



Pfc. Brandon Norton, an M1 Abrams crewmember with Company B, 1st Battalion, 63rd Armor Regiment, 2nd Armored Brigade Combat Team, 1st Infantry Division, launches a Lethal Miniature Aerial Missile System 6 April 2018 for aerial support during a Robotic Complex Breach Concept assessment and demonstration at Grafenwoehr, Germany. According to widely publicized press accounts in March 2022, the United States has provided a hundred such lethal loitering munitions to Ukraine. The individual launched drones have been described as the equivalent of individual cruise missiles that identify and then attack targets with a powerful fragmentation charge, exploding on contact. Unlike other types of indirect fires, the drones have proved very effective in attacking targets located in narrow or confined spaces with pinpoint accuracy. The drones are light weight and relatively inexpensive compared to other types of fires weapons. (Photo by Sgt. Gregory T. Summers, 22nd Mobile Public Affairs Detachment)

# How to Keep Changing an Army

## Adjusting Modernization in the Age of Loitering Munitions

Maj. Ryan Orsini, U.S. Army

Somewhere along the Second Island Chain, 2028:

*“What’s the status of waves one and two?” asked an exasperated Lt. Col. Smith. With his small battalion task force still stretched across the airfield, only this question mattered. From under a poncho came a reply, “Sir, wave one has four rounds and eight high-payoff targets remaining, and wave two will be up in eight mikes.” Wave one consisted of twenty-four air-launched loitering munitions during the unit’s SEAD [suppression of enemy air defenses] mission. Somewhere in the dark, his paratroopers frantically derigged two all-terrain vehicles from the heavy drop to get wave two in the air, consisting of sixteen more ground-launched loitering munitions. No one reported joint assets available—there were none. Smith’s team was on its own. Serving collection, strike, and protection roles, the loitering munitions were his eyes, ears, fists, and life jacket. Smith started the timer on his wristwatch—wave two could provide up to eight hours of cover.*

*Smith marveled at how this type of operation unfolded just twenty years ago. Back then, joint force assets would hover over the lodgment until OH-58 Kiowa helicopters could be airlanded, unfolded, and sent airborne. That aircraft was long gone, and so too were the joint forces to protect his team. Joint assets that secured a window for his airborne assault were now focused twenty miles north of his position, supporting a Marine littoral regiment raid elsewhere on the second island chain. If Smith could secure this lodgment, two more C-17s would airland a multi-domain task force strategic fires element. Time was of the essence. Wave two needed to get in the air. Smith thought of B. H. Liddell Hart’s quote about military innovation: “The only thing harder than getting a new idea into the military mind is to get an old one out.”<sup>1</sup> Casualties were mounting, and the outcome far from certain, but Smith knew the Army got this change right.*

**F**orty years ago, as U.S. Army Gen. Donn Starry looked back at the last ten years of U.S. Army modernization post-Vietnam, he saw that the only constant was the need for change itself.<sup>2</sup> The signature conflict of the 1970s, the 1973 Yom Kippur War, pitted two peer militaries in a ground fight using technology and tactics similar to those planned for a U.S.-Soviet fight in Europe. The conflict did not initiate modernization—the post-Vietnam force generated that awakening. Rather, it served as an inflection point of iterative innovation that eventually yielded the Big Five

technology and AirLand Battle concept that fueled U.S. military success until today.<sup>3</sup>

The 2020 Nagorno-Karabakh war is another inflection point for U.S. military adaptation. The conflict provided the next snapshot of war’s changing character toward faster and more lethal forms of stand-off.<sup>4</sup> Azerbaijani unmanned platforms, particularly loitering munitions, effectively established aerial dominance that enabled massed ground maneuver. These lessons should not be dismissed due to the relative status of the combatants. The improving technology and tactics of massed loitering munitions in the hands of more formidable adversaries could dominate a future battlefield.<sup>5</sup>

The task ahead of the U.S. Army today is not to bring about a change effort—its modernization program began years ago. Rather, it is to pivot ongoing programs. Military adaptation is both relative and dynamic—the service must keep up with the rate of change for loitering munition employment in the current and future operating environments.<sup>6</sup> The Army must pivot its modernization by adjusting how it organizes, experiments, and trains for change.

## Welcome to the Snow Dome—the Evolution of Loitering Munition Employment

*If we could learn how to change our institutions from within instead of creating the circumstances in which change is forced upon us ... The need to change will ever be with us.*

—Gen. Donn Starry<sup>7</sup>

The recent wave of American military modernization centers on one operational problem—the snow dome.<sup>8</sup> Sometimes referred to as an antiaccess/area denial bubble, a snow dome is a temporally and geographically layered combined arms effort in depth to limit an adversary’s maneuver and enable its destruction from a distance. The concept of geographic denial is not new to warfare and consistently evolves over time. This variant uniquely counters U.S. advantages in force projection, decision-making, and strike capabilities.

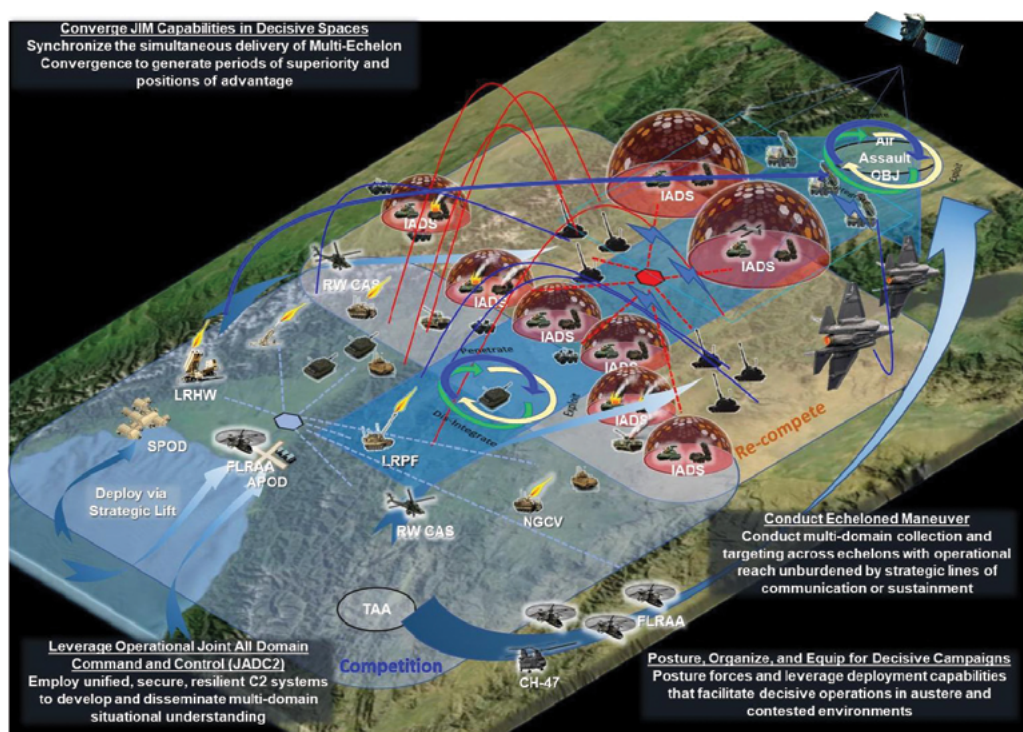
The first version of the snow dome appeared in earnest in 2014 when two crises rocked the U.S. military establishment: the Russian invasion of Crimea and the Chinese artificial island construction in the South China Sea. Version 1.0, exemplified by Russian

operations in eastern Ukraine, stood out for its ability to use multiple domains to quickly queue lethal surface-to-surface engagements by massed cannon, rocket, and missile fire.<sup>9</sup> Electronic warfare assets and unmanned aerial vehicles enabled Russian battalion tactical groups to destroy Ukrainian formations at great range, unleashing a new effectiveness of their reconnaissance-strike concept. After years of focus elsewhere, U.S. planners could finally envision the reality of peer conflict.

Against Russia, electronic and information attacks could isolate U.S. maneuver units, and massed rocket strikes could annihilate U.S. Army mechanized formations.<sup>10</sup> Against China, the growing People's Liberation Army Rocket Force could sink U.S. Navy ships at a range and scale that the U.S. military could not replicate or reconstitute.<sup>11</sup> The U.S. military has since re-

sponded with its largest modernization effort in decades, focusing on large-scale combat operations (LSCO) with new concept and materiel development such as the U.S. Army's multi-domain operations concept and the U.S. Marine Corps' littoral regiments.<sup>12</sup>

Predictably, the threat has continued



U.S. forces often see future maneuver by neutralizing enemy integrated air defense systems as demarcated with red bubbles above. This graphic fails to capture how our enemy will seek to place similar bubbles, antiaccess/area denial-generated snow domes, over U.S. forces to isolate and defeat them. (Figure from Army Futures Command Pamphlet 71-20-1, *Army Futures Command Concept for Maneuver in Multi-Domain Operations 2028* [7 July 2020]).

to evolve. The Nagorno-Karabakh conflict provides the best example of the snow dome version 2.0, where lethality is predominantly unmanned and aerial-to-surface to dominate multiple domains.<sup>13</sup> Unmanned platforms, specifically the Bayraktar TB2, served as an aerial command-and-control node, linking sensor to shooter for collection, strike, assessment, and exploitation. The emerging centerpiece of this new snow dome is the loitering munition.<sup>14</sup> Sometimes referred to as “kamikaze drones,” these munitions present tremendous operational capability.<sup>15</sup> Tightly integrated with intelligence, surveillance, and reconnaissance capabilities on the battlefield, loitering munitions can be launched well out of contact until queued by manned or unmanned systems for additional reconnaissance or precision strike with various payloads.

While the United States retained unprecedented dominance in manned and unmanned aerial attack capabilities in its post-9/11 wars, other states iteratively tested loitering munitions to complement their own comparative advantages. Houthis targeted Saudi

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Patriot systems in counterinfrastructure missions.<sup>16</sup> Iranian militias employed loitering munitions against U.S. forces in Iraq.<sup>17</sup> Russia struck targets in Syria using domestically produced Lancet loitering munitions.<sup>18</sup> Yet no nation refined the capability for battle like Turkey. Turkey honed techniques in Syria and Libya, earning the moniker of Pantsir-killer, referring to the Russian mainstay point air-defense asset.<sup>19</sup> In Nagorno-Karabakh, the Harop loitering munition, with its one thousand-kilometer range, six hours of endurance, low cross-section, and top attack trajectory deployed in large numbers from mobile launch trucks to obliterate high-priority targets such as air defense, artillery, and armor.<sup>20</sup> Much has been made of deficient Armenian equipment and training, but in truth, no military currently employs sufficient active and passive protection measures to stop the precision, mass, and synchronization loitering munitions bring to the battlefield today.

Loitering munitions will continue to increase the complexity of future battlespaces as both the technology and concepts mature. In the near-term, states will optimize munition lethality by size, payload, and endurance for more effective employment in both the close and the deep fights.<sup>21</sup> Squads and divisions alike will employ variations to facilitate targeting at their level. In the long-term, manned-unmanned teaming will provide unparalleled levels of synchronization, where loitering can queue or complement other assets with various levels of human integration.<sup>22</sup>

These trends lines reveal two challenges for future ground forces. First, mass matters, and units must balance mass with the masking and decentralization required to survive.<sup>23</sup> As units fight dispersed and degraded, loitering munitions must be forward to rapidly achieve effect or to replace lost capability when isolated from the rest of the joint force. Second, offense will be the best defense in a world where the archer is more elusive, arrows more plentiful, and communication links less necessary. Units will need to attrit loitering munitions as a system from logistics to launcher as they will offer redundant targeting capability to the adversary's electronic warfare, intelligence, and fires capabilities. While the services lack consensus on the scale and time horizon of the future threat, they can count on loitering munitions playing an increasing role in future conflict.<sup>24</sup>

## Implications—Risk and Opportunity for U.S. Ground Forces

*Offensive operations, often times, is the surest, if not the only (in some cases) means of defence.*

—George Washington<sup>25</sup>

The loitering munition threat is particularly acute for U.S. ground forces because it overlaps existing and future tactical gaps in sensing, shooting, and protecting. These gaps typically occur between fifty and three hundred kilometers, the depth of the battlefield where U.S. Army divisions are reliant on higher headquarters for critical joint capabilities and authorities.<sup>26</sup> Significant warfighting capability from national intelligence assets and multi-domain task forces to F-35 sorties may not be responsive enough for tactical units, leaving them vulnerable to the organic capabilities of adversaries. In 2017, the U.S. Army Combined Arms Center's LSCO gap study rendered a similar conclusion, revealing a wide gap in cannon, rocket, and missile strike and protection capability.<sup>27</sup> Tactical units at the division and below must be able to sense and shoot to keep an adversary's snow dome from quickly falling on them, particularly when dispersed, degraded, and separated from the larger joint force or otherwise risk isolation and defeat in detail.

On the other hand, loitering munitions provide incredible opportunity to mitigate the U.S. Army's operational and modernization weaknesses and generate adversary dilemmas. First, the range and endurance of today's munitions would provide much needed tactical flexibility to the ground component, mitigating the sense, shoot, and protect gap between division and corps with an asymmetric, top-attack capability. This massed and synchronized surface-to-surface fire is essential to take down the snow dome for either ground maneuver or as ground force support to the joint force.<sup>28</sup> Second, this capability provides ground forces the ability to degrade gracefully, meaning they can operate with limited functionality in denied and degraded space and cyberspace environments. As a result, units can not only fight cut off but also use unmanned systems to provide cross-domain data solutions for others in contested environments.<sup>29</sup> Finally, a decentralized loitering munition capability provides escalation flexibility.<sup>30</sup> Overreliance on precise, expensive, and centralized capability, such as the emerging hypersonic capability, might be too limited in quantity



Multiple Azerbaijani unmanned aerial vehicles circle over a reported strike against Armenian military forces 1 October 2020 during the Second Nagorno-Karabakh conflict. (Photo courtesy of the Azerbaijan Defense Ministry)

and authority to sustain necessary mass in the opening phases of conflict. Such flexibility is especially important early on in LSCO when mass and reconstitution are critical components of victory.

## Recommendations—How to Keep Changing an Army

*Change requires institutional, organizational, and conceptual momentum towards shedding those practices or platforms which are no longer relevant.*

—Gen. James McConville<sup>31</sup>

The services can facilitate a modernization pivot with three interrelated steps to how the services organize, experiment, and train for change. First and foremost, the U.S. Army must elevate loitering munition employment as a critical effort. The U.S. Army's modernization priorities are colloquially known as the "31+4," featuring thirty-one signature efforts led by cross-functional teams and four critical efforts led by the Rapid Capabilities and Critical Technologies Office (RCCTO).<sup>32</sup> While these priorities acknowledge gaps in sensing and shooting, they are biased toward transformation of strategic-level assets such as

hypersonic missiles and upgrades at the tactical level including the Army Tactical Missile System replacement and extended range cannon.<sup>33</sup> Recently, RCCTO announced the charter of a midrange capability with the first operational battery in fiscal year 2023.<sup>34</sup> This office should grow around the employment of loitering munitions and consolidate a fifth critical modernization effort.

Second, the services must focus experimentation on loitering munition employment. One of the greatest benefits of service initiatives like Project Convergence, a yearly U.S. Army initiative to collaboratively experiment and scale incipient military technologies, is the emphasis on service member touch points early on in capability development.<sup>35</sup> The U.S. Army should get loitering munition capabilities to U.S. Army divisions and allow them to physically and digitally experiment on optimal employment to provide dispersed mass on the battlefield. Their mandate should include bill-payer strategies for a no-growth environment. For example, a loitering munition battery could replace a howitzer battery in each active-duty field artillery battalion, thereby minimizing overreliance on towed artillery and making use of

the resident fires planning and logistics capabilities of these formations. The U.S. Army can induce competition between the divisional experimentation and the midrange capability by the RCCTO. Further, the U.S. Army can compare its experimentation with the U.S. Marine Corps, which focused loitering munition development not for mass fires, but for long-range reconnaissance and small-unit employment.<sup>36</sup>

Third, a modernization pivot requires changes to training. Time and again, history shows military modernization is more than materiel—just as important are the doctrinal concepts, training, and leadership that implement change.<sup>37</sup> Service experimentation should iterate on the principles of ground-based loitering munition employment, particularly how to balance mass and masking techniques. Finally, leaders must focus self-study on the historical trends of mass attack—such as the nineteenth-century infantry charge, the twentieth-century naval air strike, or the twenty-first-century attack helicopter raid.<sup>38</sup>

## Conclusion—When Pivots Become Normal

*Put simply, militaries and their civilian leaders must believe there is something worse than change.*

—Christian Brose<sup>39</sup>

If no plan survives first contact with an enemy, then surely no modernization plan should be cast in stone. The U.S. Army's modernization plan must be flexible enough for task pivots to become normal. Forty years ago, Starry taught us that innovation is an intensely iterative arena. The 2020 Nagorno-Karabakh conflict can be a famous—or infamous—lesson for all militaries about the future character of war. The next time U.S. ground forces are committed to combat, some version of the snow dome will descend around them. Will they be ready? ■

*The views expressed are those of the author and do not reflect the official position of the Department of the Army or Department of Defense.*

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