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*Juan Carlos Andrés Herrero**

Pulsating Warfare: combat at the speed of machines

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Abstract:

The 21st century is redefining the art of war through the massive use of disruptive technologies such as Artificial Intelligence (AI) and robotics, which have a particular impact on the virtual and cognitive domains. This change suggests the advent of a military revolution that will lead to a new Generation of Warfare. Cognitive activities prioritize the manipulation of perceptions and narratives, while virtual activities accelerate combat beyond human capacity. This revolution leads to hyper-accelerated combat that we call Pulsating Warfare. This concept uses autonomous systems (AWS) and AI to overwhelm the enemy, attacking simultaneously in all domains and focusing on destroying their will to fight. Humans go from operating to training these systems, facing ethical and legal challenges of machine autonomy in warfare.

Keywords:

Pulse, hyperaccelerated, tempo, rhythm, artificial intelligence, cognitive, saturation.

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The extensive use of disruptive technologies in military operations is changing the foundations on which the art of warfare was structured. The 21st century is witnessing exponential development and massive use of technologies that catalyze new capabilities. We are presented with a scenario full of new means of warfare, which will undoubtedly change the ways of fighting. If tradition presented us with attrition warfare and modernity with maneuver warfare, this new era will surprise us with a new type of warfare.

The current disruptive technological drivers include artificial intelligence (AI), robotics, the Internet of Things (IoT), 5G communications, additive manufacturing, biotechnology, nanotechnology, and quantum technology. Among these, we highlight AI and robotics for their direct application in the physical domains (land, sea, air, space), but which in turn generate greater impact in the domains of cyberspace (virtual) and the cognitive (information).

The Spanish Chief of Defense Staff[1] highlights the importance that the virtual and cognitive domains will have in future wars. The cognitive domain is defined as the non-physical space of operations that directly affects perceptions and decision-making, with the human factor being the most relevant element of war, a struggle of opposing wills. This domain has taken on renewed importance due to the global hyperconnectivity facilitated by cyberspace, which makes it easy to influence populations and leaders.

1. Catalysts for change: technological and social approach.

Revolutions in the art of war are associated with moments in history when a series of large-scale technological and social changes alter the way war is understood, modifying doctrine, organization, and modes of combat. They occur when new technologies (Industrial Revolution) or ways of understanding the world (French Revolution) trigger profound changes in economic systems, social structures, and military forces (Schwab[2], 2016).

This allows us to identify a relationship in the technology-war-society triad. What are known as Military Revolutions (MR) derive from socio-political changes that modify the resources and organization of the state for war. For their part, Revolutions in Military Affairs (RMA) are changes in the doctrine and organization of military forces brought about by emerging technology that seeks to adapt to the contemporary world. While the nature of war remains the same, the ways and means employed change (Tapia[3], 2024).

[1] Inaugural lecture for the 2024-2025 academic year. Admiral General Teodoro López Calderón, Chief of Defense Staff, on October 21, 2024, at the Academy of Military Sciences and Arts.

[2] La cuarta revolución industrial, 2016. Dr. Klaus Schwab

[3] La tecnología como catalizador del cambio en la guerra del cambio en la guerra, G.B. (RES.) SALVADOR SÁNCHEZ TAPIA Professor of International Relations at the University of Navarra;

Humanity is immersed in a period of accelerated technological evolution that is profoundly changing societies. The democratization of technology and its dual-use nature has intensified the relationship between technology, war, and society. While until now the control and military use of technology was state-owned, today control is in private hands, opening the door to disruption by non-state actors. All this is taking place in an interconnected global society in which information and perception are aspects of strategic importance.

Private companies have greater freedom of action, with less governance and regulation. In some cases, they seem to be gaining a leading role, comparable to that of states. Therefore, collaboration and a consensual balance between the public and private sectors will mark the roadmap for this century. The current trend toward rearmament with more technological systems requires financial backing that is often limited, requiring the adoption of sustainable technology policies.

The application of this model must take advantage of dual-use technologies, those that can be used in both the civil and military spheres, applying the changes inherent to each sphere. Companies operating in the commercial and defense markets are the key players. Using the Commercial-Off-the-Shelf (COTS) approach allows the transition to Military off-the-shelf (MOTS). COTS-MOTS synergies are key to the military adoption and integration of dual-use technologies.

Image 1. Catalysts for military change (Source: own elaboration with Gemini).

2. The Generations of Warfare: a polemological approach.

War is a chameleon[4]; it adapts to its environment. Therefore, when disruptive technologies are applied to combat, are we necessarily facing a military revolution or simply the application of military innovation? The reality is that technological change is not the only factor to consider; other dimensions, such as doctrine and organization, must also change for it to be considered a revolution. Javier Jordán[5] defines military revolution as the coincidence in time and space of a large number of technological innovations. It is a cumulative process, the result of the simultaneous and synchronized use of novel and disruptive elements in armed conflicts.

This is an age-old debate, and theorists have found that military revolutions are a more accurate intellectual categorization of war than traditional classifications such as "conventional" or "guerrilla." What is certain is that the dynamics employed on the battlefield have evolved in step with technology and society. Any change, innovation, adaptation, or revolution will have a different level of impact on the elements of military capabilities (MIRADO-I): Material, Infrastructure, Resources, Training, Doctrine, Organization, and Interoperability. If we establish Doctrine as the engine of change, circumstantial changes in Techniques, Tactics, and Procedures (TTPs) applied to a specific area of operations do not necessarily produce a profound doctrinal change.

It is common to use basic classifications of war based on type, which are often obsolete. Among these, we highlight the following:

- Conventional/unconventional.
- Irregular/asymmetric/hybrid.
- Low/medium/high intensity.
- Blocks, maneuver, indirect approach[6], attrition.
- Cold, soft, economic, and nuclear warfare.

William S. Lind, one of the most renowned military thinkers of recent times, who has been instrumental in some of the most significant doctrinal changes within the Pentagon, orders the wars of the Modern Era since the 17th century by generation[7].

1GW - First Generation (1648-1860): Line and column warfare; derived from the First Industrial Revolution (1780) with factories and the steam engine, and the French Revolution (1789) with mass mobilization and ideology. Armies became state-run and professional, with extensive use of firearms: muskets and cannons. This era of pre-

[4] Claussewitz.

[5] Javier Jordán is a professor in the Department of Political Science and Administration at the University of Granada.

[6] The Strategy of Indirect Approach, 1941, Liddell Hart.

[7] Comprendiendo la Guerra de Cuarta Generación, 1989, William S. Lind.

modern warfare was characterized by the use of large, centralized military formations with static confrontations on a single battlefield.

2GW - Second Generation (1860-1918): War of Attrition; following the Second Industrial Revolution (1870) with electricity and mass production, and the Prussian Military Revolution (1860) which led to the model of doctrine and efficient organization. Military forces focused combat on firepower, artillery, and the use of trenches. The Industrial Revolution enabled mass production and sophistication of weapons and ammunition, such as machine guns and high-rate-of-fire artillery. In fact, this period is also known as the Industrialized War period.

3GW - Third Generation (1918-1990): Maneuver warfare; catalyzed by the Third Industrial Revolution (1950), which also brought telecommunications and automated production. The Declaration of Human Rights (1948) and the various civil rights revolutions also had an influence, with the life and death of soldiers beginning to impact public opinion. It is characterized by the speed provided by the extensive use of mechanized means and the integration of aviation, with the Blitzkrieg as its ultimate expression. This made it possible to break through fronts by attacking the enemy's vulnerabilities using the concept of combined arms and precise indirect fire. The aim was to break the enemy's will to fight rather than to destroy them completely. It was notable for its extensive use of radio, combat vehicles, and military aviation.

4GW - Fourth Generation (1990-present?): Hybrid warfare. The Fourth Industrial Revolution 4IR (2000) or Digital Revolution enhances global connectivity, large-scale information processing and storage capabilities, with a high rate of technology adoption (faster development and integration into processes). There is also the so-called identity and social justice revolution, in which the doctrine of “zero casualties” is established. Decentralized, asymmetric, and hybrid wars are waged by non-state actors against states, mainly through insurgency. Kinetic actions in the physical domains give way to non-kinetic actions in the cognitive (information) and virtual (cyber) domains aimed at social influence. The strategy involves political, economic, social, and religious factors, with a focus on the psychological and cognitive dimensions of the conflict. The war is waged by non-state actors against the legitimacy of the state, using a mixture of kinetic and non-kinetic means. A mixture of kinetic (violence) and non-kinetic (propaganda) means. Use of information technology (media).

However, many contemporary authors consider this classification to be incomplete, as it does not take into account the generations of war prior to the Peace of Westphalia (1648), and obsolete, as more than thirty years have passed since his prospective analysis of hybrid warfare in which the state loses its monopoly on violence. For example, Fernando del Castillo Durán completes the historical period prior to the generations developed by Lind and expands it to include up to eight generations of war. Hence the question of whether we are still in 4GW.

Specific technological innovations should not trigger an RMA, but rather a review of the aspects affected. This is the case of the RMA declared by the Pentagon at the end of the 20th century, derived from Information Technologies that promised to end the "fog of war." The possibility was raised of completely changing the organization of the armed forces towards a reduced and technologically advanced model that would take advantage of technological hegemony.

However, the counterinsurgency wars in Afghanistan and Iraq ultimately revealed the hastiness of the idea. This is an example of a premature understanding of the timing and manner of change, in which over-reliance on technology without integration with the human factor was not analyzed, nor was the natural resistance of military institutions to change anticipated (Knox and Murray, 2001[8]). Although we consider Durán's classification to be more comprehensive, we will rely on Lidl's classic classification as it is the most widely used general reference, which we interrelate chronologically with technological and social revolutions.

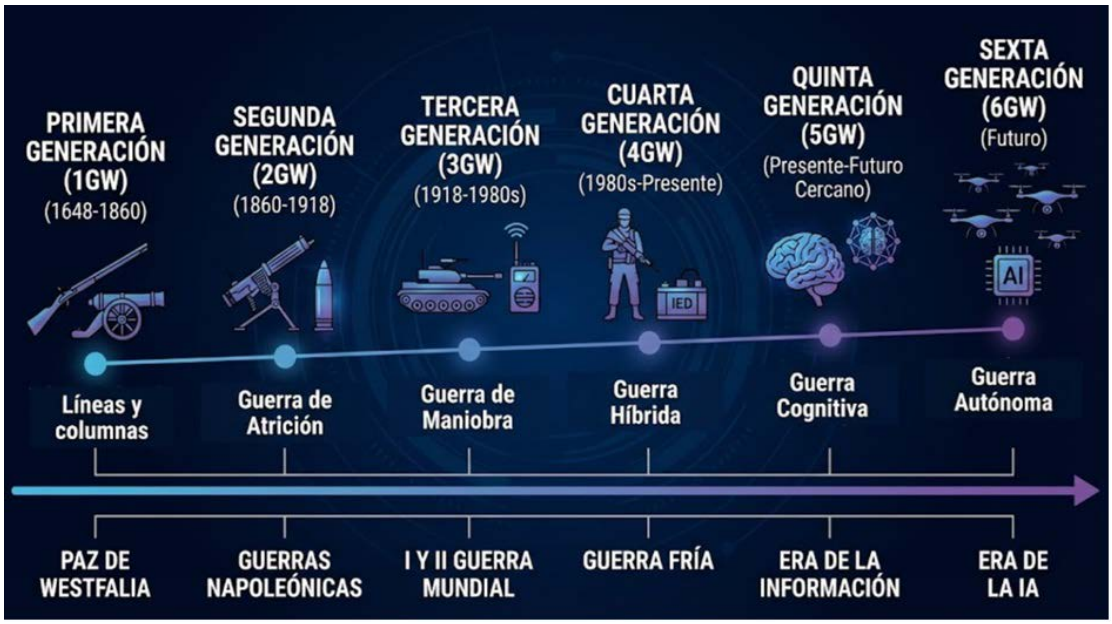

Image 2. The Warfe Generations (Source: own creation with Gemini)

Although the majority opinion is that we are still in the 4IR, some scholars, mainly European and Japanese, believe that AI, especially generative AI, will initiate a new industrial revolution based on human-machine collaboration (rather than automation), deep learning, productive autonomy, and sustainability (rather than efficiency). Thus, although it has not yet happened, we may be on the cusp of the Fifth Industrial Revolution (5IR).

[8] The Dynamics of Military Revolution, 1300–2050; 2001, MacGregor Knox y Williamson Murray.

3. The Next Generations of Warfare.

Be that as it may, it seems that the trend in the chronological graph is that industrial and social revolutions anticipate the emergence of a new Generation of War. In this case, the 4IR and the revolution of sustainability and social justice could be the triggers for a Fifth Generation of War (5GW), and who knows, perhaps the 5IR will lead to a Sixth Generation of War (6GW). What is obvious is that the time between revolutions and generations is shortening exponentially. It may seem that we are in the midst of change and, at the same time, laying the foundations for the next one.

These theories are based on two movements derived from the extensive use of AI (from the virtual dimension): the Cognitive Revolution (REVCOG) in the cognitive domain and the Autonomous Revolution (REVAUT) in the physical domains. REVCOG shifts the battlefield to the minds of combatants (military) and citizens (social) through AI to perform predictive analysis, social engineering, and mass disinformation campaigns, creating a deliberately ambiguous and non-attributable scenario. The goal is to manipulate the adversary's perception and will to achieve social, political, and military paralysis of the enemy, without necessarily resorting to kinetic actions. REVAUT generates a battlefield without temporal and spatial limits through the massive and simultaneous use of autonomous weapon systems (ASW) in all physical domains powered by AI, which will accelerate decision-making cycles (OODA-Loop) beyond human capacity.

In this regard, experts such as Antonio Herrera[9] have begun to define a 5GW in which the virtual and the cognitive displace the kinetic. Others, such as Armin Krishnan[10], are already talking about 6GW, whose main mode of combat is the collapse of society through non-kinetic actions on strategic targets.

5GW - Fifth Generation Warfare. Cognitive warfare between state and non-state technological actors. It establishes the primacy of cognitive and virtual domains, with perceptive and generative AI with human control “on the loop.” It is a non-kinetic, invisible conflict, whose ultimate goal is to conquer the human and social domain of the adversary through perceptions and narratives. Employing proxy actors to maintain ambiguity, this strategy uses Artificial Intelligence (AI) and social platforms to carry out information operations with Weapons of Mass Confusion, creating a vortex of disinformation, chaos, and psychological conflict. Non-kinetic actions, such as social engineering, cyberattacks, and psychological operations (PSYOPS), are prioritized over open violence. The goal is not to destroy the enemy, but to paralyze their will to fight and induce desired behavior, achieving surrender or paralysis by continuously and simultaneously attacking multiple

[9] Antonio Herrera, 2023, Lisa Institute.

[10] Fifth Generation Warfare: Dominating the Human Domain, 2024, Armin Krishnan.

cognitive and cyber domains. In this generation, physical domains are losing importance to cyberspace and, fundamentally, the cognitive domain.

6GW - Sixth Generation Warfare. Autonomous warfare between technological superpowers. Decision-making on the battlefield is ceded, partially or totally, to Artificial Intelligence (AI) and Autonomous Weapons Systems (AWS), including lethal ones (LAWS). Disruptive technological advances drive this leap forward, enabling operations without direct human intervention (HOOTL). The battlefield becomes dehumanized and swarms of small, coordinated drones are deployed. The defining factor is the hyper-acceleration of the decision-making cycle (OODA-Loop), rendering human response capabilities obsolete. It takes warfare to an unprecedented level of speed and sophistication, raising serious legal, moral, and ethical challenges around the replacement and relegation of human judgment.

But as we have seen, the mere application of a novel technology does not necessarily lead to a generational revolution in warfare. We are currently witnessing the application of a high level of robotics on the battlefield, with a certain level of AI, but without generating permanent changes in doctrine. However, the combination and convergence on the battlefield with other disruptive emerging technologies mentioned above, such as hypersonic weapons, directed energy, quantum technology, and nanotechnology, could lead to profound changes in the way we understand warfare a revolution.

The human programmer of the system defines the mission parameters for the AWS, including objectives. Unlike conventional remotely operated unmanned systems (UxS), AWS are capable of modifying their itineraries and making decisions about their activities thanks to the integration of artificial intelligence (AI). Autonomous systems acquire situational awareness from data collected from the operating environment with their own sensors and from data shared in the autonomous collaborative network via the combat cloud.

4. The Pulsating Warfare: fighting at the speed of machines.

As we have already seen, technology is accelerating all human processes, both physical and cognitive, including those related to combat. Of all technologies, artificial intelligence (AI) and robotics applied to unmanned systems (UxS) stand out for their catalytic role in combat. The combination of these two tools generates what are known as autonomous weapon systems (AWS). NATO defines AWS as systems that decide and act to achieve desired objectives, within defined parameters, based on acquired knowledge and evolving situational awareness, following an optimal but potentially unpredictable course of action.

Having autonomous systems that make their own tactical decisions using AI will exponentially increase the pace of operations and the tempo of decision-making. The

frenetic pace imposed by machines due to their physical speed and the faster tempo of AI decision-making will ultimately leave humans out of many activities and actions. This autonomy will require less human involvement in actions and, as a direct consequence, a lower degree of situational awareness. We will find ourselves on a battlefield with two types of cognition: one natural (human) and the other artificial (AI), with different decision-making processes.

The doctrine needs to evolve towards a concept that encompasses both types of cognition and hybrid forms of solving military problems. As a result, the capacity for deception and misdirection regarding these types of cognition will change. Whereas until now humans have deceived humans, in the future machine-human, machine-machine, and human-machine deception maneuvers may be employed. Autonomous forces create a new paradigm in the dimension of planning, decision-making, and deception of the adversary. As we have seen above, 5GW is characterized by the preeminence of actions in the cognitive domain, with ambiguity and manipulation of perceptions. It will become increasingly difficult to discern what is real and what is not, and whether we see is precisely what the adversary wants us to see.

On the other hand, we could consider that the trend in the time required for decision-making (tempo) and the execution of actions (rhythm) tends towards zero. In turn, the time gap between tempo and rhythm also shortens and tends towards zero, while their spaces for cognition and action tend towards infinity. AI understands everything, and robotic swarms cover everything. Consequently, with equivalent values, tempo (the cognitive) and rhythm (the physical) are equated to create a new concept of warfare beyond Attrition, Maneuver, and Hybrid Wars; or perhaps all at once.

Let's imagine actions in which AI is capable of identifying vulnerabilities in the adversary's system in real time and applying a huge amount of mass based on AWS swarms for the time strictly necessary to achieve the desired effects and avoid the loss of combat capability. And repeating this over and over again constantly without allowing the enemy any margin for reaction or recovery.

These pulsing actions would be the ideal concept for an autonomous combat system. A Pulsating War, multi-domain in nature, based on a large federated network of autonomous combatants that do not require a hierarchical chain to make the best decision, simultaneously applying the principles of war, a constant repetition of stimulus-decision-action that saturates the adversary (rhythm) and breaks their decision-making cycle (tempo).

Autonomous pulsating actions that will not only be executed in physical domains, but will also employ other channels of action in the virtual domain through generative AI. Cyber actions will have a dual purpose. On the one hand, they will attack systems that are vital to the normal functioning and sustainability of the enemy (physical effects), creating chaos

and confusion. On the other hand, they will generate massive disinformation campaigns using bots that manipulate the narratives and perceptions of combatants and adversarial society (cognitive effects).

In this way, AI becomes the sole and omnipresent coordinator in the physical and virtual domains, creating combined effects between both environments, which achieve multiplying synergies in the cognitive domain. The result is the annihilation of the adversary society's will to fight and, with it, the withdrawal of resources and forces from combat. It is the result of a repetitive combination of kinetic and non-kinetic actions on an enemy overwhelmed and outmatched on the physical, virtual, and cognitive fronts.

Image 3. Conceptual image of Pulsating War (Source: own creation with Gemini)

4.1. Physical dimension.

The disruptive technologies we have mentioned are raising the concepts of speed and precision to unprecedented levels, while at the same time decoupling the operation of systems from human operators. Beyond the debate as to whether this is innovation or a genuine military revolution, what is certain is that the foundations are being laid for a paradigm shift. Military forces that anticipate these changes and adapt will gain an advantage in combat.

Sustainment will have to be reoriented to support autonomous platforms in which human presence will be residual. Medical support will lose specific weight in favor of maintenance, so that the former effort of evacuation and treatment of casualties will be directed toward the recovery and repair of machines. In addition, the sensorization of systems will create digital twins that will enable predictive maintenance actions to be carried out.

Procurement classes focused on human sustainment (I, II, VI, and VIII) are losing ground to those focused on machines (classes III and IX). Additive manufacturing is enabling military units to self-sufficiently create essential spare parts and complete combat systems. This represents a radical change in the concept of logistics, with the emergence of a new function: production. As a result, the acquisition of systems would not fall entirely to the civilian industry, but would be taken to the battlefield itself, accelerating the speed of replenishment.

The volume and weight devoted to the human component of systems will be reduced or used in other capacities. This will allow autonomous platforms to do the same, or more, with less size and cost. The trend in autonomous system design is to reduce SWaP factors to gain discretion and lower costs. With a lower SWaP[11] ratio, the battlefield will be flooded with an ecosystem of small sensors and autonomous vehicles.

The doctrine may incorporate new modes of operation based on manned, remotely controlled, semi-autonomous, or autonomous systems. Two concepts stand out. One interesting concept in this area is the Optionally Manned Platform (OMP), which, depending on the mission, will have personnel on board, be remotely controlled, or be fully autonomous. On the other hand, there is collaborative combat with MUM-T (Manned-Unmanned Teaming) protocols, which allow manned units and autonomous escort systems to operate in conjunction.

And as we have already anticipated, some combat functions, and in the future perhaps all of them, may become autonomous; although, for the time being, others will remain human or somewhere in between. AI will allow humans to expand the range of data at their disposal and perform simultaneous processes. Paradoxically, this will cause the organization to demand even more from human operators. Therefore, the training of the human component will have to be adapted to these new requirements.

4.2. Virtual dimension.

Safeguarding AI cognition will be essential for the survival of an autonomous military force. The object of protection would shift from the physical to the virtual. Cybersecurity will therefore become the main effort for protecting one's own vulnerabilities and exploiting those of the enemy. All this will take place in an operational environment with a congested and competitive electromagnetic spectrum, in which pulsating cyber actions will generate physical and cognitive effects.

Delving deeper into this idea, the concept of autonomous military forces will move away from the traditional physical (hardware) platform-based vision and toward a virtual (software) architecture. Beyond data, bandwidth, sensors, or liaison equipment, the

[11] Space, Weight and Power

efficient management of the information and knowledge (IKM) generated by these elements will be the basis for the operation of autonomous forces (cognitive objective). The tactical advantage will therefore be achieved through the ability to implement mission algorithms superior to those of the adversary. In short, achieving a high degree of integration based on unique, robust, and sovereign software.

The human component will be trained in human-machine interaction to ensure the efficient use of hybrid forces. Some of these personnel will also be responsible for programming and supervising the training of the AI responsible for governing the autonomous systems of the entire force. Machine learning is evolving toward deep learning, which allows systems not only to learn and replicate human cognitive abilities.

Protecting the integrity of AI, its algorithms, and training are high-value targets for the adversary. We are faced with a vulnerability in the system, a backdoor that can be activated at a critical moment in combat. It could cause AWS to stop working, limit their operability, or in the worst case, desert. AI will need robust training (covering the entire spectrum of combat) and secure training (guaranteeing the cognition desired).

Unlike current military forces, whose center of gravity lies in large platforms and systems, autonomous forces will be based on the simultaneous and collaborative use of compatible operating systems. This represents a profound change in the concept of force, shifting from traditional physical domain hardware to virtual domain software in autonomous forces.

Conducting military operations using a broad ASW ecosystem will require an unprecedented level of synchronization. All operating systems used must be the same or, at least, compatible. This will ensure the flow of information in the federated network that governs the force. AWS will be able to share data obtained jointly by sensors throughout the ecosystem, creating a transparent battlefield. Similarly, weapons and robotic components will be able to achieve synergies by combining effectively.

Software-defined systems are presented as the best option. Therefore, in order for the AIs of all these systems to be able to communicate and understand each other on the battlefield, procurement programs must be determined by the dominant software and operating system. Software thus becomes the cornerstone of autonomous force.

This symbiosis, based on a federated distributed network with deep multi-agent coordination, requires common software compatible with machines, sensors, and humans. The collaborative multi-agent relationship generates a flattened structure monitored in a Combat Management System (CMS) that channels the control function of the symbiotic force governed by machines and humans.

4.3. Cognitive dimension.

The human component is gradually being replaced by machines and systems in those physical processes that allow it (rhythm), and as assistants in certain cognitive processes related to decision-making (tempo). All of this is synchronized by communications, command, and control systems that create the virtual environment in which humans and machines are integrated; and in which humans govern machines, for the time being. Here we return to the idea that on the battlefield defined by Pulsed Warfare we find two types of cognition, one natural (human) and the other artificial (AI), both with different decision-making processes.

With all of the above, human attention could come to focus more on how autonomous systems operate rather than on the tactical situation on the battlefield, a shift from the fog of war to the fog of systems. Some thinkers go further and anticipate a singularity on the battlefield, whereby human cognitive capacity will be unable to keep up with the pace and tempo imposed by machines. In other words, humans would not make significant contributions, becoming irrelevant to decision-making. This leads to a question of transcendence: whether to keep humans in the control loop of machines or remove them from it.

We therefore have a new way of understanding the role of humans in warfare. Humans will abandon tasks related to “operating” and reinvent themselves to “train” machines. An autonomous, or partially autonomous, military force will operate with three modes of human control and supervision:

- Human-in-the-loop (HITL): supervision and instructions. Human orders for action are necessary, applying the traditional “Kill Chain.” Example: AEGIS.
- Human-on-the-loop (HOTL): supervision only; related to the new concept of “Kill Web.” Example: CIWS Phalanx.
- Human-out-of-the-loop (HOOTL): no supervision or instructions, fully autonomous, “Killer Robots.” The machines are capable of learning and operate without any intervention to achieve the set objective.

In situations of pressure and limited time, when a machine makes a recommendation, humans resort to automatic reasoning rather than deliberative reasoning. Social psychology identifies an automation bias here, whereby humans begin to be marginalized from decision-making by placing excessive trust in machines. No human operator is capable of acting with sufficient speed and precision to intercept a threat at the high speeds that have begun to conquer the battlefield.

In these scenarios, where attack and defense occur at superhuman speeds, a distinction is beginning to emerge between actions that can be carried out by humans and those that must be autonomous. There are no restrictions on the use of AWS-HOOTL for support operations such as logistics or rear production, far from conflict zones. On the other hand,

AWS-HOTL is becoming essential for defensive or reactive actions. However, it seems that deliberate offensive actions will continue to require humans to “press the button” that triggers kinetic action with potential human casualties, with AWS-HITL.

The three-apple theory applied to levels of human control in autonomous systems, with the three modes of control occurring simultaneously on the same battlefield. Undoubtedly, the legal and ethical framework should be the first process to be finalized in order to clarify the limits on the programming and use of these systems.

The big difference between 5GW and 6GW will be AI's high capacity for perception, analysis, and decision-making. Deep learning defines the four categories of AI:

- Perceptual (sensory). Recognition and interpretation of the outside world through vision, audio, temperature, and other sensors.
- Computational (analysis). Data processing, optimization, complex and repetitive calculations on a large scale, with predictive capabilities.
- Cognitive (reasoning). Planning and decision-making, imitating human thinking, decision-making, and strategic learning.
- Generative (creation). Content generation, synthesis, production of new and original results (text, image, audio).

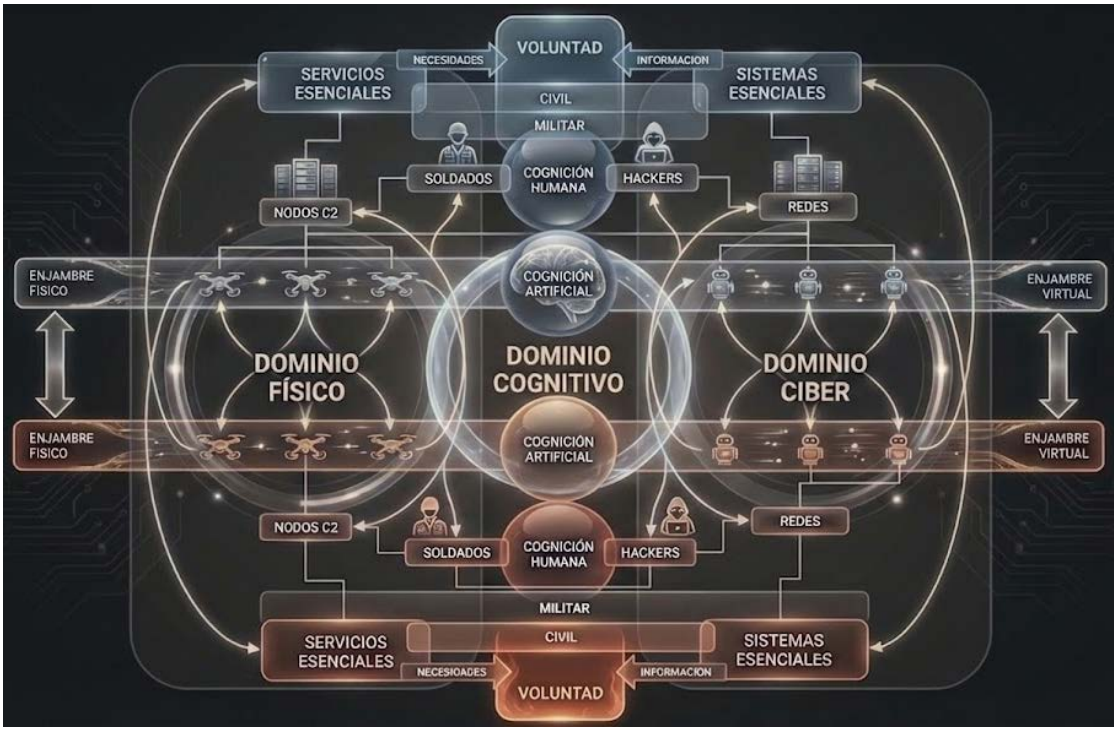

Image 4. Order of battle of the Pulsating War (Source: own creation with Gemini)

It is precisely the lethality of these systems that lies at the heart of the ethical debate. The legal implications of the decisions and actions carried out by autonomous systems remain an unresolved issue. The responsibility of commanders, operators, and programmers, the survival instinct of AWS, and collateral damage are some of the points to be developed.

The use of autonomous systems must comply with intentional legality based on international humanitarian law and the law of armed conflict, with key aspects such as the distinction between combatants and civilians, proportionality, and the necessity of the use of force. The UN is working on an international treaty for 2026 that would ban lethal autonomous weapons systems (LAWS) without human control.

5. Conclusions.

Among the generations of warfare, experts indicate that we have likely moved beyond the era of Hybrid Warfare (fourth generation - 4GW) and are now in the annals of Cognitive Warfare (fifth generation - 5GW), in which combat focuses on the mind, will, and perceptions. The goal is not physical destruction, but rather to break the will to fight off the adversary, from its combatants to the society they protect.

Artificial intelligence and unmanned systems have hyper-accelerated decision-making processes and tactical actions. Pulsed Warfare is born, a mode of combat that seeks to saturate enemy defense systems in the physical and virtual dimensions with constant, massive, and precise actions using artificial intelligence-driven systems.

Humans become the weak link in the decision-making cycle. The speed of modern combat exceeds our biological capacity to react. Humans are no longer the ones pressing the button; they have become algorithm trainers and supervisors, inevitably left out of immediate tactical decision-making.

Giving combat systems total autonomy remains an unresolved ethical and moral dilemma. However, experts already consider the start of Autonomous Warfare (sixth generation - 6GW) a real possibility, an era in which machines will operate with total autonomy on dehumanized battlefields. Evolution is exponential, and the periods between generations are becoming shorter and shorter.

Software thus becomes the center of gravity for these new generations of warfare. The strategic advantage lies in having compatible operating systems and robust cybersecurity to prevent artificial intelligence and the command and control system it uses from being hacked. Technological sovereignty will be key in an area where dependence on private companies is growing, with non-state actors capable of accessing systems with high military potential.

*Juan Carlos Andrés Herrero**
Comandante de Infantería de Marina