Military developments of armed forces in the European Union caused by the war in Ukraine.

Essay

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Abstract & Keywords

This essay is the result of research work of the developments of the European armies after the war in Ukraine.

For this mean, it has been studied both the lessons learned during the conflict, from diverse sources, as well as the new acquisitions and modernization programs European member states have carried out in order to meet these new requirements.

Only four countries have been studied for this matter, all in the sake of obtaining the most reliable answer to this query. It has been decided that it would be more convenient to study in detail four countries (its choice is justified later), rather than studying all the member states at the same time, a method that would have not resolved the question as faithfully as I intend this essay will.

Preexisting literature has been used, and dutifully cited, in order to identify the lessons learned during the conflict as well as to study the defence budgets.

In the conclusion section, this essay has the objective of presenting to the reader the developments achieved by European armies after the irruption of the war in Ukraine.

Key words:

1. Lesson learned
2. Remotely Piloted Aircraft System (RPAS)
3. Command and Control
4. Ministry of defence budget
5. Open-source intelligence

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2.   Preface

The war in Ukraine has been one of the major black swans of the last years; just when the world started to recover from the Covid-19 pandemic, the Russian Federation illegally attacked and occupied Ukrainian sovereign territory since 2022.

War is a factor that involves and affects the entirety of society, but specially to those who are in charge of the defence of their nation.

Still being a 2nd Lieutenant in the Academia General Militar in Zaragoza, I am completely aware of the repercussions this invasion will have, in me, and in the totality of the Spanish army; in matters such as doctrine, weapon system acquisitions and future exterior operations.

For this reason, and motivated to work to the best of my ability, I humbly hope this essay will shed some light on the discussed topic, making it a useful contribution to the existing literature.

I would like to finish this preface giving thanks to my tutor in this military Olympiads, who with his inexhaustible patience and invaluable advises helped me in the writing process.

3.   Introduction

We Europeans have been oblivious to war since the fatidic days of the Second World War, free of the horrors and suffering, dwelling this continent peacefully until the disintegration of Yugoslavia, mistakenly believing another conflict inside our borders would never occur; until the 24rd of February 2023, when the Russian Federation launched, without warning, a so called "Special Operation" in the heart of Ukraine's capital, Kiev.

The unsuccessful attempt of capturing Kiev resulted in the beginning of the greatest conventional war we have seen in Europe in the last 80 years.

In the last decade, European armies have focused their resources in the fight against terrorism, developing their capacities towards asymmetrical adversaries, while undoubtably neglecting conventional warfare.

Symmetrical and conventional warfare have blended with sharp-edged technology, as we can see in Figure 1. This is a scenario our armies need to adapt quickly, as it is of the utmost importance for maintaining our strategical role within the geopolitical theatre.

Figure 1: The old ways of doing war combined with modern technology in the war in Ukraine[1]

Explaining how have European countries developed their armies as a consequence to this war will be the main objective of this essay.

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[1] Picture by Leah Millis, Reuters.

I will focus my efforts in the investigation of the lessons learned from the war in Ukraine and then study the ministries of defence budgets with the objective of answer how have the European member states developed militarily after the war in Ukraine.

During my research, I will use official documents issued by the ministries of defence of European countries, as well as published literature and papers including expert's opinions. In the light of this information, I will ultimately conclude this document with my own opinion, valuing if the investments have been concentrated to sectors involving the lessons learned.

Now, I consider important to define a recurrent term that appears throughout the essay:

- Lesson Learned: identification of knowledge as a result of the own experience, or the study of results by an external agent.

4.   Current state of research

The objective of this section of the essay is to present the current investigations related to the topic of this essay.

The war in Ukraine has not left anyone indifferent; for this reason, many have been those who have tried to study the lessons learned from the war in order to identify the advances in the art of war.

The study of this subject by experts is widely focused in the developments of warfare, meaning the lessons learned detected through the duration of the war.

I will begin, as it is right, mentioning how has the High Representative of the Union for Foreign Affairs and Security Policy and Vice President of the European Commission (HR), Josep Borrell Fontelles, communicated the developments of European armies.

In the same web page of the European External Action Service (EEAS), the HR wrote what have been so far the operational and strategical implications of the war, as well as the industrial and technological implications it had. Regarding to the operational and strategic implications, he identifies several lessons drawn from the war, such as the importance of training and preparation of the troop in order to obtain an army capable of combining all the arms effectively; innovations in the use of command and control; the exorbitated loss of material and equipment this high intensity war is seeing is a main source of concern for the HR and all the union, which are becoming aware of the lack of industry behind the army if we had to take place eventually in such conflicts; being the last one the importance of sustainable, flexible and effective logistics, once more.

With respect to the industrial and technological implications the HR is aware of the mentioned problems of the industrial and technological base, highlighting the lack of ammunition and the proposal for an Act of Ammunition Production. [2]

The US Army War College published an article this July in which they identify several lessons learned and give possible solutions to them, but without any mention about how the European armies gave implemented them.

For example, in regard to command and control, they assume modern western vulnerabilities. We have accustomed ourselves to operate in an uncontested

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[2] Cf.: EEAS Homepage. URL: https://www.eeas.europa.eu/eeas/lessons-war-ukraine-future-eu-defence_en [29-05-2023]

electromagnetic space, but in an all-out war against a major power nation such as the Russian Federation the US Army War College identifies different solutions to a highly contested electromagnetic space, such as giving more importance to highly mobile command posts that jump daily, minimizing electronic signature, allowing distributed collaboration…

In order to reinforce this principle of minimizing electronic signature another lesson is identified, and it is no other than the importance of the so called "mission command", obtainable with enough training and a culture shift. It is described as a disciplined disobedience, which allows the continuation of operations without needing perfect communications based on mutual trust.

The US Army War college identifies other lessons learned but, yet again, without mentioning how they have been implemented, not only in European armies, but neither in their own army, following the same methodology of explaining and detecting the lessons learned but without studying the results of the changes implemented by their government in their army. [3]

Specifically talking about the use of main battle tanks (MBT's), the Spanish Institute for Strategic Studies, which examines the developments in the use of MBT's by both sides during the war, concluding that to the date, they have been relegated from the assault operations in most cases in order to be used as a sort of artillery piece, due to its high vulnerability to unmanned aerial vehicles (UAV's) conducting reconnaissance missions and giving information to artillery batteries, or just due to its incapacity of maintaining its operability after an unexpected ambush.

The Institute detects that the supply of MBT's from Western allies have not been decisive as the Russian counterparts are not as outdated as they should be in order to make a difference. On the contrary, they stress the importance of mobilization capacities, use of artillery and drones, both for attack and reconnaissance missions.[4]

This are just a handful of sources elaborating the lessons learned in the Ukrainian conflict.

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[3] Cf.: A Call to Action: Lessons from Ukraine for the Future Force. Katie Combre & John A. Nagl (2023). Passim. Army War College Press Homepage. URL:
https://press.armywarcollege.edu/cgi/viewcontent.cgi?article=3233&context=parameters [28-07-2023]
[4] Cf.: Medios blindados en la ofensiva ucraniana de Verano: nuevas tácticas, nuevos modelos y nuevas amenzas. Daniel Saurín Martínez (2023). Passim. Spanish Institute of Strategic Studies Homepage. URL:
https://www.ieee.es/Galerias/fichero/docs_opinion/2023/DIEEEO83_2023_DANSAU_Blindados.pdf
[09-10-2023]

In addition to the literature explaining the lessons learned, there is an enormous amount of brief press articles presenting to the public the latest acquisitions and investments of European ministries of defence; a combination of a disjointed narrative which clearly does not accomplish the criteria for being categorized as a reliable source of information when looking for the developments of European armies after the war in Ukraine.

5.   Research Gap

The previous documents describe what lessons have been identified and how have European countries changed their military expenditures, but they avoid the vital part of this essay, which is to marry this two factors in a single, continuous and clear reading, explaining what weaknesses have been detected, how has Europe militarily reacted and, ultimately, help the reader to acknowledge whether the Union has been successful in this affair or, on the contrary, if it is still not prepared for an eventual war in similar conditions such as the Ukrainian war.

For those who continue to think that my work falls into futility, and that it does not solve anything of relevance just by linking these two subjects, lessons learned and military expenditure, allow me to try to convince you one last time.

Reading literature about the lessons learned in Ukraine will never answer the topic of this essay by itself, neither answers it plain information and numbers about military expenditures without any further explanation or context, it is necessary its combination.

My work will ultimately answer a simple question; have the developments been enough? Has Europe prepared in order to put the balance of force in his favour?

This is how I have closed the gap of the research the best way I am capable of, and urge the reader to understand that this essay will help him to understand the weaknesses of Russia, Ukraine and the detected ones in Europe, and how is the state of European armies as a consequence of this war; "If you know the enemy and know yourself, you need no fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle" – The Art of War, Sun Tzu.

6.   Research questions

With the research gap described in the last section, it is logical to continue with the questions that I will employ in order to mend this void in my work.

I should remark that these questions have been previously presented and, therefore, I will redact them in this part of the essay for the purpose of clarification.

The first of them being: Which have been the lessons learned from the war in Ukraine? That is to say, the weaknesses this war has brought forth.

And as a continuation of the previous question, what have our member states done in order to implement these lessons learned in their armies?

Effective answers to these questions will lead to a clear knowledge about the subject and ultimately close the research gap detected in the previous part.

7.   Methodology

I will follow with the description of the methodology used during my research, which will be used with the purpose of avoiding a random investigation and limit my self to and ordered and objective analysis.

During the section of "Research and Results of Research", I will study the lessons learned and identify the changes of military expenditures of European countries.

The following figure represents the methodology I will use during the "Discussion of Results and personal Conclusions" for and eventually investigating whether the new investments have served to the purpose of reacting to this new paradigm shift.
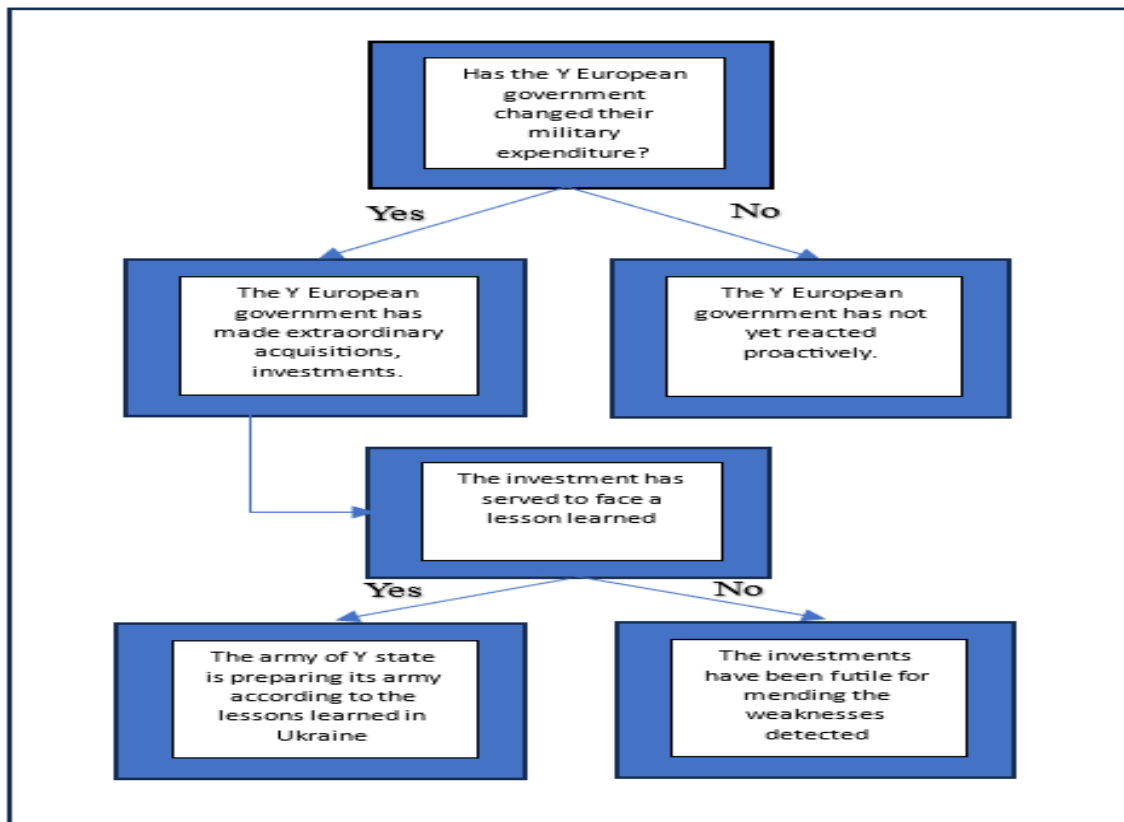

Figure 2: Methodology followed by the author.[5]

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[5] Figure created by the author using Word [11-11-2023]

8.   Research and result of research

8.1.   Which have been the lessons learned from the war in Ukraine

These have been the lessons learned I have identified from diverse readings and sources I will dutifully citate.

1. The necessity of a reliable industrial base for the supply of artillery ammunition, specially 155mm rounds. The high volume of ammunition used was not foreseen and even Europe is struggling to keep up, emptying our national reserves.[6]

2. Command and Control has utterly shifted, from an uncontested electromagnetic dominance to a scenario in which the adversary possesses similar electronic warfare equipment, sensor-based technology, counterintelligence operations, satellite imagery, RPAS reconnaissance abilities… These dilutes the fog of war incapacitating or restricting the safety of telecommunications and complicating the practice of command.[7]

3. The necessity of educating the entire army in the "mission command" concept. Defined as a disciplined disobedience in order to achieve the commander's purpose, it allows a unit to operate in an environment where perfect telecommunications are not possible, basing its principles in the trust between commanders and subordinates.[8]

4. Impossibility to obtain complete air supremacy due to the threat of small attack RPAS being impossible to resolve, which remains an unsolved problematic for both sides, will still cause problems for the use of mechanized vehicles.

5. There has been a change of paradigm in the use of MBTs. Western tanks did not prove to be superior enough for giving the advantage to the Ukrainian side in its summer offensive. Their low survival capacity in a multidomain hybrid war in front of small drones and ambushes, and the difficulty of the logistics behind them, resulted in the impossibility of using them as intended, relegating them to "artillery" missions.[9]

6. The unavoidable importance of a reliable fleet of attack and reconnaissance RPAS. The example of the Russian Lancet RPAS possess a threat not only to the

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[6] Cf.: The New York Times Homepage. URL: https://www.nytimes.com/2023/09/23/world/europe/eu-ukraine-war-ammunition.html [13-11-2023]
[7] Cf.: Katie Crombe & John A. Nagl (2023). Op.cit. P. 5ff.
[8] Cf.: Ibid. P. 5f.
[9] Cf.: Daniel Saurín Martínez (2023) Op.Cit. Passim.

mentioned battle tanks, but also to command posts, highly valuable infrastructure… On the other hand, reconnaissance RPAS allows infantry units to conduct short-range obtention of information, giving them the capacities of gathering reliable intelligence moments before an assault for their own use or the superior echelon.

7. The complexities behind the requirement of high volume of troops, obtained after an effective and training program, their mobilization and rotation during campaigns is a major lesson we have forgotten from the long past days of the II World War.[10]

8. The integration of the Open-source intelligence (OSINT) to the multidomain spectrum, side by side with regular intelligence capabilities. Voluminous tweeter threads, uploads of pictures in social networks such as Instagram can reveal valuable information to the enemy.[11]

9. The importance of deception operations, with the example of the Kherson Ruse. Not only of sophisticated equipment or mass of force are crucial for winning battles, but also the ability of taking into action secret movements with the purpose of obtaining the advantage in a standstill front.[12]

10. The birth of Artificial intelligence in warfare. Ukrainian drones autonomously attacking enemy drones; AI-enabled voice transcription processing intercepted enemy communications and highlighting relevant information; and the use of drones with AI technology for facial recognition are only some examples of Artificial Intelligence irruption in warfare.[13]

11. The use of long-range Rocket Launchers by Ukraine such as the HIMARS has proven to be crucial in the destruction of enemy deposits, supply lines and supressing adversary artillery.[14]

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[10] Cf.: Katie Crombe & John A. Nagl (2023). Op.cit. P. 6.

[11] Cf.: Modern War Institute Homepage. URL: https://mwi.westpoint.edu/the-kherson-ruse-ukraine-and-the-art-of-military-deception/ [13-11-2023]

[12] Cf.: Ibid.

[13] Cf.: SP's LandForces Homepage: https://www.spslandforces.com/story/?h=Lessons-from-the-Ukraine-War&id=870 [13-11-2023]

[14] Cf.: Atlantic Council Homepage. URL: https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/game-changers-implications-of-the-russo-ukraine-war-for-the-future-of-ground-warfare/ [13-11-2023]

8.2. What have our member states done in order to implement these lessons learned in their armies?

In the sake of narrowing down the research as a cause of the limited space of six pages some are the countries that this work will not overview, in favour of other countries that may have a bigger impact in the results of the investigations.

I have considered only to study Germany, France, Italy and Spain as they are the four biggest nations in terms of population as it is one of the main factors of economic potential for a country, as well as an unvaluable source of potential resources during armed conflicts.

8.2.1. Germany

In June 2023, Olaf Scholz, Chancellor of Germany, signed the "National Security Strategy" outlining the Ministry of Defence's objectives.

The document specifically says that Germany will is willing to increase their ministry of defence budget up to a 2%.

The 3rd of June 2022 the German government quickly reacted with a 100 billion euros special fund for the Bundestag; it was stated how the fund would be spent.

A third of it is reserved for the Luftwaffe, with the purpose of acquiring F-35s, Chinooks CH-47F and the Eurofighter ECR, Heron TP Drones, additional air defence systems etc.

Twenty percent for the acquisition of a new network of encrypted telecommunications, including tap-proof radio devices.

They will also modernize their Infantry Fighting Vehicle (IFV) Puma and their Marder and Fuchs Main Battle Tanks (MBT).

422 million euros are foreseen to be invested into investigation and development of artificial intelligence. [15]

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[15] Cf.: Bundesministerium der Verteidignung Homepage: https://www.bmvg.de/de/aktuelles/ministerin-wir-sorgen-fuer-voll-einsatzbereite-bundeswehr-5438596 [13-11-2023]

8.2.2. France

The French's Republic Parliament approved the 13ᵗʰ of July 2023 the "Loi de programmation militaire 2024-2030", extraordinarily increasing their ministry of defence budget by 413.3 million euros as a consequence of the ongoing war in Ukraine.

The law meticulously describes how will the fund be invested in this 7 years period throughout various sectors, some of items exposed in the document are:

Cyber defence capabilities will see its budget increased by 4 billion euros.

Five billion euros for enhancing intelligence and counterintelligence capabilities.

The same amount for will be spent in drones, remotely operated munitions as well as the multinational development of the Eurodrone.

Five more billion allocated for surface-to-air defence systems.

Six billion euros will be used to enhance overseas capabilities.

Six billion euros as well to the development of space domain.

Ten billion will be invested in the development of innovative technology investments, such as swarming drones and robotic capabilities.

Sixteen billion allocated for munitions and the development and development of air-defence systems.

Forty-nine billion for maintenance of the current equipment of the French army.[16]

8.2.3. Spain

Spain has increased by 25.8% of their defence budget in 2023, reaching 12.825 billion euros.

4.902 million,72% more than in 2022, are reserved for special modernization programs.

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[16] Cf.: Loi de programmation militaire 2023-2030. Ministère des Armées Homepage. URL : https://www.defense.gouv.fr/sites/default/files/ministere-armees/Livret%20de%20pr%C3%A9sentation%20de%20la%20Loi%20de%20programmation%20militaire%202024-2030%20%286%20avril%202023%29.pdf Passim. [14-11-2023]

The acquisition programs Spain is conducting include the EF-2000 (Eurofighter)[17], the acquisition of a new assembly line for the A-400M program, the development of the S-80 (submarine) program, the F-110 (frigate), or the 8x8 Dragon IFV.[18]

OBJETIVO	2021		2022		2023
	Presu-puestado	Ejecución	Presu-puestado	Ejecución Prevista	Presu-puestado
1. Programas Especiales (Miles de €)	2.341.589,33	2.352.468,70	2.848.007,58	2.298.007,60	4.901.716,30

INDICADORES	2021		2022		2023
	Presu-puestado	Ejecución	Presu-puestado	Ejecución Prevista	Presu-puestado
Inversiones:					
— Fragatas F-100 (Miles €)	0,00	0,00	81.635,90	81.635,90	104.064,92
— Leopardo (Miles €)	48.172,00	56.573,21	267.721,64	59.417,94	51.301,32
— Producción EF-2000 e ILS (Miles €)	488.878,01	516.753,25	593.858,42	466.358,42	619.998,75
— Programa A/400M (Miles €)	321.524,41	426.824,40	379.084,14	266.584,14	268.302,22
— Helicópteros de ataque (Miles €)	69.727,00	73.897,00	68.727,00	71.077,00	71.902,48
— Vehículo combate infantería Pizarro (II Fase) (Miles €)	71.512,36	55.246,98	65.707,82	70.644,85	58.244,27
— Submarino S-80 (Miles €)	300.000,00	302.500,00	340.000,00	240.000,00	200.000,00
— Misil contracarro (Miles €)	20.000,00	0,00	0,00	0,00	0,00
— Buques de Acción Marítima BAM (Miles €)	5.000,00	291.047,41	54.163,02	23.323,57	0,00
— Helicóptero multipropósito (Miles €)	280.291,64	157.160,89	250.409,22	301.997,35	444.699,32
— Fragatas F-110 (Miles €)	218.207,28	69.559,37	131.415,92	121.765,85	488.624,07
— Vehículos de Combate Ruedas 8x8 (Miles €)	245.227,20	55.000,00	30.000,00	62.900,00	189.570,11
— Modernización helicópteros Chinook (CH47) (Miles €)	165.862,21	165.862,21	131.284,50	131.284,50	137.101,35
— Next generation Weapons System (Miles €)	53.745,22	20.727,18	274.000,00	218.330,94	525.687,10
— BAM IS-Buque de salvamento Marítimo (Miles €)	53.442,00	13.316,80	58.000,00	45.568,00	69.854,00

Figure 3: Spanish 2021-2023 military budget for weapon systems.[19]

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[17] Cf.: Spanish Ministry of defence Homepage. URL: https://www.defensa.gob.es/gabinete/notasPrensa/2022/06/DGC-220623-ila-berlin-adquisicion-eurofighters.html [14-11-2023]

[18] Cf.: Spanish Ministry of defence Homepage. URL: https://www.defensa.gob.es/gabinete/notasPrensa/2022/10/DGC-221007-presupuestos-defensa.html#:~:text=El%20presupuesto%20del%20Ministerio%20de,se%20incluyen%20los%20fondos%20europeos. [14-11-2023]

[19] Cf.: Ministerio de Hacienda Homepage. URL: https://www.sepg.pap.hacienda.gob.es/Presup/PGE2023Proyecto/MaestroTomos/PGE-ROM/doc/L_23_A_G4.PDF P.225

INDICADORES		2021		2022		2023
		Presu-puestado	Ejecución	Presu-puestado	Ejecución Prevista	Presu-puestado
— Avión multipropósito de reabastecimiento (MRTT) *(Miles €)*		0,00	148.000,00	122.000,00	122.000,00	270.000,00
— Helicóptero H-135 *(Miles €)*		0,00	0,00	0,00	5.000,04	38.000,00
— EUROMALE Desarrollo y Producción *(Miles €)*		0,00	0,00	0,00	5.000,00	38.690,00
— Modernización helicóptero TIGRE MK III *(Miles €)*		0,00	0,00	0,00	5.119,10	29.336,80
— Helicóptero multipropósito ARMADA *(Miles €)*		0,00	0,00	0,00	0,00	180.000,00
— Aviones Patrulla Marítima-MPA *(Miles €)*		0,00	0,00	0,00	0,00	170.000,00
— Sistema Conjunto de Radio Táctica-SCRT *(Miles €)*		0,00	0,00	0,00	0,00	80.000,00
— PATRIOT-PAC 3 y Modernización *(Miles €)*		0,00	0,00	0,00	0,00	145.000,00
— Buques hidrográficos *(Miles €)*		0,00	0,00	0,00	0,00	40.300,00
— Misil contra carro-2ª Fase *(Miles €)*		0,00	0,00	0,00	0,00	119.389,15
— Plan MC3 *(Miles €)*		0,00	0,00	0,00	0,00	30.650,44
— Mortero embarcado *(Miles €)*		0,00	0,00	0,00	0,00	35.000,00
— RPAS Largo Alcance-SIRTAP *(Miles €)*		0,00	0,00	0,00	0,00	101.000,00
— Lanzacohetes alta movilidad-SILAM *(Miles €)*		0,00	0,00	0,00	0,00	22.000,00
— Avión sustituto del C.15M *(Miles €)*		0,00	0,00	0,00	0,00	130.000,00
— Avión sustituto del AV-8B y C.15M-2ª Fase *(Miles €)*		0,00	0,00	0,00	0,00	90.000,00
— Aviones Vigilancia Marítima-VIGMA *(Miles €)*		0,00	0,00	0,00	0,00	153.000,00

Figure 4: Spanish 2021-2023 military budget for weapon systems.[20]

The itemization of their expenditure reflected in both tables corroborates with ciphers the information stated by the Spanish ministry of defence.

619.998 million euros for the EF-2000, 444.699 for their multipurpose helicopter (NH-90), 525.687 for next generation weapons system, 488.624 for the S-80 submarine, 189.570 for the 8x8 Dragon IFV, 80 for the acquisition of a Joint Tactical Radio System, 145.000 into their air defence Patriot systems, 119.389 for the acquisition of the anti-tank "Spike" missile, 101.000 in the acquisition of the Long-Range RPAS-"SITRAP" and 22.000 for the acquisition of high-mobility rocket-launcher SILAM[21], but there is a prevision of expanding this project up to 714 million euros between 2023-2027.[22]

8.2.4. Italy

After announcing the rise of its defence budget up to a 2% of their GDP in 2028, the 30th of April 2022, Italy released its Biannual "Documento Programmatico Pluriennale della Difesa 2022-2024", describing the particular investments their army is going implement as a consequence to the war in Ukraine.

The next statements are some of the expenditures of the Italian ministry of defence.

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[20] Cf.: Ibid. P.226
[21] Cf.: Ibid P.225f
[22] Cf.: Infodefensa Homepage. URL: https://www.infodefensa.com/texto-diario/mostrar/4436562/defensa-inyecta-otros-424-millones-lanzacohetes-ejercito-abre-puerta-segunda-bateria [13-11-2023]

Technological adjustments to Software Defined Radio or SDR platforms, 95.7 million until 2028; modernization of the Very Low Frequency (VLF) station, 10 million between 2022 and 2027; adaptation/update of the EW (Electronic Warfare), IMINT (Imagery Intelligence) and HUMINT (Human Intelligence) capabilities of the multi-domain manoeuvre brigade-tactical information brigade, 57.1 million until 2033; creation of the 3rd generation optical satellite system, 264 million euros in total; acquisition of Remotely Piloted Aircraft (APR), micro, mini and light categories, 143 million euros in total; MQ-9 Payolad, aimed at the weaponization of the APR Predator B, 152 million euros in total; Mid-Life Modernization program for 125 units of the Ariete MBT with 980 million euros in total; acquisition of a family of platforms for the Armoured Infantry Combat System, 3.73 billion euros in total; Operational extension for 135 Dardo vehicles and 159 M113 in derivative versions, 192 million in total; renewal of SHORAD capabilities on CAMM-ER, 29.6 million in total; modernization of medium/long range anti-tank capability with the Spike missile, 51 million; Modernization of the PzH-2000, for use of the "Vulcano" ammunition, 150 million; the "ammunition" section receives 36.9 million euros; acquisition of Joint Strike Fighter F-35, investing 1.269 million euros, and finally 2.766 million euros will be allocated for the establishment, management and replenishment of strategic ammunition stocks.[23]

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[23] Cf.: Analisi Di Difesa Homepage. URL: https://www.analisidifesa.it/2022/09/il-documento-programmatico-pluriennale-2022-24-della-difesa/ [13-11-2023]

9.   Discussion of Results and personal Conclusions.

All the information gathered reading the defence budgets, and all the lessons learned written down in this essay are the means of obtention of the answer I am trying to give to this topic; have these four European states implemented significant changes in their armies, so that we can say their armies have developed after the war in Ukraine?

Germany:

- The German Republic has increased its military expenditure by 100 billion euros as an extraordinary measure and the objective of rising it up to a 2% in the next years. They mainly focusing in their F-35 and encrypted telecommunications acquisition programs. In reference to the lessons learned. They have done advances in the numbers 2,6,8,10,11, giving less priority to the 1,4,5,7 lessons learned.

France:

- France has been the member state with the most important rise in its defence budget with 413.3 billion euros and the promise of a 2% GDP investment in 2025 for their defence ministry. The most important remarkable investments in this fund are the 10 billion euros for technological advances and forty-nine for the modernization and maintenance of current equipment. They have done advances in lessons learned 1,2,6,8,10,11, giving less priority to the 4,5,7 lessons learned.

Spain:

- The Kingdom of Spain has improved their defence budget in 2023 in a 25.8% compared to the previous year, up to 12.825 billion; Spain has also promised to rise its budget up to 2% in the next years. From the mentioned funds, approximately a third will be destined to the modernization. It is important to note the efforts done in the acquisitions of their new rocket launcher system, SILAM. They have done advances in lessons learned number 2, although with scarce resources,6, and remarkable investments in the 11th lesson learned, giving less priority to the 1,4,5,7,8,10 lessons learned.

Italy:

- The Italian Republic published, in 2022, its biannual defence budget and the promise of achieving a 2% GDP defence budget in the next years. Like Germany

they have invested a considerable amount in the acquisition of F-35 and the modernization of their MBTs. They have done significant advances in lessons learned 1 (but scarce), 2,6,8 and 11, giving less priority to 4,5,7 and 10.

Difficult to measure but essential to take into account:

- Number 3 and 9 are two lessons learned difficult to measure in term of ciphers. The development of this lessons learned in European armies is a question that only the high command of each country has the answer.

It is important to remark that this study only analyses the changes, and not the previous capacities of countries, meaning that even if a certain country has not still developed as much as another, that does not necessarily mean they are not prepared in the area in question.

The struggle with the implementation of the 5th lesson learned is a concept that involves the actual use of the systems and not their acquisition. It would be false to affirm that the investments in MBT are futile. We need to keep modernizing our tank fleet but take into account the lesson learned previously mentioned.

Although we still suffer from certain weaknesses in our armed forces, specially in the reliability of 155mm ammunition production, it is right to conclude this essay with a message of positivism, European countries have developed significantly after the irruption of the war in Ukraine, we are now more prepared than ever, we react now faster than ever, and as a result of our measures Europe has reassured its geostrategic importance for the times to come.

10.   Annexes

10.1. List of Abbreviations

- **AI:** Artificial intelligence.

- **EEAS:** European External Action Service.

- **EW:** Electronic Warfare.

- **GDP:** Gross Domestic Product.

- **HUMINT:** Human Intelligence.

- **HR:** High Representative, referring to the high representative of the union for foreign affairs and security policy.

- **IFV:** Infantry Fighting Vehicle.

- **IMINT:** Imagery Intelligence

- **MBT:** Main Battle Tank

- **OSINT:** Open-source Intelligence.

- **SDR:** Software Defined Radio.

- **UAV:** Unmanned Aerial Vehicle.

- **VLF:** Very Low Frequency.

10.2. List of Figures

- **Figure 1:** The old ways of doing war combined with modern technology in the war in Ukraine. Page 3.

- **Figure 2:** Methodology followed by the author. Page 10.

- **Figure 3:** Spanish 2021-2023 military budget for weapon systems. Page 15.

- **Figure 4:** Spanish 2021-2023 military budget for weapon systems (continuation). Page 16.

10.3. List of Literature

- A Call to Action: Lessons from Ukraine for the Future Force. Katie Combre & John A. Nagl (2023).

- Medios blindados en la ofensiva ucraniana de Verano: nuevas tácticas, nuevos modelos y nuevas amenzas. Daniel Saurín Martínez (2023)

Grau García
Military Developments of armed forces in the European Union
Caused by the war in Ukraine

11.   Affidavit

I declare that I have written the present essay independently and on my own. I have clearly marked any language or ideas borrowed from other sources as not my own and documented their sources. The essay does not contain any work that I have handed in or have had graded as a previous scientific paper earlier on.

I am aware that any failure to do so constitutes plagiarism. Plagiarism is the presentation of another person's thoughts or words as if they were my own – even if I summarise, paraphrase, condense, cut, rearrange, or otherwise alter them.

I am aware of the consequences and sanctions plagiarism entails. Among others, consequences may include nullification of the essay, exclusion from participation in the CSDP Olympiad. These consequences also apply retrospectively, i.e. if plagiarism is discovered after the essay has been accepted and graded. I am fully aware of the scope of these consequences.

…………………………………

(2nd Lieutenant Diego Grau García, Industrial Organisation Enineering)

Zaragoza, Spain in November 2023