

# Directed-Energy Weapons

## An Option for Strategic De-Escalation

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*A strategist should think in terms of paralyzing, not killing. . . . And on a still higher plane, psychological pressure on the government of a country may suffice to cancel all the resources at its command—so that the sword drops from a paralyzed hand.*

—B. H. Liddell Hart, *Strategy: The Indirect Approach*



Emerging technological advances have provided multiple nonlethal options to deter, deny, and incapacitate threats posed by new adversaries and changing strategic implications. Directed-energy-weapon (DEW) options demonstrate, via an escalation of force from nonlethal to lethal, a direct targeting capability with a high likelihood of low collateral damage and reduced risk of civilian casualties.

The Joint Intermediate Force Capabilities Office, formerly the Joint Nonlethal Weapons Directorate, is exploring the function and application of nonlethal DEW defense technologies across the spectrum of conventional warfare and the competition continuum. These technologies will allow the US military to accomplish the mission while protecting friendly forces “without unnecessary destruction that initiates or prolongs expensive hostilities.”<sup>1</sup> Current binary decision-

making solutions limit early nonlethal weapon-escalation possibilities across the entire range of military options.<sup>2</sup>

### **A Case for Directed-Energy Weapons**

As the United States transitions from a well-developed understanding of terrorism and violent extremism to focus on strategic competition, the US military and coalition forces will encounter similar adversary tactics, techniques, and procedures. In both operational environments, proxy belligerents pursue their objectives in irregular warfare battlespaces.<sup>3</sup> Terrorists and violent extremists conduct embedded operations in populated areas to conceal intent, often seeking opportunities to create collateral damage (CD) and civilian casualties (CIVCAS).<sup>4</sup>

As seen in recent operations, US forces have limited conventional weapons' options against hostile actors comingling with noncombatants as these adversaries seek to capitalize on US kinetic operations and CIVCAS reporting.<sup>5</sup> Violent extremist organizations, with the presence of the world's media, take advantage of mistakes and collateral damage by promulgating narratives critical of US kinetic CD and CIVCAS reporting, shaping an "us-or-them" local propaganda message and shifting international opinion.<sup>6</sup>

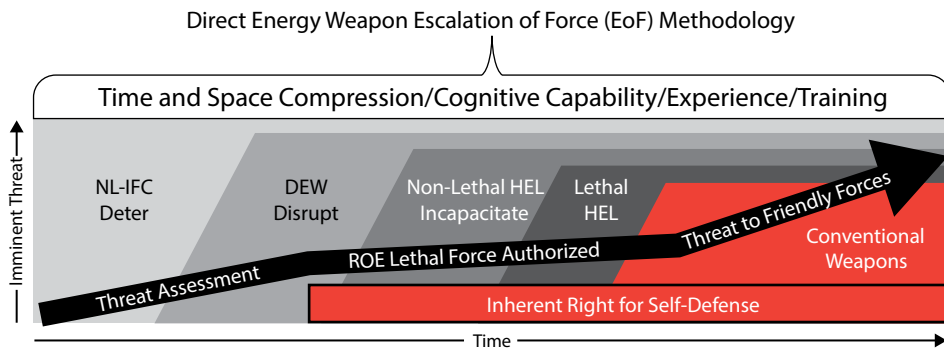
By portraying the United States as callous and indifferent to the suffering of local populations, this effective guerrilla tactic creates vulnerabilities for the United States and coalition forces. These vulnerabilities are especially problematic when the US military tries to balance offensive operations and self-defense with strategy in conventional operations and across the continuum of strategic competition. Uncertainty about the true nature of civilian casualties in the battlespace means a delay in identifying hostile acts or intent. Under the current rules of engagement (ROE) in Phase III military operations and exacerbated by the inherent compression of time and space, the rapid escalation of force necessitates a preference for lethal conventional kinetic weapons.<sup>7</sup> Often as a result, the comprehensive analysis required to identify and prosecute a threat is limited.

Traditional conventional weapon escalation-of-force scenarios also limit system 1 (fast thinking) and system 2 (slow thinking) cognitive problem analyses used to determine hostile intent.<sup>8</sup> This analytic model is vital in determining hostile intent and calculating associated responses across the full spectrum of military options, from Phase 0 to Phase V and along gray-zone continuums. Moreover, this calculus is made even more complex by the limitations on range capabilities, complex targeting solutions, fog (actual and metaphorical), and the inescapable friction of war.<sup>9</sup>

Directed-energy weapons should be used in conjunction with conventional weaponry to provide friendly forces with various escalations-of-force capabilities,

enabling the military to apply the minimum force required for a specific threat versus a one-size-fits-all kinetic solution.<sup>10</sup> This new escalation-of-force operational concept (fig. 1) complements conventional weapons with the sequential and concurrent use of intermediate-force capabilities. Such an operational concept provides the nonlethal and lethal DEW effects that Joint Force commanders require while safeguarding US policy and strategy, limiting adversary retaliation or escalation, and controlling battlespace information and perceptions.

The simplified targeting and speed-of-light characteristics of DEWs provide an increased standoff range for forces, allowing opportunities to prosecute hostile threats early. With a new employment operational concept, DEW capabilities expand the current kinetic escalation-of-force timeline, foster minimum-force weapon applications, and increase safety for friendly forces.



**Figure 1. DEW escalation-of-force methodology**

## Nonlethal Directed-Energy Weapons

Bridging the gap between military presence and lethal intent, the Joint Intermediate Force Capabilities Office shapes the use of emerging nonlethal microwave, millimeter, and laser-energy technologies in gray-zone operations, urban areas, and irregular and unconventional warfare battlefields.<sup>11</sup> Nonlethal DEWs are “developed and used with the intent to minimize the probability of producing fatalities, significant or permanent injuries, or undesired damage to material or infrastructure.”<sup>12</sup> Nonlethal DEW technologies safeguard US forces against nefarious activities with capabilities including long-range, laser-induced plasma audio devices that communicate US military presence, and nonlethal dispersal and denial devices, which are silent and invisible to the human eye.<sup>13</sup>

Additionally, silent, often nonattributable, nonlethal millimeter and microwave devices exist to disorient personnel and disable, neutralize, and incapacitate enemy electronic targets such as threat vehicles, vessels, and aircraft, with mitigation benefits similar to those noted above for the escalation-of-force concept.<sup>14</sup> Nonlethal

DEW options could better address a potential hostile act in uncertain battlespaces—urban—precluding an automatic, and possibly unnecessary, acceleration to lethal-targeting options.

### **Lethal Directed-Energy Weapons**

Lethal DEW, including high-energy lasers (HEL), complement nonlethal DEW diffuse capabilities in the escalation-of-force methodology, progressing from nonlethal intermediate-force capabilities to material-kill targeting. These DEWs are “technologies that relate to the production of a beam of concentrated electromagnetic energy or atomic or subatomic particles.”<sup>15</sup> These technologies are developed into weapons or systems “that use directed energy to incapacitate, damage, or destroy enemy equipment, facilities, and/or personnel.”<sup>16</sup>

Silent and invisible, high-energy laser systems used on countermaterial targets can disable and destroy the mobility of positively identified personnel, minimizing conventional-weapon escalation and the secondary threat of collateral damage and civilian casualties.<sup>17</sup> High-energy lasers are in the nascent stage of development and not currently authorized. But as their power levels evolve, weapon-quality lethal targeting options will emerge.<sup>18</sup>

### **Advantages**

Directed-energy weapon technologies offer a simplified aiming solution and instantaneous targeting escalation from nonlethal intent to lethal force, resulting in an elongated nonlethal weapons escalation-of-force window. If applied early, nonlethal and lethal DEWs “in certain cases prevent the use of excessive force, escalation in hostilities, and CD.”<sup>19</sup> Lethal DEW effects, highly discriminant and anti-suffering, offer a solution to minimize critical infrastructure or private property collateral damage while still accomplishing military and political objectives. These weapons also remove the violent sensation and perception associated with conventional kinetic weapons, avoiding third-order effects of adversary information-operations propaganda and messaging that facilitates support and recruiting.<sup>20</sup>

Over time, as the size, weight, power, and cooling levels of DEWs advance, flexible nonlethal and lethal DEWs are anticipated to proliferate across a diverse range of security environments. These capabilities could be employed more routinely than any other conventional weapon or emerging-weapons technologies.<sup>21</sup>

### **The Right Tool**

With various overlapping 5-Ds (deny, degrade, disrupt, deceive, or destroy) properties, the preemptive escalation-of-force application of DEWs could resolve

malicious activities before conventional lethal force is required. The early application of nonlethal weapons de-escalates ambiguous situations with minimum use of force, safeguarding friendly forces while avoiding CD and CIVCAS. These weapons can be applied sequentially and concurrently during the escalation of force to demonstrate resolve while avoiding damage caused by conventional kinetic (blast, fragmentation, cratering, incendiary, and penetration) weapons.

During confrontations where the ROE authorize lethal force, violence is not always immediately suitable across the range of military options, particularly in gray-zone operations where US policy and strategy limit military operations below the threshold of armed conflict. The civilian population-centered approach facilitated by nonlethal DEWs retains the hearts and minds of those the United States defends and helps gain the long-term trust and confidence of future populations facing irregular and unconventional warfare in these unstable gray-zone battlespaces of great power competition.<sup>22</sup>

The scalability, silent, and often nonattributable nature, damage-level selections, and immediate responsiveness (speed of light) of DEW capabilities provide friendly forces the means to target nuisance cominglers and direct threats with a variety of tailored, minimum-force weapons.<sup>23</sup> Nonlethal and lethal DEW capabilities also allow for engineered warfare scenarios. The combination of effects could greatly influence multiple wartime missions and result in less cause for the enemy to retaliate or escalate force. With no clear evidence of US force and attribution or signature-less employment by friendly forces, the United States can engineer the de-escalation of a potential enemy threat.

Great power competition proxies deliberately operate below the threshold of armed conflict, rendering conventional kinetic weapons incompatible as they can “adversely affect efforts to gain or maintain legitimacy and impede the attainment of both short-term and long-term goals.”<sup>24</sup> The use of intermediate-force capabilities, nonlethal DEWs, and the nonlethal application of HELs are particularly advantageous in gray-zone scenarios “when restraints on friendly weaponry, tactics, and levels of violence characterize the operational environment” across the competition continuum.<sup>25</sup>

Although the 2017 *National Security Strategy*, 2018 *National Defense Strategy*, and 2021 *Interim National Security Strategy* have refocused the Department of Defense toward strategic competition, the nature of warfare and our adversaries’ tactics, techniques, and procedures (to operate as a wolf in sheep’s clothing, maneuvering to induce CD and CIVCAS events that can then be exploited to the disadvantage of the United States) remain unchanged.<sup>26</sup>

Military forces operate across the spectrum of conflict zones, including military operations other than war. During such noncombat operations, the authorized

use of nonlethal DEWs early in an escalation-of-force methodology increases the envelope of time available to identify and mitigate a threat. This capability provides Joint Force commanders the technological advantage to ensure friendly-force safety with mission success across multiple spectrums.

### **Alternative Consideration**

Implementing DEWs, individually and as a whole, will involve the expected hurdle of doctrine, organization, training, materiel, leadership, personnel, facilities, and policy, and necessary bureaucracy. But DEWs will also face external scrutiny. Some argue the premature, ultimately disappointing DEW technologies in the Department of Defense are based not on results but instead on overestimated technological capabilities and unrealistic timelines.<sup>27</sup> Others amplify this warning, noting future budgetary constraints, challenges in adopting innovation, and disconnects in implementation as the United States fails to capitalize on Ally and partner relationships, particularly in DEW technologies.<sup>28</sup>

The effects of public opinion on US decision makers are an unanticipated obstacle to the implementation of existing DEWs. Highlighted by the US and international media, multiple human-rights activists and critics have raised two fundamental issues regarding DEW effects—safety concerns and ethics violations.<sup>29</sup>

Culminating in 2010, controversy obscured the capabilities of the Active Denial System in Afghanistan.<sup>30</sup> Major media headlines hypersensationalized the effects of active-denial-system weapons—in this case a microwave heat ray gun dubbed *Silent Guardian*—as crippling and brutally painful, like “being exposed to a blast furnace,” or “making people feel like they are on fire.”<sup>31</sup> These only partially substantiated media spins resulted in the immediate removal of the Army active-denial system weeks after its arrival but before its operational use—drastically stunting the progress and momentum of DEW implementation.<sup>32</sup>

The effectiveness of the media campaign directly conflicts with the hypothesis that nonlethal DEWs promote strategic benefits and tactical prudence.<sup>33</sup> The effects of public opinion also highlight future requirements to purposely incorporate supportive narratives that encourage the adoption and implementation of DEW, which include re-educating decision makers on past misunderstandings and current capabilities.

### **Conclusion**

New and old adversaries alike seek to exploit political perceptions regarding the use of force. Changing US priorities have led to new challenges that modern technologies and innovative tactics could address, providing Joint Force com-

manders the tools to achieve military objectives and ROE authorities to execute minimum-force effects. Directed-energy weapons, including intermediate-force, nonlethal, and lethal capabilities, present a complementary set of useful minimum-force options as the US military continues to operate across multiple spectrums of conflict, especially in urban environments.

Updated escalation-of-force guidance in the form of ROEs that leverage DEW capabilities early could enable Joint Force commanders to proactively shape battlefield conditions and avoid unnecessarily raising the level of conflict. These weapons could mitigate second- and third-order effects of irreversible US kinetic weapon miscalculations, thus safeguarding US strategy and political objectives, limiting adversary retaliation, and shaping battlespace information, influence, and perceptions in conventional operations and across the continuum of strategic competition.<sup>34</sup>

Additional research should aim to quantify if effects across multiple spectrums of conflict can offset conventional weapon incompatibilities, de-escalate battlefield scenarios, deter adversaries, and shape battlespace information, influence, and perceptions. Furthermore, research must address the current escalation-of-force model, coercion, first-use policies, and just war theory to validate benefits for an early escalation-of-force methodology. Moreover, a clearly articulated DEW science and technological understanding, a cost-benefit analysis, and the merging of Joint Intermediate Force Capabilities Office intermediate-force capability doctrine with HELs will encourage policy makers and DOD leadership to adopt and implement these emerging DEW capabilities. 🌟

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