

# On Contested Logistics

Ukrainian attacks on Russian fuel depots indicate the need for a revolution in battlefield supply.

JAMES HASIK  
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With this note, I am beginning an ongoing analysis of the challenge of contested logistics in modern warfare, and what technologists, industrialists, and investors can do about it. For now, I offer four points:

In the ongoing war, the Ukrainians are effectively targeting Russian vulnerabilities in the industrial concentration of fuel and ammunition.

Thus, expect that logistics on any future, modern battlefield will be very difficult.

In response, land forces need to distribute those iron mountains of supply into little hills, adopt teleoperation and robotic platooning of existing trucks, and embrace wheeled robotic mules for resupply and casualty evacuation.

These are challenging tasks in engineering and marketing, but they require no high science.

I will update this analysis as events warrant and time permits.

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## **Situation: the Ukrainians are effectively targeting Russian vulnerabilities in the industrial concentration of fuel and ammunition.**

Recent attacks by Ukrainian drones (really, low-speed cruise missiles) on fuel facilities in Krasnodar (Yekaterinodar) and Rostov-on-Don appear to be part of an ongoing campaign against Russian fuel facilities, presumably in advance of the long-awaited spring offensive (1). I offer three observations:

The wide separation of the attacks indicates that the Ukrainians are pleased to keep the Russians guessing as to the main direction of their intended thrust, as they successfully deceived the Russian high command before their offensive last year to retake their territory around Kharkiv, and then around Kherson.

The nature of the targets indicates that the Ukrainians are working to prevent the Russians from undertaking fast motorized movement against the flanks of their presumably pending breakthroughs. (I will be addressing the likelihood of those breakthroughs in a forthcoming research note.) Russian tanks, after all, have a recent history of running short of fuel.

The range of the attacks indicates impressive reach of Ukrainian weapons. Yekaterinodar, the furthest target noted, is about 250 miles behind the front. In American terms, that's akin to the distance from Washington DC to Raleigh. Not Richmond, Raleigh. That is a long way for the Russians—or anyone—to haul fuel and munitions by truck, as their trains are easily targeted.

As I have heard Marine Corps Commandant General David Berger recite, "logistics are the pacing war-fighting function." (2) Within that consideration, fuel is a highly valuable target. Combustion engines push all military forces, save atomic-powered warships, sail-drones, the odd spy balloon, and infantry on foot. More so, fuel depots are not-too-challenging as a target: they are large, obvious, and flammable. Ammunition is similarly valuable, and yet more explosive.

### **Implication: logistics on the "modern" battlefield is getting very difficult.**

In modern warfare, much of vulnerability comes from massing or communicating, but much of battlefield success through maneuver has depended on massing and communicating. This is the problematic, dynamic contradiction inherent in what Stephen Biddle termed the "Modern System" of warfare (3). The problem has become acute over the past decade. As T. X. Hammes recently noted (4), commercial satellites and militarized drones are offering pervasive surveillance: daily passes covering the entire battlefield with optical, radar, and infrared sensors. Change detection software now partially automates the discovery process. Hiding individual infantrymen has become difficult. Hiding depots and convoys is impossible.

Pity the poor Russians, but seriously—how does anyone maneuver and resupply under combat conditions as these? Also credit the intrepid Ukrainians for their technical genius and drive, but recall that as late as the end of the Poroshenko presidency in 2019, their arms industry was focused on other things than defending the country. To some extent, borrowing an awkward American military term, today's Ukrainian drones are effectively aerial improvised explosive devices. All this means that any would-be victims of Chinese invasions should expect a far more furious wave of inbound missiles than what the Ukrainians have mustered, but no greater ability to hide their large and obvious logistical infrastructure.

Indeed, as I recently heard Brigadier General Mark Clingan of the Marine Corps note, and as the Marines have been intoning for a few years now, one will need to fight through the enemy's "weapons engagement zone" simply to enter the battle (5). Sustaining anything heavy will be difficult in that environment. Recent wargames at the Center for Strategic and International Studies have suggested that movement of large American transport aircraft and ships into Taiwan in the event of war would be very hazardous (8). Consider that the American military

does little without movement of large transport aircraft and ships. Just surviving the next war will require a revolutionary rethinking of both demand and supply on the battlefield. It is perhaps no wonder that the Marine Corps so resolutely shed its Abrams tanks, for the Abrams is the most gas-guzzling of any tank worldwide.

## **Action: Rethink and then rebuild battlefield supply with autonomous, networked swarms of smaller vehicles.**

Looking for answers at a recent conference (6), I asked a panel of experts on autonomous systems to suggest the “no-brainers” (my term) for today’s militaries. One called that “a phenomenal question.” Quite practically, it elicited three strong, near-term suggestions for economizing on scarce, expensive military labor; removing people from harm’s way; and safeguarding valuable supplies:

In the rear, distributing those iron mountains of supply into little hills, but with front-line visibility into what is where.

In connecting the rear to the front, enabling teleoperation and robotic platooning of existing trucks, until self-driving vehicles are more available.

At the front, fielding soldier-following robotic mules (wheeled more likely than legged) for supply, but also casualty evacuation.

Why have we not seen more of this already? I might also ask why we have not seen faster progress in actually fielding cargo drones and unmanned transport ships (7). The US Marines have actually shed their tanks, but they are only so far reimagining a supply chain with many more, smaller, unmanned, swarms of resupply platforms, attempting to hide in plain sight.

Fairly, far from all of the technical feasibility of these ideas has been demonstrated. Technologists and industrialists have plenty of work ahead in designing and fielding better systems of these types, which creates business opportunity. For example, field logisticians need better software and networks—electronic and human—for finding and pulling forward what the frontsoldaten need. Truly, though, Amazon and other firms have a certain fingerspitzengefühl for this business. That begs the question of what type of company is best suited to the military’s logistics software. What matters most? Is it organizational acumen in distributed logistics, cyber-proofing, and the extent of the software-and-data cloud? Or is it familiarity with a given military’s organizational proclivities and receptivity to different types of business-to-government marketing?

To paraphrase the late Net Assessment Director Andrew Marshall, the problem of furthering a revolution in military affairs can be more organizational than technological. Military innovation often depends on new weapons technologies, but not always—Bonaparte achieved much more than his predecessors with essentially the same technologies available a century prior. New technologies, however, usually create dependencies for change in human capital,

employment doctrines, organization structures, logistics infrastructures, and cost-effective but reliable supply chains.

What's the next direction for progress? Most air forces have gotten comfortable with removing the pilot from some or even most of their airplanes. But as one attendee at the NGCV meeting put it to me, armies need to get comfortable with the thought of leaving self-driving vehicles behind, or summoning them forward, as the troops move separately. (Navies are a whole other talk show.) Coaxing customers into that mindset might be more challenging than building the resupply robots.

## References and Further Review

1. See, for example, the coverage by Matthew Luxmoore and Laurence Norman in the *Wall Street Journal*: "Crescendo of Attacks Target Russian Supply Lines Ahead of Expected Offensive," 4 May 2023; and "Drones Hit Russian Supply Lines," 5 May 2023.
2. I heard this again recently from Brigadier General Mark Clingan, at "Game Changers or Little Changed? Implications of Ground Combat in Ukraine," panel discussion at the Atlantic Council, Washington DC, 3 April 2023.
3. Stephen Biddle, *Military Power: Explaining Victory and Defeat in Modern Battle*, Princeton University Press, 2004.
4. Heard at "Game Changers of Little Changed? Implications of Ground Combat in Ukraine". Atlantic Council, 3 April 2023; see also Hammes' issue brief by the same title.
5. Also at the "Game Changers" event. Suitably for the American military, the weapons engagement zone has been termed the WEZ, or "wez".
6. The National Congress on Next Generation Combat Vehicles (NGCV), Arlington, Virginia, 24 March 2023. Registration is already open for next year's conference.
7. I credit retired Marine Corps Lieutenant General John Jansen with suggesting to me the latter idea in 2017, when he was commandant of the Eisenhower School at the National Defense University.
8. Mark F. Cancian, Matthew Cancian , and Eric Heginbotham, *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan*, CSIS, January 2023; <https://www.csis.org/analysis/first-battle-next-war-wargaming-chinese-invasion-taiwan>.