (2019). The Finnish Defence Forces has received the total delivery of the Main Battle Tank Leopard 2A6, [online] Available at: <https://maavoimat.fi/en/-/puolustusvoimat-on-yastanottanut-kaikki-leopard-2a6-tuotokelpansarivaunuit> (accessed February 12, 2020)

51. Maavoimat, (-). Self-Propelled Howitzer K9 Thunder – from Research to Procurement Programme, [online] Available at: <https://maavoimat.fi/en/self-propelled-howitzer-k9-thunder> (accessed February 12, 2020)

52. Army Recognition, (2018). 'Finland Crotale NG fitted with Catherine XP thermal camera completes successful test-firing'. [online] Available at: <https://www.armyrecognition.com/june-2018-global-defense-security-army-news-industry/finland-crotale-ng-fitted-with-catherine-xp-thermal-camera-completes-successful-test-firing.html> (accessed: February 11, 2021)

53. Defense Brief, (2019). 'Finland kicks off homegrown rifle development project', [online] Available at: <https://defbrief.com/2020/05/25/finland-kicks-off-homegrown-rifle-development-project/> (accessed: February 8, 2021)

54. Maavoimat, (2020). Army's armoured wheeled vehicle programme to the product development phase. [online] Available at: <https://maavoimat.fi/en/-/army-s-armoured-wheeled-vehicle-programme-to-the-product-development-phase> (accessed February 12, 2020)

55. Wither, J. (2020). 'Back to the future? Nordic Total Defence Concepts'. Defence Studies. 20 (1), 61–81.

## **CHAPTER 3: CUTTING EDGE TECHNOLOGY: “LOOKING AT THE NEAR FUTURE.”**

The military domain has always paid particular attention to the research and development of new technologies to enhance the efficiency, effectiveness, safety of operations, face new types of combat, and emerging security threats. Several military-technological innovations have left the military field and changed the world, impacting civilian life immeasurably. Notable examples include the internet, which began life as a military communication system, and military aviation technology such as radar and guidance aids, which have influenced civilian aviation and made flight safety a matter of routine.

Innovation in the military domain has brought changes to contemporary warfare. This change is sometimes incremental and sometimes revolutionary. Gunpowder, coal-powered ships,

armoured vehicles, wireless telegraphy, radar, jet engines, and stealth technology represent some historical examples of individual technologies that have changed how war is fought. Recently, Unmanned Aerial Vehicles (UAVs), such as the MQ-1 Predator, and the MQ-9 Reaper, changed the conduct of counterinsurgency campaigns. These carried out reconnaissance and strike missions with a pilot in remote control many miles away, directly reducing the military footprint in the operational environment.

At present, there is an explosion in high-tech possibilities in the military domain: UAVs are becoming more sophisticated, the military use of artificial intelligence (AI) is widely debated within institutions, and the development of new weapon systems such as hypersonic



missiles and drone swarms is increasing. This assortment of exquisite systems and technologies could bring various military advantages such as increased standards and performances, together with a potentially lower level of direct involvement of land forces in the battlespace.

Among these cutting-edge technologies, AI draws a lot of attention within European institutions for its military utility. AI is the ability of a machine or a computer to demonstrate and utilise human qualities such as learning, thinking, planning, and creating. It allows integrated and networked systems to understand their surrounding environment and act to reach the desired goal. These systems acquire data using sensors, cameras, or oth-

er processes and can develop answers organically. AI systems can adapt their behaviour, analyse the effects of previous actions, and work autonomously. They can be linked and may be especially useful in the cybersecurity domain in helping with reconnaissance and cyber threat analysis through continuous learning from large data sets. This allows an AI to understand trends and recognise how previous attacks were carried out.

With the increase of connected systems and with a more digitised battlefield, the security of information and communication technology (ICT) will acquire greater importance. It will be a vital determinant in a future conflict. The continuous development of ICT in recent decades has opened the way for the total



connection and integration of all the elements of a military force.<sup>56</sup> This applies to forces in the same battlespace and virtual reality, which will shape the future of training.

The increased utilisation of military AI aims to increase the rapidity and readiness of military action entrusted to autonomous systems or remotely manned vehicles. At present, remotely manned missions with a controller thousands of kilometres away from the action always maintain a human factor.<sup>57</sup>

Today, human efficiency and human decision-making are still preferred and indispensable methods for completing tasks that require human factors or where autonomous systems do not yet perform at an acceptable level of security and reliability.

The current debate on AI and autonomous systems focuses on the need for human judgment and human decision for all activities and operations that involve the possibility of lethal action<sup>58</sup>. Autonomous systems may also be used in scenarios where humans are put in danger. These include the disarming of weapons and explosives, and minesweeping.<sup>59</sup> Autonomous systems can represent a force multiplier for armed forces effectiveness and combat power, they can reduce the number of personnel directly involved in military operations.<sup>60</sup> It is also expected that AI will impact military command posts, whether they be friendly or opponents. However, it seems that overall command decisions will remain human.

### 3.1 Drones and Jammers

The diffusion of commercial unmanned aerial vehicles (UAVs) and drones has registered an exponential increase in recent years. Beyond military UAVs, small commercial drones are cheap and easily accessible, and they can be controlled with a smartphone or remote control. The most common are quadcopters utilised for leisure and filming purposes. These could be combined with Improvised Explosive Devices (IEDs) to maximise their potential destructive power. Due to their reduced dimension and velocity, they are not easy to detect and, in many cases, almost silent; furthermore, it is worth emphasising they are capable of rapid movement at low altitude. Many armed forces are testing or deploying small drones for the use of military units on the battlefield.

Several European armed forces have organised new specialised teams and are acquiring new technology to face a threat represented by commercial UAVs. This threat became evident after the Gatwick Airport incident in 2018, in which air traffic was disrupted for more than 30 hours by errant drone activity near the runways.<sup>61</sup>

The counter-drone market has grown significantly in recent years, especially as far as it concerns equipment that allows interception, detection and disabling of drones. Despite the development of this technology, there are still difficulties for detection systems. The most common counter-drone systems are designed

56. Nones M., Marrone A, 2011, *La trasformazione delle Forze Armate: il programma Forza NEC*, IAI

57. Army Doctrine Publication (ADP) 3-0, *Unified Land Operations* (Washington, DC: U.S. Government Printing Office, October 2011).

58. NATO, Williams, Andrew. (2015). *Autonomous Systems: Issues for Defence Policymakers*. [online] Available at: [https://www.act.nato.int/images/stories/media/capdev/capdev\\_02.pdf](https://www.act.nato.int/images/stories/media/capdev/capdev_02.pdf)

59. The U.S. Army Robotic and Autonomous Systems Strategy (Fort Eustis, VA: U.S. Army Training and Doctrine Command, March 2017).

60. Maj. Thomas Ryan, U.S. Army, Vikram Mittal, PhD. (2019) *Potential for Army Integration of Autonomous Systems by Warfighting Function*, Army University Press, <https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/September-October-2019/Mittal-Autonomous-Systems/#:~:text=Autonomous%20systems%20provide%20a%20combat,as%20the%20state%20of%20technology>

61. Wallace, B., (2018), *UK now has systems to combat drones*, retrieved 14/02/2021 - <https://www.bbc.com/news/uk-england-46676762>

to disturb and interfere with a UAV's communication systems and GPS to either reroute or neutralise them. This is useful as many commercial drones are vulnerable to jamming.<sup>62</sup> Regarding countermeasures and the anti-drone market, there is no single prevalent anti-drone system in which countries are investing above others; instead, there is a multitude of manufacturers and systems: France and the US use equipment supplied by DroneShield<sup>63</sup>, an Australian-US provider of optronics, detection, and jammers such as the DroneGun MKIII and the DroneGun Tactical. Italy acquired and is testing systems provided by CPM Elettronica<sup>64</sup>, such as Watson,

Wilson, DJI 120 4B jammers, and detection systems. Leonardo Defence recently delivered its counter-unmanned aerial system Orcus to Britain's Royal Air Force and the Italian Army<sup>65</sup>. The same company also developed other systems to counter small drones, such as Falcon Shield, a system capable of detecting and jamming drones. Following the success of the Israeli air defence system Iron Dome, Rafael Advanced Defence Systems developed the Drone Dome. This complex anti-drone weapon system detects, disrupts or disables small UAVs.



62. Rinaldi, S., 2021, Finabel European Army Interoperability centre, Infoflash, 16/02/21. [online] Available at: <https://finabel.org/countering-drones-how-european-land-forces-are-organising-their-anti-uav-capabilities-for-homeland-security/>

63. DroneShield, (2021), Company website, [online] Available at: <https://www.dronesshield.com/> (retrieved 14/02/2021).

64. CMP Elettronica, (2021), Company Website. [online] Available at: <https://www.cpmeltronica.com/> (retrieved 14/02/2021)

65. Leonardo Aerospace, Defence and Security, (2021). [online] Available at: <https://www.leonardocompany.com/> (retrieved 14/02/2021)



## 3.2 Drone Swarms

The versatility and flexibility of small commercial drones have led to divergent uses from leisure, to filming, to commercial activity. Another utilisation that is becoming increasingly popular is the drone display: the use of numerous drone's flying in formation as a flight display. Recently, such a display took place during a celebration following Joe Biden's first speech as president-elect<sup>66</sup>.

The technology behind the simultaneous control of multiple drones allows the possibility of military development. The US military has prioritised this technology's development<sup>67</sup>, especially from a defensive perspective, as it can be used to reduce risks to deployed land forces. Drone swarms could not only perform standard Intelligence, Surveillance, and Reconnaissance (ISR) missions, they could monitor the threat environment and defend assets. Furthermore, once the software is fully developed, it will be cheap to operate and replace such systems. Furthermore, due to the high number of networked drones, they will be difficult to destroy simultaneously<sup>68</sup>. Thus, an opponent's ability to attack could be neutralised by this networked system. At present unmanned weapons carry out pre-designated missions, the effectiveness of which depends on enemy capabilities and enemy predictability. "If the enemy does something unexpected, pre-programmed weapons become ineffective, and additional resources may be required

to complete the mission<sup>69</sup>". The networked and semi-autonomous system, integrated with artificial intelligence can represent an automated advantage: observing and immediate reaction to an enemy, and anticipation of the enemy reaction<sup>70</sup>.

## 3.3 Hypersonic Weaponry

Hypersonic weapons have recently captured the interest of major powers on the world stage. For example, in the fiscal year 2021, the US budget for the research and development of hypersonic weapons has jumped from 2.6 to 3.2 billion dollars<sup>71</sup>. Weapons such as General Atomics Electromagnetic System (GA-ESM) have received increased funding from the US Army Combat Capabilities Development Command Armaments Centre (DEVCOM AC) to further develop new hypersonic projectiles<sup>72</sup>. These projectiles are launched by an electromagnetic railgun, which guarantees extraordinary acceleration. This development will be integrated into US air defence capabilities soon, and the first field test of this new system is scheduled for the end of 2021.

The United States Air Force (USAF) has been promoting several projects to acquire hypersonic weapons. The most advanced is represented by the AGM-183 Air-launched Rapid Response Weapon (ARRW). The USAF is also accelerating the development of a multi-role hypersonic platform named: Expendable

66. Goodwin, J., 2020, CNN Business. [online] Available at: <https://edition.cnn.com/2020/11/09/tech/joe-biden-victory-speech-drone-light-show/index.html> [13/02/2021]

67. Lynn, S., et al., 2020, Aerospace & Defence. [online] Available at: <https://www.aerodefensetech.com/component/content/article/adl/features/articles/36813> [retrieved 12/02/2021]

68. *Ibid*

69. Air Force Research Laboratory (2020). "Golden Horde". [Online] Available at: <https://afresearchlab.com/technology/vanguards/successstories/golden-horde> [retrieved 17/02/2021].

70. *Ibid*.

71. Cavanna, G., (2021), ARES Osservatorio Difesa, Mayhem, la nuova arma ipersonica multi ruolo dell'USAF. [online] Available at: <https://www.aresdifesa.it/2020/08/20/mayhem-la-nuova-arma-ipersonica-multi-ruolo-dellusaf/> [retrieved 15/02/21]

72. Cavanna, G., (2021), ARES Osservatorio Difesa, Prosegue lo sviluppo dei proiettili ipersonici di General Atomics, retrieved 15/02/21, <https://www.aresdifesa.it/2021/01/12/prosegue-lo-sviluppo-dei-proiettili-ipersonici-di-general-atomics/>

Hypersonic Air-Breathing Multi-Mission Demonstrator Program (“Mayhem”). This is a missile with both strike and reconnaissance capabilities.

It is not clear yet how these cutting-edge technologies will impact warfare. However, at the current state of the art, except for AI and systems that are becoming increasingly inde-

pendent and autonomous, most new weapon systems are oriented to or reliant upon the implementation of current technologies. The next generation of weapon systems and their increased performances and capabilities will be interesting to observe in shaping future warfare.

## **CHAPTER 4: MODERNISATION OF MILITARY TRAINING**

Armed Forces around the world, regardless of their particular circumstances, are constantly developing their capabilities because they share a common goal: defending the sovereignty of their nation.<sup>73</sup> This can be achieved through the design of improved strategies and adaptation to technological transformations. A great deal of the effort in land force modernisation is based upon improving the capacity of personnel. The particular reason for this lies in the idea that “the surest way to prevent war is to be prepared to win one.”<sup>74</sup> Thus, the degree of readiness of an army can deter possible attacks from adversaries. On top of improving personnel capabilities, technology has developed and grown rapidly to become a fundamental force in industry and military activities. It has changed the way armies defend their nations and the way they prepare to do so. In recent decades, many computer systems have been developed for simulated training through advantageous and ingenious platforms that offer tools to manage mission

performance more effectively.

Simulation has become a key concept that could be understood as “a broad collection of methods and applications to mimic the behaviour of real systems.”<sup>75</sup>

Many countries have been working in this field, and others have adapted to new trends, thus taking advantage of technological advances to ensure quality training and successful operations. This is a key objective in various modernisation projects across the world. The US military is a key driver in the development and use of technology in all areas of military preparation. As a consequence, US military personnel have been using virtual reality for simulation training of all kinds. For example, US soldiers use the Virtual Interactive Combat Environment (VICE) simulator to enhance their shooting training. The VICE simulator is designed to improve marksmanship, reaction, and strategy skills in combat situations: the system organises troops in separate booths to form training lines with

73. Guilmarin, J. (2020). 'Military technology', Encyclopaedia Britannica. [online] Available at <https://www.britannica.com/technology/military-technology> (accessed: February 8, 2021)

74. US Dept of Defense, (2018). 'Summary of the 2018 National Defense Strategy'. [online] Available at: <https://www.defense.gov/Explore/Spotlight/National-Defense-Strategy/>

(Accessed: February 8, 2021)

75. Kelton, D. et al., (2007). Simulation with Arena. McGraw Hill: Boston



image, sound, camera and a replica weapon, it allows both individual and team training.<sup>76</sup> European countries have also begun to utilise these technologies. Since 2013, the Royal Netherlands Army adopted the Command and Staff Trainer (CST) from the Israeli company Elbit System.<sup>77</sup> This simulation tool offers a high-tech practice mechanism to strengthen the training and education of military personnel. The system is fully customisable, according to the requirements of the operation to be carried out. The British Army, consistent with its IOPC25 objectives of deepening its physical and virtual development has also chosen a training

program called VR In-Land Training (VRLT) from Bohemia Interactive Simulations (Bi-Sim). This program allows participants to configure training scenarios to be executed and to analyse the most effective solutions to the challenges that are presented to them.<sup>78</sup> Similarly, Lithuania has not only chosen to considerably expand its main training centre, the Silvestras Zukauskas General Training Area in Pabradė, but has also modernised its training methods by integrating a series of simulation exercises.<sup>79</sup> In addition, the Kaunas University of Technology, located in the centre of Lithuania, has “designed a field training equipment for short-range air defence systems”, which

76. DAS. VICE: Virtual Interactive Combat Environment. [online] Available at: <https://www.d-a-s.com/vice> (accessed February 15, 2020)

77. Army Technology, (2012). ‘Elbit delivers Command and Staff Trainer to Royal Netherlands Army’, Available at: <https://www.army-technology.com/news/news/elbit-delivers-command-staff-trainer-royal-netherlands-army> (accessed: February 15, 2021)

78. Dugdale, M. (2020). ‘BISim delivers VR collective training at scale to British Army’, VRWORLDTECH, [online] available at: <https://vrworldtech.com/2020/11/26/bisim-delivers-vr-collective-training-at-scale-to-british-army/> (accessed: February 12, 2021)

79. Lithuanian Armed Forces, (2019). ‘Training’. [online] available at: [https://kariuomene.kam.lt/en/structure\\_1469/training\\_and\\_doctrine\\_command/units/general\\_adolfis\\_ramanauskas\\_combat\\_training\\_centre/training\\_3231.html](https://kariuomene.kam.lt/en/structure_1469/training_and_doctrine_command/units/general_adolfis_ramanauskas_combat_training_centre/training_3231.html) (Accessed: February 15, 2021)

includes all the necessary functions without firing real missiles.<sup>80</sup>

The Spanish company Indra, a provider of various Spanish Armed Forces services, has developed the Single Weapon Shooting Simulator: Victrix. This system allows participants to use real weapons with certain modifications according to the required simulation, and the weapons can vary from heavy to light, allowing considerable saving of time and resources.<sup>81</sup> More recently, the company developed sophisticated goggles that allow the simulation of firefights with the participant holding a weapon.<sup>82 83</sup>

In conclusion, what stands out the most about all these simulators are their highly programmable capacity to re-create fully immer-

sive environments. The purpose of military training is the preparation in peacetime of capabilities matched to the demands of operations. Virtual reality might not fully replace physical training, but simulations represent an important tool to enhance learning quality. Technological training improves participants' decision-making capabilities and allows them to experience situations as adverse and complicated as those on the battlefield without incurring potential risks. Where participants can strengthen their skills in the handling of certain weapons and vehicles or different military manoeuvres, minimising the equipment and maintenance costs and even having a significantly lower impact on the environment.

## CONCLUSIONS

Modernisation and transition in military affairs are perennial. They require deep analysis and constant revision. Despite emphasising technology and equipment, they are a more complex and articulated business encompassing the entire military domain. For example, new equipment and technology lead to changes in doctrine and conduct that lead to changes in the laws of war.

It is worth noting that there is no universal scheme for doctrinal modernisation, just as there is no universal scheme for doctrine it-

self, and a particular doctrine is inherently connected to the country applying it. Military doctrine accounts for many factors: the nature of the conflicts, the military capabilities of the country, the level of integration within the branches of the armed forces, and the nature of the opponent(s).

Considering current conflicts and the trends of recent years, alongside national military decisions, the major focus of a re-elaboration of doctrine may occur in the field of unconventional, asymmetric and hybrid warfare

80. KTU, (2019). Lithuanian scientists offer cheaper and safer solutions for defence training. [online] available at: <https://en.ktu.edu/news/lithuanian-scientists-offer-cheaper-and-safer-solutions-for-defence-training/>. (Accessed: February 15, 2021)

81. Indra, (2019). Simulador de fusil de asalto. [online] available at: [https://www.indracompany.com/sites/default/files/indra-simulador\\_de\\_tiro\\_militar\\_victrix.pdf](https://www.indracompany.com/sites/default/files/indra-simulador_de_tiro_militar_victrix.pdf) (accessed February 15, 2020)

82. Indra, (2019). Indra enhances military training with the use of virtual reality goggles. [online] available at: <https://www.indracompany.com/en/noticia/indra-enhances-military-training-use-virtual-reality-goggles> (accessed February 15, 2020)

83. Summers, J. (2012). 'Simulation-based Military Training: An Engineering Approach to Better Addressing Competing Environmental, Fiscal, and Security Concerns'. *Journal of the Washington Academy of Sciences*. 98 (1), 9–29.

contexts.

European nations have shown great concern for, and attention to, the process of land forces modernisation. In recent times, threats to security such as drug-trafficking, terrorism, ongoing conflicts, and non-democratic states aggressive behaviour have been experienced by many European countries and by the European Union itself. In this challenging strategic environment, it is fundamental to maintain one's guard and guarantee an effective, efficient and prepared defence sector. To constantly improve and keep resources ready to detect and counter these threats, countries are working to exploit new technologies and developments in the defence domain. Technology plays an important role in this process, creating new military means and improving current operations. Armies are constantly replacing their assets or they are redesigning assets to face new threats. Consequently, the modernisation of land forces is an integrated process that requires change on different scales. The availability of improved assets and tools for national defence is vital and must be integrated with coordinated, adapted, and organised strategic developments.

Artificial Intelligence sits at the cutting edge of military modernisation and is probably the most interesting evolution despite its infancy. It could soon have a revolutionary impact on how a war is being fought. Additionally, cyber-security will be shaped by this new technology, and consequently, cyber warfare itself. Whether or not politicians, academia, and the military agree on the need to keep the human factor in the decision-making process, these systems are gaining popularity and becoming more sophisticated. Autonomous systems can represent an important means of reducing risks for land forces, which will become less involved on the battlefield or delegate certain tasks during combat or peacekeeping missions to non-human operators.

Future warfare will be increasingly impacted by the evolution of the technologies and the systems discussed in this paper. It will be interesting to observe the impact they will have on the design of future equipment and the elaboration of doctrine. Their impact will surely create the need for further developments in the land forces modernisation process.

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Created in 1953, the Finabel committee is the oldest military organisation for cooperation between European Armies: it was conceived as a forum for reflections, exchange studies, and proposals on common interest topics for the future of its members. Finabel, the only organisation at this level, strives at:

- Promoting interoperability and cooperation of armies, while seeking to bring together concepts, doctrines and procedures;
- Contributing to a common European understanding of land defence issues. Finabel focuses on doctrines, trainings, and the joint environment.

Finabel aims to be a multinational-, independent-, and apolitical actor for the European Armies of the EU Member States. The Finabel informal forum is based on consensus and equality of member states. Finabel favours fruitful contact among member states' officers and Chiefs of Staff in a spirit of open and mutual understanding via annual meetings.

Finabel contributes to reinforce interoperability among its member states in the framework of the North Atlantic Treaty Organisation (NATO), the EU, and *ad hoc* coalition; Finabel neither competes nor duplicates NATO or EU military structures but contributes to these organisations in its unique way. Initially focused on cooperation in armament's programmes, Finabel quickly shifted to the harmonisation of land doctrines. Consequently, before hoping to reach a shared capability approach and common equipment, a shared vision of force-engagement on the terrain should be obtained.

In the current setting, Finabel allows its member states to form Expert Task Groups for situations that require short-term solutions. In addition, Finabel is also a think tank that elaborates on current events concerning the operations of the land forces and provides comments by creating "Food for Thought papers" to address the topics. Finabel studies and Food for Thoughts are recommendations freely applied by its member, whose aim is to facilitate interoperability and improve the daily tasks of preparation, training, exercises, and engagement.



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