



METINVEST

# THE UKRAINIAN UNDERGROUND

LESSONS FOR US ARMY MEDCOM SUSTAINMENT  
IN LARGE-SCALE COMBAT OPERATIONS

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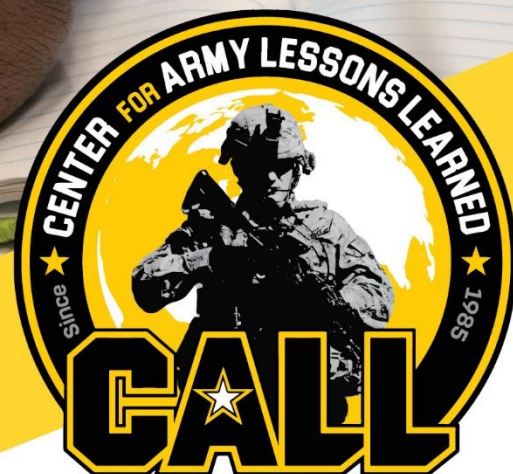
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## Executive Summary

The ongoing conflict in Ukraine has starkly demonstrated the vulnerability of traditional medical infrastructure to deliberate attack, prompting a remarkable adaptation in Ukrainian battlefield medicine. This paper examines Ukraine's innovative approach – a decentralized network of underground medical facilities built using both repurposed Cold War structures and rapid new construction – and offers critical lessons for the U.S. Army Medical Command (MEDCOM) to enhance its medical sustainment capabilities in large-scale combat operations (LSCO).

The key to Ukraine's success is a focus on prolonged field care, necessitated by the increased threat to medical evacuation posed by drone warfare, and a dynamic collaboration with private industry for rapid procurement of essential resources. Ukraine's implementation of "stabilization points" close to the front lines has increase the survivability for medical units while also providing Role 2 (advanced trauma management, emergency surgery, and resuscitative care) medical care.

This paper recommends that MEDCOM adopt a similar model, prioritizing dispersed, hardened medical facilities, investing in advanced training for medics in prolonged care, and streamlining acquisition processes to leverage commercial innovation. Adapting these lessons to specific operational theaters, like the Indo-Pacific and Europe, is crucial. Proactively implementing these changes is essential for ensuring the U.S. military can sustain forces and save lives in the face of evolving threats and challenging battlefield conditions.

## Introduction

"A war benefits medicine more than it benefits anybody else. It's terrible, of course, but it does."  
Mary M. Crawford, M.D.  
First female ambulance surgeon World War I.<sup>1</sup>

Since 2014, and dramatically escalating with the 2022 full-scale invasion, Ukraine has demonstrated a remarkable capacity for medical sustainment through the extensive use of underground facilities. This response was necessitated by Russia's unprecedented assault on both civilian infrastructure and medical facilities, which have become frequent and deliberate targets. The Russian military has repeatedly attacked hospitals and health centers across Ukraine, violating the Geneva Conventions that protect medical personnel and infrastructure during armed conflict. According to the Ukrainian Ministry of Health, more than 300 medical facilities have been destroyed and over 2,000 damaged since the invasion began. The World Health Organization (WHO) recorded 2,215 attacks on healthcare in Ukraine from February 2022 to January 2025, with the highest number – 464 – occurring in March 2022 alone. These assaults

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<sup>1</sup> Hampton, Ellen. *How World War I Revolutionized Medicine*. The Atlantic. 24 February 2017, <https://www.theatlantic.com/health/archive/2017/02/world-war-i-medicine/517656/>. Accessed 2 August 2025.

have involved the use of heavy weapons, cruise missiles, and aerial bombardments deliberately targeting hospitals.<sup>2</sup>

In response to these relentless attacks, Ukraine pioneered the construction of underground hospitals designed to withstand bombardments and ensure continuous medical care. This paper examines the Ukrainian approach – leveraging both inherited Cold War infrastructure and rapidly constructed new facilities – to maintain medical capacity and support military operations. It analyzes the challenges encountered, mitigation strategies employed, and, crucially, offers recommendations for adaptation by the MEDCOM to enhance its medical sustainment capabilities in LSCO.

## Historical Context

World War One (WWI) marked a turning point in modern warfare, with innovations and inventions escalating the scale of killing to an unprecedented level. The widespread use of the machine gun, employment of poison gas, tanks, and trench warfare made the battlefield exceptionally lethal. However, this conflict also spurred significant advancements in medical techniques still used today, such as blood transfusions, psychological care for “shell shock,” and the implementation of field hospitals and mobile medical units. Notably, one of the first underground hospitals was constructed during this period.

In Arras, France, existing tunnels called “Boves” were extended by New Zealand tunnellers to create a tactical advantage for Allied forces. These tunnels were intended to house Allied troops massing for the 1917 Arras Offensive in complete safety and unknown to the Germans. The Underground Hospital at Arras opened in 1916, and consisted of waiting rooms, operating theaters, rest stations, rooms for 700 stretchers and a mortuary. Additionally, it had electricity and indoor plumbing.<sup>3</sup> This historical example illustrates the recurring need to adapt medical practices to the realities of modern warfare.

## The Loss of the Golden Hour

For the past 20 years of conflict, the United States military has benefited from air superiority, rapid evacuation to surgical care, and robust resources, including blood, medical personnel, and surgical teams. The “golden hour” – the critical first hour after injury when prompt medical intervention significantly increases survival rates – has been a cornerstone of U.S. battlefield medicine.

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<sup>2</sup> Washington Centre for International Law. *Ukraine's Underground Hospitals: A Response to Systematic Violations of International Humanitarian Law*. <https://www.washingtoncentre.org/ukraines-underground-hospitals-a-response-to-systematic-violations-of-international-humanitarian-law/>. Accessed 20 June 2025.

<sup>3</sup> GCSE History. *Base Hospitals in World War One*. accessed 9 August 2025. <https://www.gcsehistory.com/faq/basehospitals.html>.



## Medical Evacuation – LSCO

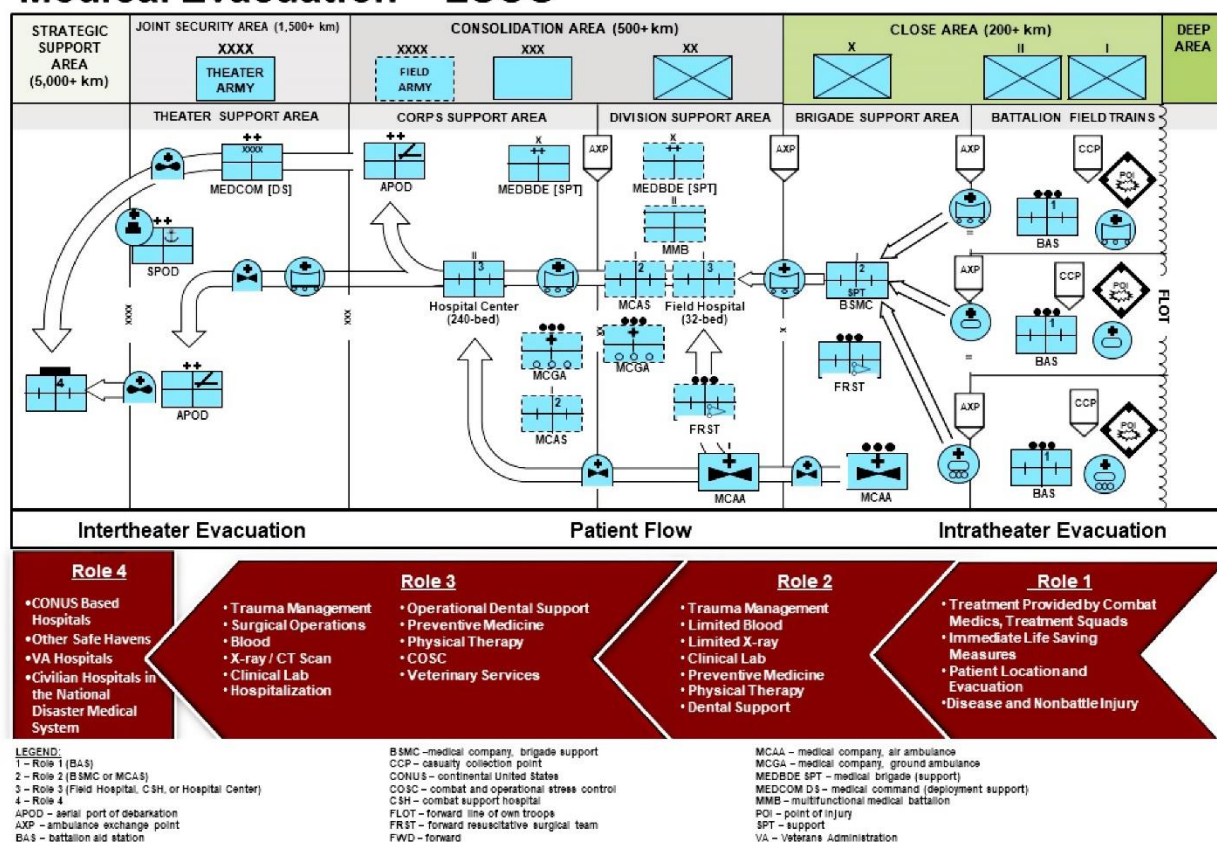


Figure 1. Medical Evacuation<sup>4</sup>

The current doctrine, *Medical Evacuation* ATP 4-02.2, July 2019, focuses on large-scale combat operations. However, the war in Ukraine demonstrates that maintaining this advantage will be significantly more difficult in future conflicts, particularly those involving drone warfare. The proliferation of drones on the battlefield has made casualty evacuation, especially by air medevac, increasingly hazardous. Ukrainian combatants have reported that “if it can be seen on the battlefield, it will be killed,” highlighting the vulnerability of personnel and vehicles exposed to drone surveillance.<sup>5</sup> Consequently, future LSCO are likely to involve restricted evacuation capabilities and a diminished ability to provide advanced surgical support within the golden hour for many, if not most, wounded personnel. Ukraine has adapted to address these challenges by emphasizing prolonged medical care on the battlefield.

### Origins and Implementation of Ukrainian System

Ukraine has heavily relied on a network of pre-existing and rapidly constructed underground facilities to provide medical care, logistical support, and personnel sustainment. These facilities

<sup>4</sup> U.S. Army. *Medical Evacuation*. ATP 4-02.2. July 2019.

<sup>5</sup> Smith, David. *Death of the Golden Hour in Ukraine Might Make It Harder to Save U.S. Combat Casualties in the Future*. Sandboxx. 21 Feb. 2023. Accessed 15 June 2025.

are not simply hospitals; they are multi-functional nodes designed to maintain operational capacity in a high-threat environment. Ukraine initially repurposed a significant network of Cold War-era civil defense shelters, bunkers, and tunnels. Additionally, new facilities were rapidly built, often utilizing existing mineshafts, subway systems (in Kyiv), and even reinforced basements. These ranged from small, hardened aid stations to larger, more comprehensive “hospitals” capable of surgery and prolonged care.<sup>6</sup>

Providing medical care directly to the frontline demanded a unique approach. The Ukrainian Ministry of Defense (MOD), in partnership with Metinvest Group, collaborated to design, produce, and field Ukraine’s first underground “stabilization” center.

Metinvest Group, a multinational steel and mining company with operations in Ukraine, Italy, Bulgaria, the UK, and the U.S., played a crucial role.<sup>7</sup> As a result of the Russian-Ukraine Conflict, its subsidiary, Steel Front, strategically repurposed its extensive network of mines, tunnels, and industrial shelters into critical medical facilities and sustainment points, demonstrating a remarkable level of industrial resilience. Steel Front also adapted its prefabricated corrugated steel shelters – originally designed to protect soldiers on the forward line of own troops (FLOT) – for use as underground hospitals, or “underground stabilization points.”<sup>8</sup>

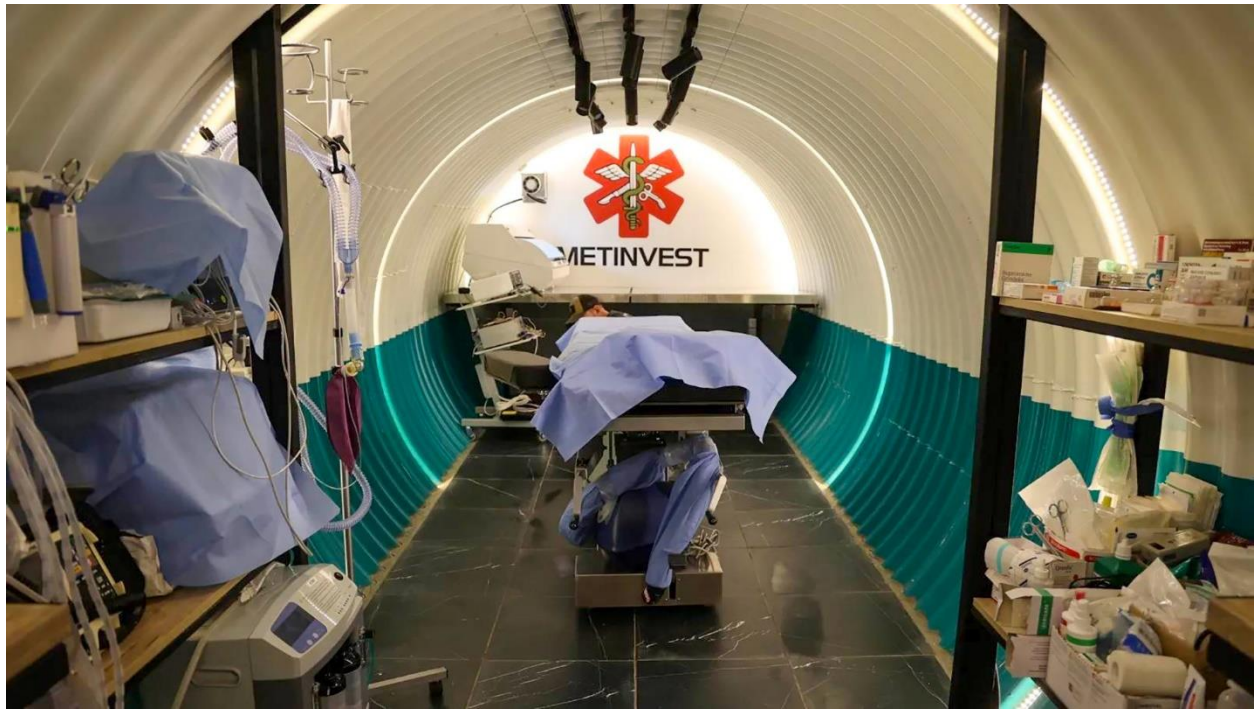
These stabilization points are constructed from six expanded steel bunkers, each 7.6 meters long and 2.5 meters wide, forming the hospital’s foundation. The complex includes two full-scale operating theaters, two resuscitation stations, a work area, and a recreational space for medical staff. It is equipped with advanced medical equipment, including oxygen concentrators, ventilators, cardiac monitors, and defibrillators. Developed by the medics of the Medical Forces “East,” the concept and technical aspects adhere to NATO standards for second-echelon field hospitals (Role/Echelon 2). The hospital is capable of both stabilizing the wounded and performing up to four surgeries simultaneously.

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<sup>6</sup> Kramer, Andrew E. *As Russia Attacks, Ukrainians Take Shelter Where They Can*. The New York Times. 2 Mar. 2022. <https://www.nytimes.com/2022/03/02/world/europe/russia-ukraine-war-shelters.html>. Accessed 15 June 2025.

<sup>7</sup> Wikipedia. *Metinvest*. Wikimedia Foundation. 5 July 2025. <https://en.wikipedia.org/wiki/Metinvest>. Accessed 14 June 2025.

<sup>8</sup> Ministry of Defense of Ukraine. *The MoD Has Put into Operation the First Underground Stabilization Point for the Armed Forces of Ukraine*. Ministry of Defense of Ukraine. 13 Sept. 2023. <https://mod.gov.ua/en/news/the-mo-d-has-put-into-operation-the-first-underground-stabilization-point-for-the-armed-forces-of-ukraine>. Accessed 7 June 2025.



**Figure 2. A surgical ward within a Ukrainian “stabilization point” is ready to receive combat-related trauma.<sup>9</sup>**

Roman Kuziva, Acting Commander of the Eastern Military Medical Forces, stated, “each facility will allow us to treat over 100 patients daily, directly impacting our ability to save lives on the battlefield.”<sup>10</sup> To ensure continuous operation, the facility incorporates ventilation, water supply, drainage, and alternative power sources. Furthermore, electronic warfare (EW) systems are integrated to enhance safety and security.

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<sup>9</sup> Steel Front. “The First Underground Steel Hospital from Steel Front.” Steel Front. 13 Sept. 2024, <https://steelfront.scm.com.ua/en/novyny-1/13-09-2024-pershiy-v-ukraini-pidzemnyy-staleviy-shpital-vid-stalevogo-frontu>. Accessed 13 June 2025.

<sup>10</sup> EDR Magazine. *Revolutionizing Battlefield Medicine: Akhmetov’s Steel Bunkers Bring Life-Saving Care to Ukraine’s Front Lines*. 5 Sept. 2024. <https://www.edrmagazine.eu/revolutionising-battlefield-medicine-akhmetovs-steel-bunkers-bring-life-saving-care-to-ukraines-front-lines>. Accessed 7 June 2025.





**Figure 3. Medical equipment ready for casualty care within Ukraine’s “stabilization points” somewhere near the FLOT.<sup>11</sup>**

This approach has yielded significant benefits: preservation of medical capacity amidst widespread destruction, increased casualty survival rates, creation of strategic depth by dispersing medical resources, and a boost to national morale.

### **INDOPACOM Application: Adapting to the Pacific Theater**

How can the Army Medical Command (MEDCOM) apply these lessons in the Indo-Pacific Command (INDOPACOM) area of responsibility? The challenges and opportunities differ, but the core principles remain relevant. The Indo-Pacific is fundamentally a maritime domain, presenting unique logistical complexities due to vast distances, while Europe is more land-centric.

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<sup>11</sup> EDR Magazine. *Revolutionizing Battlefield Medicine: Akhmetov’s Steel Bunkers Bring Life-Saving Care to Ukraine’s Front Lines*. EDR Magazine, 5 Sept. 2024. <https://www.edrmagazine.eu/revolutionising-battlefield-medicine-akhmetovs-steel-bunkers-bring-life-saving-care-to-ukraines-front-lines>. Accessed 7 June 2025.



**Figure 4. INDOPAC Areas of Responsibility showing U.S. bases. Notes: AFB is Air Force Base; JB is Joint Base; MCAS is Marine Corps Air Station; MCB is Marine Corps Base; NB is Naval Base; and USAG is U.S. Army Garrison.<sup>12</sup>**

A Chinese invasion of Taiwan would likely result in casualties isolated and surrounded on the island, with significant difficulties associated with amphibious operations and evacuation across the Pacific Ocean to definitive care.<sup>13</sup>

The U.S. Army Medical Department (AMEDD) is undergoing a substantial transformation to prepare for large-scale combat operations within the INDOPACOM area, recognizing that traditional medical support models are insufficient for a potential conflict against a peer adversary like China. The core challenges stem from the tyranny of distance – vast distances between potential battlefields and medical facilities.<sup>14</sup> Coupled with China’s anti-access/area denial (A2/AD) capabilities threatening evacuation routes and the unique logistical hurdles presented by littoral and island environments, the AMEDD is prioritizing expeditionary medical capabilities (EMC), focusing on modular, rapidly deployable units like Combat Support Hospitals and forward surgical teams, and emphasizing prolonged field care (PFC) due to anticipated extended casualty evacuation times. This PFC approach needs advanced training for medics in critical care, deployment of sophisticated medical equipment to the point of injury and leveraging telemedicine for specialist consultation.

<sup>12</sup> Congressional Research Service. *U.S. Defense Infrastructure in the Indo-Pacific: Background and Issues for Congress*. Report R47589. Washington, DC. 2024.

<sup>13</sup> Center for Strategic and International Studies (CSIS). *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan*. CSIS. 2023. <https://www.csis.org/analysis/first-battle-next-war-wargaming-chinese-invasion-taiwan>.

<sup>14</sup> U.S. Army. *2022 Army Medical Modernization Strategy*. 7 October 2023. <https://api.army.mil/e2/c/downloads/2023/10/07/2cc0bedb/2022-army-medical-modernization-strategy.pdf>.

Adapting the Ukrainian stabilization points model offers a valid solution to these challenges. The initial approach would be to utilize existing underground structures – natural caves and tunnels, former/current military installations, and civilian infrastructure. If these are unavailable, replicating the Ukrainian model with pre-manufactured, self-contained Role 2 medical facilities incorporating ventilation, water supply, drainage, alternative power sources, and integrated electronic warfare (EW) systems would save time and provide a battle-proven asset.<sup>15</sup>

### Challenges to Implementation in INDOPACOM

Unlike Europe and Ukraine, the INDOPACOM environment presents unique constraints. Many islands within the Pacific, such as Guam, are volcanic in nature, potentially making underground construction unsuitable due to geological constraints like volcanic activity, unstable ground, and high-water tables.

These stabilization points will not be mobile, requiring careful site selection. Once installed, relocation will be difficult. Adversaries will actively seek to detect and target these facilities, necessitating effective camouflage, concealment, and deception, as well as robust countermeasures and operational security (OPSEC).

### Potential Locations for the Stabilization Points

Considering the INDOPACOM Theater, the most feasible locations for these facilities, ranked from easiest to most difficult, are:

**Guam & Hawaii:** Significant investment in hardening existing facilities and constructing new ones. These locations are the easiest to develop as they are U.S. territories.

**Philippines:** Leveraging existing agreements and infrastructure to establish cooperative sustainment points. The strong relationship between the U.S. and the Philippines – based on a bilateral security alliance, extensive military cooperation, close people-to-people ties, and shared strategic and economic interests – facilitates this approach.<sup>16</sup>

**Japan (Okinawa):** Integrating underground facilities into existing base infrastructure. Okinawa hosts over 52,000 U.S. military and civilian personnel, and these bases would likely be targeted by drones and fires in a conflict with China.

**South Korea:** South Korea's DMZ, the Baltic Defense Line, and Poland's Eastern Shield all function as heavily fortified zones designed to deter aggression from neighboring powers. With South Korea facing increasing threats from North Korea and, increasingly, China, the concept of underground hospitals – “stabilization points” is highly relevant. Mirroring the model seen in Ukraine, South Korea with assistance from the U.S.

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<sup>15</sup> EDR Magazine. *Revolutionizing Battlefield Medicine: Akhmetov's Steel Bunkers Bring Life-Saving Care to Ukraine's Front Lines*. EDR Magazine. 5 Sept. 2024. <https://www.edrmagazine.eu/revolutionising-battlefield-medicine-akhmetovs-steel-bunkers-bring-life-saving-care-to-ukraines-front-lines>. Accessed 7 June 2025.

<sup>16</sup> Lum, T., Dolven, B. & Arabia, C. *The Philippines: Background and U.S. Relations Congressional Research Service*. 14 September 2022.



AMEDD could easily employ a number of these systems along the DMZ, as well as around major bases and cities.

## The EUCOM Theater

The Baltic Defense Line and East Shield, now called the Eastern Flank Deterrence Line (EFDL), is a border fortification and counter-mobility plan covering Estonia, Latvia, Lithuania, and Poland. The goal is to strengthen deterrence and deny adversaries access to NATO and EU territory. The EFDL presents ideal locations for constructing these stabilization points. Should NATO experience an incursion from the east, it could face similar warfare to that currently seen in Ukraine. Early emplacement of these stabilization points would ensure NATO and U.S. medical forces are prepared to provide Level 2 care to frontline personnel. Unlike INDOPACOM, implementation within the EUCOM theater is more straightforward, as these countries are NATO members with strong relationships with the U.S. and similar soil compositions to Ukraine, simplifying site selection procedures.



Figure 5. Hypothetical incursion on NATO's Eastern Flank<sup>17</sup>

<sup>17</sup>Chang, Felix. *NATO's Baltic Defense Challenge*. Foreign Policy Research Institute. June 2017. <https://www.fpri.org/2017/06/natos-baltic-defense-challenge/>.

## **Working with Private Industry**

Ukraine has successfully incorporated private industry to procure essential supplies for survivability. The Department of Defense's (DOD) traditional defense acquisition systems can be slow and cumbersome. Partnerships with private industries provide essential bridges to commercial innovation, allowing the military to become a "fast follower" that rapidly adopts cutting-edge commercial technology rather than reinventing it in government labs.<sup>18</sup> The lessons learned from how the Armed Forces of Ukraine (AFU) leverage private industry are key takeaways. The DOD must be able to rapidly employ the latest technology in the evolving security environment.

## **Manning and Training**

The Ukrainian Stabilization Points do not have a direct equivalent within the U.S. Army Medical Department (AMEDD). However, considering capabilities, the U.S. Army Medical Company – often referred to as a Brigade Support Medical Company (BSMC) or "Charlie Med" – is the closest functional match. Both the Ukrainian Stabilization Points and the Medical Company are designed to provide Role 2 care, encompassing advanced trauma management and emergency medical treatment. Medical personnel would require no additional training, as the equipment is consistent with that used within the Medical Company; however, engineers installing these facilities would need training on digging in these steel bunkers.

Manning requirements can be tailored to staff these stabilization points. While the exact number of personnel staffing these facilities in Ukraine is unknown, a comparable AMEDD-adapted unit should be staffed with 85-100 individuals, consistent with standard staffing for Medical Companies (Infantry, Armored, and Stryker). Adding a Forward Resuscitative Surgical Detachment (FRSD) would enable the Army Medical Company to provide the same level of forward damage control – including resuscitation and surgery – and prolonged field care to stabilize patients for medical evacuation when conditions permit, as demonstrated in Ukraine.

## **Conclusion**

The conflict in Ukraine starkly illustrates the vulnerability of medical infrastructure in modern warfare and the limitations of traditional casualty care approaches. The Ukrainian response – a robust, decentralized system of underground medical facilities – represents a paradigm shift in battlefield medicine, demonstrating remarkable effectiveness in the face of relentless attack. This paper has highlighted how Ukraine's innovative use of existing infrastructure, coupled with rapid construction leveraging private industry, has preserved medical capacity, improved casualty survival, and bolstered national resolve.

For the U.S. Army MEDCOM, the lessons from Ukraine are not merely instructive, but critical. The anticipated characteristics of future large-scale combat operations – the proliferation of drones, potential loss of air superiority, vast distances, and challenging terrain – demand a

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<sup>18</sup> GovFacts. *Pentagon partnerships: How the military works with private companies*. GovFacts. <https://govfacts.org/federal/defense/pentagon-partnerships-how-the-military-works-with-private-companies/>

proactive re-evaluation of medical sustainment strategies. Relying solely on traditional, centralized medical facilities and rapid evacuation is a gamble the U.S. military cannot afford to take.

The adoption of a Ukrainian-inspired model, focused on dispersed, hardened, and self-sufficient stabilization points, offers a viable path forward. While specific implementation will require adaptation to the unique geological and political landscapes of potential theaters – from leveraging existing infrastructure in Guam and Okinawa to navigating the complexities of Taiwan and the Baltic States – the core principles remain constant: prioritize prolonged field care, embrace industrial partnerships for rapid procurement, and invest in resilient, underground facilities capable of withstanding attack.

Successful implementation hinges on overcoming key challenges, including careful site selection, robust camouflage and security measures, and a commitment to operational security. Furthermore, the DOD must streamline its acquisition processes to mirror the agility demonstrated by the Ukrainian Armed Forces in collaborating with private industry.

Ultimately, the Ukrainian experience underscores a fundamental truth: battlefield medicine is not an afterthought, but an integral component of operational success. By proactively investing in resilient medical infrastructure and embracing innovative approaches to casualty care, the U.S. Army MEDCOM can ensure its ability to sustain forces and save lives in the challenging environments of the 21st century. Failing to learn from Ukraine's hard-won lessons would be a strategic misstep with potentially devastating consequences.





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