

A “Ukrainian Campaign” for the Russian Armed Forces? Logistical Deficiencies During the Invasion of Ukraine 2022

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The attack on Ukraine by Russia on February 24, 2022, stunned the international public opinion, even though a series of warning signs had been pointing to this attack for several years. A large number of papers were published to comment on the geopolitical stakes of a war in the heart of Europe, and its implications on the world economic order. On the other hand, little attention has been paid to the logistical deficiencies that have manifested themselves at the level of the Russian armed forces, whose strength and recurrence explain in part the renunciation of the Russian general staff to take control of Kiev. While major works have been conducted on military logistics to underline the importance of supplies in the success of a strategy of territorial conquest, the conflict between Ukraine and Russia indicates that failures at this level can undermine this strategy. The article raises the question of the key role of logistics as a support for military action, its originality being to highlight the failures rather than the successes.

Keywords: failure, military logistics, pre-positioning, strategy, transport, Ukraine-Russia conflict, vulnerability, wartime procurement

INTRODUCTION

Perhaps one of the most famous historical failures in logistics is Napoleon’s attempt to conquer Russia in 1812. After gathering more than half a million soldiers, Napoleon entered Russia with the largest army ever assembled, but the adventure ended in failure. Poor discipline, disease and bad weather were the main reasons given before a lack of logistics was finally mentioned. Napoleon’s method of warfare was indeed based on the rapid concentration of armed forces at a key location to destroy the enemy, with a precise objective: to bring the war to a conclusion in twenty days. To do this, he had 30 days’ worth of food transported to Russia. However, as the Nazis also discovered in 1941, Napoleon realized that Russia had only a very poor road network, forcing them to advance slowly on a narrow front. Over time, the soldiers were weakened by poor nutrition and lack of supplies, and of the original army of 600,000 soldiers, less than 100,000 soldiers returned to France after the defeat (de Ségur, 1825/2008).

Napoleon’s disastrous “Russian campaign” is now studied in numerous works of military history, and even management (Kroll *et al.*, 2000; Lieven, 2006; Nester, 2013), emphasizing how much, beyond the hubris of an emperor, efficient logistics condition the success of a territorial conquest or, conversely, how much a deficient logistics can lead to failure. The attack on Ukraine by Russian troops in February 2022, and their difficult advance on the battlefield, and even the renunciation of taking control of the country, can be explained largely by the support the Ukrainians received from Western countries, particularly in terms

of arms and ammunition. But the first reports from war correspondents underline the extent to which the Russian armed forces have been confronted with major and recurring logistical difficulties, even if some of the facts reported “on the spot” must be examined with caution. In a way, President Putin seems to be experiencing a terrible “Ukrainian campaign”, undergoing what Napoleon experienced two centuries earlier, and Adolf Hitler 80 years earlier in Russia. In 2022, once again, the central importance of logistics in the success or failure of military operations comes to light and deserves special attention.

To address this issue, the article is structured in three parts. In the first part, we underline that an approach of pre-positioning of logistical resources has been implemented by the Russian armed forces from 2021; it is a conventional approach in logistics management, especially in humanitarian logistics, whose objective is to plan resources well before the needs in terms of product movements appear. In the second part, a synthetic analysis of the logistical blockages experienced by the Russian armed forces in their strategy of territorial conquest of Ukraine is proposed, insisting on the underestimation of the problems related to the supply of troops, associated with the resistance of the populations on the ground. In the third part, the emphasis is placed on the vulnerability of the railways, linked to the difficulty of access to the infrastructure for Russian troops, forcing them to use the road mode, which is less easy to use and subject to the risks of attack by the guerrillas.

PRE-POSITIONING OF LOGISTICAL RESOURCES

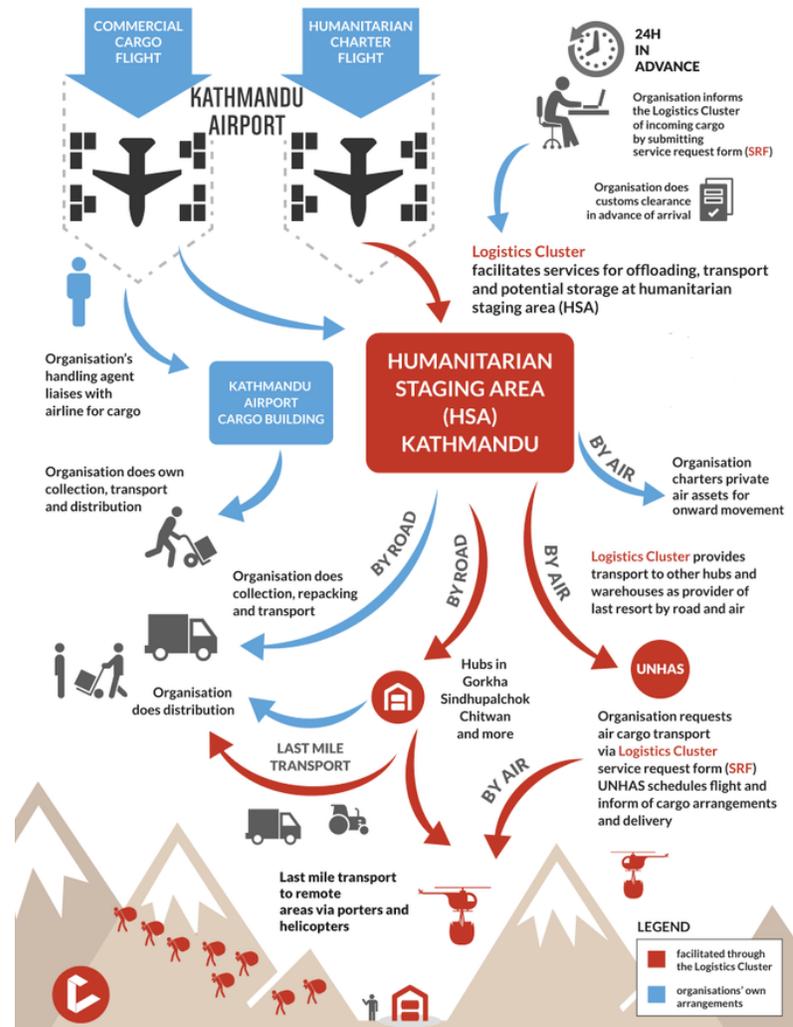
While the world was partly surprised by Russia’s attack on Ukraine on February 24, 2022, despite the rise of separatist movements in the Donbas since 2014 (Pavicic *et al.*, 2022), some observers noted that a process of pre-positioning military resources began as early as the spring of 2021. This process presaged a highly predictable territorial conquest action. On the other hand, few specialists anticipated a possible logistical failure given the insufficiency of support means, the centrality of which has been known since the work of Jomini (1838/2017). Jomini (1838/2017) theorized the art of war with reference to three levels: strategy, tactics and logistics. Strategy is the art of directing troops in the theater of war, either for the invasion of a country or for the defense of one’s own; tactics is the art of combining and conducting battles in order to achieve victory; logistics, finally, refers to the art of moving armies to lead them into battle by ensuring sufficient supplies of food and equipment. However, the pre-positioning of military resources (tactical dimension) will only make sense if it is accompanied by the pre-positioning of supplies in quantity and quality (logistical dimension). This reality has been known for a long time, and the issue of pre-positioning logistical resources is central in the context of humanitarian action (Duran *et al.*, 2013).

The basic principle of humanitarian action is that knowing the demand is problematic because of its unpredictability (Van der Laan *et al.*, 2016), but also because of the difficulty of access to disaster areas and the multiplicity of products that must be provided to save the population (food, medicine, emergency shelter, electrical generators, etc.). If we had to wait for a humanitarian disaster, whether natural or man-made, to find suppliers, place orders and deliver the necessary assistance, the delays would be so great that they would undoubtedly result in increased mortality. In order to respond efficiently and quickly to a humanitarian disaster, emergency stocks must be built up and, if possible, positioned as close as possible to the most sensitive areas. As noted by Ruano Lima (2021), the leadership, command and control of the armed forces, among other capacities, can be mobilized in an efficient manner on this occasion. The logistical structures for humanitarian action are implemented at a double level, continental and local, in areas where new disasters are likely to occur frequently (for example Haiti, regularly ravaged by cyclones, or Somalia, where the political situation remains deeply unstable).

Transport operations are planned in order to organize shipments of complete batches as well as groupage operations or the pooling of shipments. In addition, better planning makes it possible to use more time-consuming but less expensive shipping methods (maritime and railway links). The objectives of rapid intervention and reduced transport costs therefore justify the pre-positioning of logistical infrastructures to facilitate the deployment of assistance equipment for emergency operations. Two pre-positioning frameworks coexist. The first framework consists in setting up a few warehouses in hubs with a high logistical capacity; this allows for an emergency response to disasters throughout the world. The second

framework consists of locating local or regional infrastructures to respond to disasters affecting a specific region; this favors local procurement by better handling the constraints and hazards of last mile delivery. Figure 1 provides an example of how humanitarian logistics –including pre-positioning– works in Nepal.

**FIGURE 1
HUMANITARIAN LOGISTICS IN NEPAL**



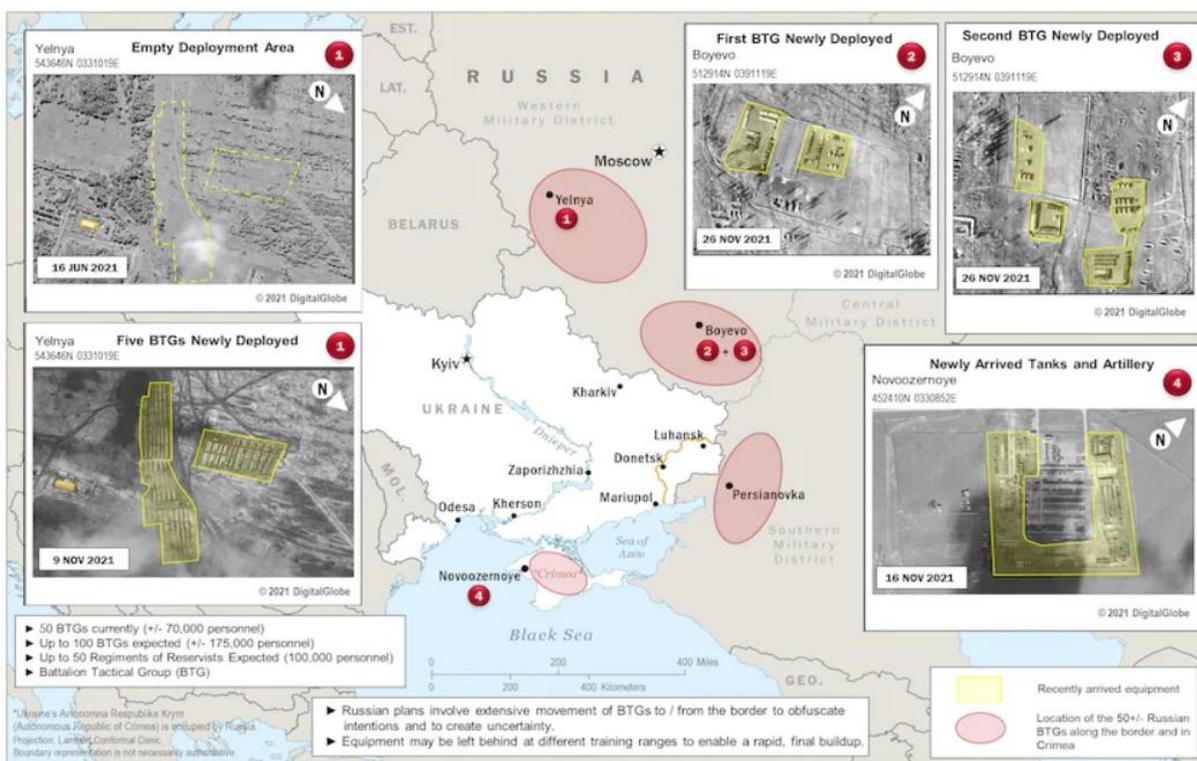
Source: OCHA document

With reference to the pre-positioning approach, how can we qualify the situation for Russia a few months before the attack on Ukraine? As early as April 2021, the significant strengthening of Russian military capabilities is observed on the borders of Ukraine, suggesting a “power grab” by Moscow against Kiev. The G7 foreign ministers then indicated that these large-scale troop movements, occurring without prior notification, constituted a threat and a destabilizing factor, but without any reaction from the Organization for Security and Cooperation in Europe (OSCE). The Supreme Headquarters Allied Powers Europe (SHAPE) similarly assesses the risk of an attack on Ukraine by Russia as “low to medium”, based in part on the positions occupied by Russian forces. The latter have not set up procurement systems for fuel, spare parts and foodstuffs at a sufficient level to support a possible offensive in Ukraine. It was not until the end of the large-scale exercise Zapad 21, organized in Belarus, that the diagnosis was reviewed, with the deployment of T-80 tanks, artillery systems, Iskander ballistic missiles and air defense capabilities. It

is true that the experience of the exercise Zapad 17 exercise, conducted four years earlier on NATO's eastern borders in Russia's western military district, already heralded a credible threat of major geopolitical tension (Johnson, 2017).

The most important point to note, however, is that unlike the spring of 2021, a pre-positioning of logistical resources is being methodically organized as early as September 2021 on the borders of Ukraine. Russian forces are strengthening their supply and medical chains, which would allow them, if ordered, to launch a military offensive with sufficient troop support. Figure 2, taken from an unclassified U.S. intelligence document, indicates that four pre-positioning locations were identified very early on by the American secret services (Harris & Sonne, 2021). It appears that the system put in place by the Russian general staff is concentrated at about 150 miles from the Ukrainian border, with military personnel estimated at between 70,000 and 90,000 soldiers. Preparations suggest that Russia has the means to mobilize, if necessary, up to a hundred battalions, or 175,000 soldiers, and the equipment levels stationed in the four pre-positioning locations could provide front-line forces for seven to ten days, and support units for up to a month. At the beginning of 2022, therefore, various signals indicate that, following Jomini's (1838/2017) reasoning, the logistics level is ready to serve the strategic and tactical levels. However, within a few weeks, the Russian armed forces will encounter logistical blockages that will call into question the very idea of a "lightning victory" against Ukraine.

FIGURE 2
RUSSIAN MILITARY AND LOGISTICAL RESOURCES ON UKRAINE'S BORDERS IN LATE 2021



Source: Harris & Sonne (2021).

ANALYSIS OF LOGISTICAL DEFICIENCIES

As many works have indicated, modern military logistics has its roots in WW II, particularly through the organization of Operation Overlord that led to the successful landing of Allied forces on the beaches of

Normandy in June 1944 (McKell, 2014). Over the years, perfectly mastered logistics allowed the tactician to carry out military maneuvers in the field and gain the upper hand over the enemy, particularly by being robust and resilient in order to quickly change objectives or seize opportunities. In order to conquer territory, an army must have a sufficient critical mass of personnel and equipment, combined with a logistical flow that allows it to conduct operations. Logistics handles all support functions to enable the operational engagement of units (Zeimpekis *et al.*, 2015). It would be unthinkable for vehicles to run out of fuel or for an engaged unit to be unable to fire its weapons due to an ammunition shortage, just as it would be unthinkable for casualties to go untreated due to poorly sized medical logistics.

A number of logistical resources must be redundant to enable an armed force to cope with enemy actions. Indeed, if the enemy destroys one combat company of a battalion, it can continue to fight with the other companies that remain available. However, if the enemy destroys the logistical support, the entire battalion is paralyzed. To avoid this situation, in addition to guaranteeing a certain distance from the front, the logistical resources are usually protected by *ad hoc* forces and strategically distributed in the geographical space. The resulting networking is designed to quickly shift military resources from one point to another, and if necessary, to quickly change effort depending on the enemy's actions on the ground. Ensuring the chain of command of armed forces has the ability to redirect its logistical elements allows for constant adaptation to enemy action, or to seize an opportunity for troop advance that was not originally planned. In brief, the best military action strategists give logistics a performance (strategic dimension) that will be all the stronger for its high level of flexibility (tactical dimension).

By pre-positioning military and logistical resources on the borders of Ukraine, President Putin probably imagined that its special military operation would take place according to the timetable and plan formulated in the general staff as early as 2021, and on the model of a "lightning warfare". In the first hours of the intervention of the Russian armed forces, by striking with missiles the Ukrainian military sites, including airfields or anti-aircraft systems spread throughout the territory, the first idea is to destroy the defense lines of Ukraine as quickly as possible. Kiev is also a priority target. By quickly attacking the Hostomel airport, about 20 miles from Kiev, with the help of numerous helicopters and airborne troops, the Russian general staff wishes to attack the center of Ukrainian power in order to make it fall. Bombings hit the capital, while fighting took place in the Obolon district, only a few miles from the government buildings before the Russian forces were finally pushed back. President Zelensky remained in place, and the military support of many European countries and the United States led to fierce resistance, preventing the Russian armed forces from entering Kiev. In brief, the initial strategic plans of the Russian military command failed.

How to explain this reversal of fortune, concerning one of the most powerful armies in the world, finally unable to conquer a neighboring country with weak military resources and very little preparation for an invasion? Certainly, the military support given to Ukraine by NATO members is an important explanatory element. But it is also and above all within the Russian armed forces that the roots of the failure of the "lightning warfare" originally planned by the general staff must be identified. There seems to be little doubt that the stated ambitions were thwarted by the logistical deficiencies of the Russian armed forces, which became apparent after a few weeks, or even a few days. At the gates of Kiev, but also in other regions of Ukraine, many Russian trucks and armored vehicles have come to a standstill for lack of fuel. Having decided to invade the country at the end of February 2022, Moscow has also exposed itself to the vagaries of the weather, the ground becoming, in many regions, very muddy with the melting of snow, the thaw and the torrential rains (the "Rasputa" phenomenon). The question of the relationship between climate and war is moreover underlined by Henninger (2015). Blocked on the spot, and thus cut off from their line of procurement, Russian soldiers also began to run out of food, with the impact that one can imagine on their morale.

As the stunning effect of a rapid and massive attack did not work, the Russian forces quickly had to change their strategy, accepting a more limited territorial conquest, concerning only the southeast of Ukraine. The strategic redeployment created problems in terms of logistical organization of operations, with the forced movement of military resources from northern Ukraine. It is important to know that an armored regiment, active on the front, requires about 350 tons of supplies every 24 hours. These 350 tons correspond to all the resources necessary for the troops to remain operational (water, food, fuel,

ammunition, spare parts, spare vehicles), knowing that in times of war, the equipment is quickly damaged. The consumption of equipment is therefore very high and requires particularly voluminous support logistics. Thus, for each kilogram of fighting weight, the Russian T-80 tank needs four kilograms of various logistical resources to remain operational. Similarly, ground force soldiers are associated with significant body armor, the objective of which is to improve survivability and reduce casualties (weapon, ammunition, water, batteries, and other gear). Figure 3, taken from the investigation conducted by Fish & Scharre (2018) in the context of the U.S. Army, shows the equipment a soldier in combat must have, with the corresponding weight. It is very likely that the numbers are comparable for the Russian armed forces.

**FIGURE 3
LOGISTICS ASSOCIATED WITH A SOLDIER IN COMBAT**

Notional Individual Soldier Equipment	Pounds
Army Combat Helmet	6.5
Body Armor	33.2
2 armor plates (ESAPI)	12.5
IOTV	15.7
2 side plates	5
Weapon + Ammo (210 rounds)	
M4	5.9
M249	17
Ammo	7
Light Thermal Sight	1.9
Night Vision Goggles (PVS14)	1.4
Rucksack	8
Power Sources (Batteries: 3-day mission)	16
Comms/Radio (Leader only)	
PRC148	1.9
PRC152	2.6
Rations (3-day mission)	
First Strike Ration	6
MRE	13.5
Other (Uniforms, water, personal hygiene, first aid, etc)	19

Source: Fish & Scharre (2018).

It is therefore easy to understand that the redeployment of Russian troops after the failure of the control of Kiev has caused enormous logistical difficulties, aggravated by the Ukrainian resistance (supported by military aid from several European countries through the United States, notably with the sending of 2,000 FGM-148 Javelin anti-tank missiles). This resistance was able to attack the Russian soldiers themselves, as many media reported, but also and especially all their support logistics. It is important to know that 500 destroyed trucks are enough to completely prevent deliveries to two battalions, and thus to paralyze an advance on the ground. However, a more in-depth analysis of the Russian forces involved reveals logistical deficiencies of a multi-causal nature (Johnson, 2022). On the one hand, while procurement problems are common in any military operation, they are exacerbated by the use of conscripts –not professional soldiers– with limited competences in logistical activities. On the other hand, the motorized vehicles remained unused for many years, which affected their performance in muddy terrain, and several hundred of them were subsequently immobilized for lack of maintenance.

The main logistical weakness of the Russian troops, however, is the lack of access to the railway network, given that Russia is generally very dependent on railways for the supply of goods. The road solution has therefore been chosen as a logistical substitute, even though the Russian armed forces have a

severe lack of trucks. Veshinin (2021) noted this major deficiency in an article published before the outbreak of the conflict. This problem of equipment availability is aggravated by the problem of fuel: faced with the vastness of Ukraine's territory (233,000 square miles), the Russians initially had to leave armed forces in place to control each city that fell into their hands, which did not leave them with enough manpower to create temporary pipelines. This is perhaps the most important observation that must be made: Russia has not operated on such a large logistical scale since WW II, and the general staff has realized that the conduct of combined combat maneuvers is extremely complex and difficult to organize on a broad front. From this point of view, the redeployment to the southeast can be analyzed as a desire to shorten the supply lines from pre-positioned resources, by radically modifying the original tactics.

RAILWAY VULNERABILITY

Armored vehicles at a standstill on the side of the road due to a lack of fuel and a 40-mile-long military column blocked at the entrance to Kiev are powerful images that have been making the rounds of the planet since March 2022. They highlighted the first logistical failures of the Russian armed forces, calling into question its supposed invincibility. The main cause is due to a railway vulnerability that the general staff had totally underestimated. Indeed, Russian troops could not make use of the railway until they controlled key cities such as Kharviv, Sumy and Chernihiv in the north, or Kherson, Mykolaiv and Zaporizhzhia in the south. Traditionally, and for a long time, Russia has been extremely dependent on railways in times of war, but also in times of peace. Indeed, this huge country organizes almost all of its supplies via this mode of transport due to the lack of road infrastructure, especially for meteorological reasons. As mentioned above, one can speak of a logistical culture based on the rail mode. One of the most famous symbols is the Trans-Siberian Railway, a network of railways that connects Moscow to Vladivostok over 5,600 miles. One can also point to the Baikal-Amur Mainline Railway (BAM), the former Soviet system's more than 1,800-mile "way of the future", intended to showcase the national unity, competences, and industrial power of socialism, while opening a trade route to the Pacific for USSR timber and oil (Ward, 2009).

Faced with the liveliness and success of the Ukrainian guerrilla, the Russian general staff thought that it was enough to provide its railways with sufficient protection, forgetting that the question of logistical performance is also highly dependent on the quality of the infrastructure (Ribeiro Lopes *et al.*, 2022). It was thus decided to use trains to transport tanks and troops more easily across Ukraine. However, this choice quickly became a major problem and one of the reasons for not taking control of Kiev to overthrow the official government. Russian troops and combat vehicles surrounded the capital, and to facilitate their supply, an armored train was brought in from Crimea. Two diesel locomotives and eight railcars can be seen in numerous videos circulating on the Internet, with the locomotive at the rear equipped with two ZU-23 automatic cannons. These cannons are used against low-flying aircraft, but they can also fire at ground targets, but they have an old-fashioned sighting system and do not have modern features. Three more trains were later put on track; they had been retired in the early 2000s but returned to service in 2015.

In addition to transporting troops or vehicles, typical missions for these trains include escorting other procurement trains, repairing rails in war zones, clearing mines, defending important logistical points, and supporting infantry. This is heavily armored equipment, with steel plates covering the cars, but the thickness of the armor and its effectiveness are not really known. This protection is probably sufficient to withstand small arms fire, and perhaps even heavy machine gun fire, but it is still at the mercy of remote-controlled bombs placed on the tracks. According to the U.S. Department of Defense, Russian troops are ultimately vulnerable over long distances because the risk increases as supply lines become longer and more difficult to manage (<https://www.defense.gov/News/News-Stories/Article/Article/2950915/ukrainian-resistance-logistics-nightmares-plague-russian-invaders/>, Accessed May 14, 2022). Thus, it is likely that railway vulnerability is the reason for the redeployment to southern Ukraine, and it is not surprising that President Zelensky urged citizens to destroy or delay convoys carrying fuel and ammunition with Molotov cocktails, shotguns, or anything else they could get their hands on.

In a cruel twist of history, from April 2022 onwards, railway infrastructure became the target of repeated attacks by Russian forces redeploying to eastern Ukraine. In a "scorched earth" approach, Russia

is effectively seeking to destroy as many railway lines as possible during its withdrawal movements, even though Ukrainian civilians use trains every day to flee the combat zones. The aim is to slow down the procurement of weapons from various European countries, since it is by rail that all heavy equipment transits. Thus, railway installations were hit by air strikes in the region of Vinnytsia, in the center-west of Ukraine, an important railway junction both for internal lines in Ukraine and for connections with foreign countries, with several dozen collateral victims. In the end, it is Ukraine that finds itself in a vulnerable situation, as if logistics were finally at the heart of the war, with each of the belligerents using it in turn to destabilize the enemy, after having used it for the purpose of territorial conquest. More than ever, as Bacquet (2021) notes, logistics orchestrates the mobilization of military resources corresponding to political ambitions, including in their most destructive dimensions.

CONCLUSION

Military logistics, responsible for supplying troops in combat so that they maintain their operational capabilities over time, has an ancient history, which some scholars date back to Alexander the Great (Belfiglio, 2022). Before embarking on his journey to Asia, he burned all his food wagons in order to make the mobility of his troops easier, by organizing supplies before the movement of his armies. Julius Caesar took up this idea by creating the function of “*logista*”, entrusted to an officer in charge of organizing night camps and setting up supply depots in the subjugated cities. However, it was in the 18th century that military logistics really took off. In 1806, Napoleon created an administrative staff whose mission was logistical in nature. These were workers, bakers, butchers and craftsmen attached to the imperial guard, whose mission was to ensure the supply of food to the troops, and who would distinguish themselves during all of Napoleon’s campaigns between 1806 and 1815. The contribution of Jomini (1838/2017), himself a general under Napoleon, formalized the role of logistics in the art of war.

Over time, the key elements of military logistics were refined, until it was defined as the set of activities that sought, in all circumstances, to provide the armed forces, at the desired time and place, in the necessary quantity and quality, with the means to live, to fight, to move, to care for the soldiers and to maintain the equipment. Operation Overlord was the most ambitious and successful military logistics project to date, with 150,000 men landing on the beaches of Normandy and 14,000 men being flown in by airplanes and gliders, followed by the necessary materials and equipment. In his *War Memoirs*, de Gaulle (1956/1998) stated that it was “by choosing reasonable plans, by sticking to them firmly, by respecting logistics that General Eisenhower led the complicated and passionate machinery of the armies of the free world to victory”. Since then, military logistics has continued to develop, adapting to the needs of armies in combat around the world. Yet, as the article points out, despite this progress, military logistics sometimes experiences major failures, as evidenced by the case of Russia’s attack on Ukraine in February 2022. In other words, it is because of logistical shortcomings that a strategy of territorial conquest can fail, even for a country with armed forces with formidable firepower.

However, it should not be concluded that logistical failures on the part of one belligerent automatically result in an advantage for the enemy. Indeed, if the enemy does not demonstrate a significant capacity to react to opportunities that arise, a relative *status quo* is possible. Thus, while the Ukrainian armed forces were able to destroy abandoned Russian trucks and tanks on the ground, they were not able to take advantage of the enemy’s logistical deficiencies, for example, by conducting victorious and massive counter-offensives, just as the Ukrainian air force, which was still flying two months after the start of the attack, was not always able to bomb the long columns of Russian tanks immobilized on the roads. There is no doubt that the lesson must be learned for commercial logistics. Just because a company experiences occasional logistical failures does not mean that its competitors will be in a position to take market share from it quickly and sustainably. If competitors are relatively inert, they could on the contrary stagnate and later suffer the sudden awakening of the company with the failing logistics. The same reasoning could probably be applied to military logistics.

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