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**HARSH CLIMATES, POOR TRANSPORTATION, AND IRREGULAR WARFARE:
LOGISTICAL DIFFICULTIES FROM NAPOLEON TO THE SOVIET-AFGHAN WAR
THAT AFFECT OPERATIONAL CAMPAIGNS**

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Harsh Climates, Poor Transportation, and Irregular Warfare: Logistical Difficulties from Napoleon to the Soviet-Afghan War That Affect Operational Campaigns

Ever since Napoleon Bonaparte ushered in a new style of warfare unleashed by the French Revolution and continuing on with advances in technology into the modern era, logistics has played a crucial role in operational campaigns. Whereas most nation-states in Europe had previously fought limited wars for limited objectives, the revolutionary French government decided in November 1792 to help all people gain liberty by overthrowing the existing European monarchies. The execution of France's own king, Louis XVI, in January 1793 accentuated this threat.¹ As a result, most major monarchs throughout Europe wanted to exterminate the new form of government in France. This dramatic escalation in the nature of warfare represented a fundamental change in modern warfare that has continued into the Twentieth Century, long after Napoleon took over as Emperor. Consequently, nation-states fighting for survival required much greater resources and material. To provide these greater means, France first instituted massive conscription through the *levee en masse* in August 1793.² In turn, these large armies needed tremendous amounts of logistical support to properly sustain hundreds of thousands of soldiers across vast distances and over extended durations of time. This logistical trend which started with the advent of conscription has continued despite advances in technology.

Even though technology has made tremendous advances in transporting vast quantities of supplies with railroads, mechanized trucks, and aviation since the Napoleonic era, logistics in modern warfare has continued to play a key role in the outcome of operational campaigns. Logistical systems need to gather, store and distribute supplies in all kinds of conditions to support these large armies whether using horses, railroads, mechanized vehicles, or aircraft. When the logistical support system encounters difficulties in sustaining the army and its

enhancements, soldiers die and machines break, because of starvation or climate extremes and a lack of replacement parts or harsh operating conditions. With the means to conduct war dying and breaking, operational campaigns encounter difficulties and even failure due to culmination effects from these logistical shortcomings. Even as technology improved across the Napoleonic Wars, the Russo-Japanese War, and the Soviet-Afghan War, logistical difficulties resulted in failed operational campaigns because of a lack of sufficient additional precautions taken. A synergistic logistical triad of harsh climates ill-suited for supporting large armies, immature transportation infrastructures, and irregular threats to supply lines illustrate how logistical system difficulties have led to failed campaigns throughout the history of modern warfare. After a brief background on logistics in the Napoleonic Wars, the Russo-Japanese War, and the Soviet-Afghan War, the synergistic logistical triad elements of harsh climates, immature transportation infrastructures, and irregular threats to supply lines are covered in sequence for these conflicts.

The sheer magnitude of subsistence required shows how important logistics has become with the advent of large armies. Fifty wagons capable of carrying 2,000 pounds each would supply enough hay and straw for 2,500 horses for only two days.³ These 100,000 pounds of hay and straw represent a large amount of subsistence for feeding animals only two days and does not represent the sheer amount of food required for the troops. In the Ulm campaign of 1805, Napoleon arranged for contractors to have 700,000 biscuit rations ready at Strasbourg and Mainz and to provide 1,000 four horse wagons with two drivers each.⁴ These logistical preparations would supply the French army with food for two weeks. With the advent of railroads utilized in the Russo-Japanese War, fuel requirements (e.g., coal and wood) increased to power the train engines. Similarly, the mechanized vehicles and aircraft used in the Soviet-Afghan War demanded massive quantities of parts and fuel (e.g., gasoline). As a result, technology

improvements have not reduced the importance of logistics noticed in the Napoleonic Wars for large military forces fighting in operational campaigns.

Initially, Napoleon relied on an ad hoc logistical system incapable of sustaining large armies. This ad hoc logistical system utilized contractors, such as the *Compagnie Breidt*, to provide supplies because of the *Ancien Regime's* legacy. This contracting based system was set up for the Royal army that was an order of magnitude smaller in size than Napoleon's army and that fought limited wars.⁵ However by the winter of 1806-1807, Napoleon's forces were starting to experience significant logistical difficulties. The logistical system performed poorly at distributing supplies in 1806-1807 due to several reasons: corruption, horses sinking to their bellies in dirt roads turned to mud, the harsh climate in eastern Prussia and Poland ill-suited for supporting large armies, and Prussian partisans attacking the 540 mile long supply lines from Mainz.⁶ Even with Napoleon's improvised use of the Prussian canals as an alternate form of transportation, adequate food and winter coats could not be delivered to the French troops. As a result, the winter of 1806-1807 and the battles of Eylau and Friedland decimated the French morale due to cold, hungry conditions. The French army blamed these misfortunes on the corrupt contractors because the shoes meant for reinforcements appeared on the black market.⁷ Due to the near starvation of the French army in the winter of 1806-1807, Napoleon knew logistical changes were needed. Unfortunately, these logistical difficulties foreshadowed the logistical challenges experienced by French troops in the Iberian Peninsula and Russia.

As a result of these shortcomings (e.g., mass starvation) of the ad hoc system, Napoleon developed a more professional military logistical system (i.e., the *Train des Equipages Militaires*) in March 1807. He organized the *Train des Equipages Militaires* using supply battalions as the organic units. This new logistical system performed adequately in the 1809

Austrian campaign for several reasons: the area's fertile climate and well-supplied magazines, mature transportation infrastructure, and short protected supply lines. The fertile climate enabled food requisitions to be fulfilled and the captured magazines provided weapons, ammunition, and treasure.⁸ Napoleon used river barges and wagons on roads from Strasbourg to distribute these supplies quickly and safely. With the *Train des Equipages Militaires* functioning well, Napoleon felt confident about having two operational campaigns in the Iberian Peninsula and Russia where the climate, transportation infrastructure, and threats to supply lines differ from those in central Europe. However, Napoleon's reorganization did not directly address beforehand the logistical triad elements: harsh climate, immature transportation infrastructure, and irregular threats to supply lines.

Similarly, the Russian and Soviet logistical systems realized changes needed to be made for adequate sustainment; however, they did not directly address the synergistic logistical triad elements beforehand either. Recognizing that Lake Baikal represented a choke point in the Trans-Siberian Railway, the Russians completed a route that went around Lake Baikal by the end of September 1904.⁹ Unfortunately, war remains a difficult time to radically change logistical systems. Russia still depended on a single track line with high gradients (i.e., reduced capacity at reduced speeds). Also, Russian forces failed to adapt to Japanese irregular attacks on supply lines. Similarly, the Soviet Union realized attacks on supply lines were affecting logistical performance. However, the immature transportation infrastructure reduced logistical convoy transit speeds and harsh operating climate conditions caused unexpected vehicle break down rates. Slow moving convoys pulling broken down vehicles proved easy targets for irregular attacks. However, Soviet tactics did not fully adapt to effectively conduct counter-ambushes and protect supply lines from irregular threats in the mountainous climate and geography.

Harsh climates affect logistics in a dualistic manner: the requirements increase at the same time capabilities decrease. The logistical requirements in harsh climates increase because of additional clothing, food, water, and hygiene requirements that have to be met due to temperature and geography extremes. For example, current United States Army nutrition guidance calls for increasing caloric requirements by 10% for troops operating in temperatures between 32 and 57 or between 86 and 104 degrees Fahrenheit.¹⁰ When operating in extreme cold, troops may require 5,000 calories per day instead of a more typical 3,000 calories per day.¹¹ When operating in high altitudes such as mountains, the caloric requirements may even reach 7,000 calories per day.¹² Similar percentage increases occur for water and salt requirements when fighting in harsh climates. Additionally, the logistical capabilities in harsh climates decrease due to equipment failures. This dual effect of logistical requirements increasing at the time while logistical capabilities declines results in severe logistical challenges (i.e., the logistical gap increases) that affects the results of operational campaigns. The Napoleonic campaigns in the Iberian Peninsula and Russia exhibited effects of the harsh climates on logistical effectiveness.

The climates in the Iberian Peninsula and Russia comprise vast areas ill-suited for producing tremendous amounts of agricultural products necessary to support large armies. In addition, both areas experience a wide range of extreme temperatures. These climate traits produced logistical difficulties in providing troops with adequate food from foraging and in keeping hungry troops healthy and properly clothed in both campaigns (i.e., logistical requirements increasing with more calories needed in cold weather). In addition, the harsh climates resulted in the horses needed to pull wagons dying (i.e., logistical capabilities decreasing).

The Iberian Peninsula climate consists of vast infertile areas with mountains, hills, and dry regions ill-suited for logistically supporting large armies over long periods of time. In the winter, the climate turns bitter cold in the rugged mountainous ranges, while the central dry areas experience extreme heat during the summer. Moreover, the poor population living in the Iberian Peninsula refused to actively cooperate with the requisition system because they did not have enough food for both themselves and the French troops. The second and third invasions of Portugal from Spain and the defenses of Ciudad Rodrigo and Badajoz failed due to logistical challenges resulting from the climate being incapable of supporting large armies.

The second invasion of Portugal by Marshal Soult failed due to the harsh winter climate of 1809. Soult marched south from La Coruna and chased General Moore of the British army over harsh mountainous terrain in severe winter weather. This heavy movement in the cold mountains at a high altitude meant that French soldiers most likely needed 7,000 calories a day for proper sustenance. The French forces unsuccessfully tried to requisition and forage for food but were unable to find adequate supplies from the few poor peasants living in the mountains. Furthermore, cold winter rains increased the rates of sickness in the hungry horses and men. This combination of hunger and wet wintry weather drastically decreased Soult's forces fighting capabilities and numbers. Half of Soult's horses and 23,000 of Soult's 43,000 men died due to starvation and illnesses exacerbated by hunger.¹³ As a result of this attrition, Soult waited in Oporto the whole month of April 1809 on Marshal Victor's reinforcements and heavy guns in vain. Soult eventually advanced toward Lisbon without Victor's forces, but his delay provided the British army sufficient time to reinforce and resupply in Portugal. Thus, the logistical challenge of a climate ill-suited to supporting large armies adversely impacted the second

invasion of Portugal. This same logistical challenge negatively affected the third invasion of Portugal by Marshal Massena.

Massena failed in the third invasion of Portugal during the fall of 1810 due to the logistical challenges of operating in such a harsh sustainment environment. The British General Wellington ordered a scorched earth policy to destroy the land capable of supporting foraging and withdrew to the fortifications in the Lines of Torres Vedras that took advantage of the arduous geography in October 1810. After Massena approached the Lines of Torres Vedras, he realized more troops were required to attack the fortifications. As a result, Massena waited on reinforcements from Marshals Mortier and Drouet. On 14 November 1810, the French forces pulled back because there were inadequate supplies to feed the 65,000 men in their army. Wellington's scorched earth policy exploited the harsh climate to prevent the French from using the requisition system or foraging to provide rations. Consequently, Massena's men were starving to death and only 45,000 men were still alive in December 1810.¹⁴ By 3 March 1811, Massena withdrew from Portugal and arrived in Plasencia by the end of March 1811. These same shortages of food rations affected the French defense of the fortifications at Ciudad Rodrigo and Badajoz.

The French forces failed to hold onto the fortifications at Badajoz and Ciudad Rodrigo because the harsh climate in the interior of Spain was ill-suited for supporting the concentration of large forces over a long period of time. In May 1811, Marshal Soult marched south and left General Phillipon with a small force to defend Badajoz because food shortages prevented leaving a larger force behind. Similarly during the winter of 1812, French forces suffered food shortages at Ciudad Rodrigo. As a result, Marshal Marmont dispersed his forces so they could forage in the dry climate. Wellington took advantage of Marmont's dispersed and hungry troops to capture

Ciudad Rodrigo on 18 January 1812.¹⁵ Furthermore, Wellington conquered Badajoz due to Phillipon's supply shortages on 6 April 1812.¹⁶ Wellington exploited how the Spanish climate left the isolated French fortifications at Badajoz and Ciudad Rodrigo undermanned due to food shortages.

Harsh climate conditions in Russia also presented serious challenges to Napoleon's logistics. The Russian climate along the approach used by Napoleon north of the Pripet Marshes from Poland to Moscow consists of relatively infertile plains ill-suited for supporting large armies. These plains suffer extreme temperature variations capable of killing men and horses from exhaustion in the heat of the summer and from exposure in frigid winters. Furthermore, the poor peasants refused to cooperate with the French requisition system because they often only had enough food for themselves. The relatively infertile plains offered little food for foragers in June and July of 1812 because the few crops in the fields were not ready to harvest until August.¹⁷ The tremendous losses suffered on both the advance to Moscow and the retreat from Moscow from a lack of food and temperature extremes show how the climate can influence an operational campaign through logistical problems.

The advance towards Moscow suffered tremendous human and animal losses from starvation and illnesses exacerbated by the lack of food and harsh weather. Marshal Murat's cavalry set the fast pace for the initial advance into Russia during late June and early July of 1812. These first few days experienced "suffocating heat" followed by torrential downpours of rain that caused the temperature to drop.¹⁸ By the first week in July, men and horses were already starting to die from hunger and illnesses. Consequently, men left their heavy winter coats behind. Unfortunately, the countryside provided little food from foraging and requisitions at the same time that the heavy effort required to maneuver in the temperature extremes increased

caloric and hygiene requirements. After 300 miles of hard marching to Vitebsk, one third of Napoleon's men were deceased due to starvation and illnesses made more susceptible by the lack of food.¹⁹ This almost daily trend of losing men and horses to hunger continued on as Napoleon's men reached Smolensk on 16 August suffering from hot days, cold nights and extremes of either dry dust or torrential downpours of rain. Even though Napoleon's men won the Battle of Borodino on 7 September 1812, the French army remained unable to gain a decisive victory over the Russians due to exhaustion from the hunger.²⁰ By the time Napoleon reached Moscow on 14 September, only one third of his men remained due to starvation and the lack of food making men susceptible to illnesses.²¹ Napoleon and his men did not find enough nutritious food in Moscow to sustain the forces more than a few weeks; however, they did find weather getting colder by the day. In one month in Moscow, 20,000 horses died from either Murat's men slaughtering them for food or from lack of fodder.²² Due to the harsh effects of this climate, Napoleon retreated from Moscow towards Smolensk as a result of culmination.

Unfortunately for the French army in retreat, this same climate that was already ill-suited for supporting large armies in the fall only worsened with the oncoming winter. Napoleon attempted to reach Smolensk by a different southern route than he advanced towards Moscow on. However, the Russian General Kutuzov stopped Napoleon's advance on this route at the Battle of Maloyaroslavets on 24 October 1812. Napoleon decided that his army was too hungry and exhausted to risk forcing their way through the Russian lines (i.e., the French army had reached culmination).²³ Thus, the French army continued the retreat to Smolensk along the same route that they had advanced towards Moscow on. As a result, the countryside provided no food for foragers because it had already been stripped bare by the Russians and French one month earlier.²⁴ The main source of sustenance became the cavalry's horses after the supply depots at

Smolensk were looted by the starving French men. Over 45,000 horses died from exhaustion of pulling loads in the snow without fodder in just a few weeks because their caloric requirements increase in a similar manner to humans while working in harsh climates.²⁵ The French soldiers died from exposure to temperatures well below freezing because they left their winter gear behind and from starvation. By the time Napoleon's troops arrived in Germany, the French army suffered over 500,000 casualties with the vast majority from starvation, illnesses exacerbated by hunger and cold, and exposure.²⁶ This total devastation of the French army illustrates the impact the harsh climate had on Napoleon's Russian campaign. These same trends still existed in the Russo-Japanese War despite the technical advancement of railroads.

Harsh climate conditions in eastern Russia, northern Manchuria, and northern Korea also presented logistical difficulties for the Russian military during the Russo-Japanese War of 1904-1905. As a result of the cold winters, the ground typically remains frozen six feet deep until July in Siberia.²⁷ After the wintry blizzards pass, the summers experience hot weather with bright sunlight. The approximately 400 mile long and 45 mile wide Lake Baikal and nearby mountain ranges divide Russia from its eastern regions along the Pacific Ocean. Japan timed its surprise attack on the Russian Pacific fleet at Port Arthur to take advantage of this harsh climate.

Japan chose to attack in the winter of 1904 because they knew the harsh climate caused logistical requirements to increase while logistical capabilities would decrease for the Russians. Every winter, the Trans-Siberian Railway had an annual bottleneck when Lake Baikal froze over.²⁸ The Trans-Siberian Railway had a gap in the railroad line caused by the Russian geography. Lake Baikal and the nearby mountain ranges caused this gap between Russia and northern Manchuria / northern Korea. As a result, Russia used ferries to bring men and supplies across Lake Baikal because there were no completed tunnels through the mountains. During the

winter, the two ferries remained unable to cross Lake Baikal because it was frozen over.²⁹ Furthermore, the train engines cracked during the winter if the engines were not kept warm. During the December 1904, two trains derailed west of Lake Baikal causing a complete halt to traffic for three days.³⁰ During this time no fuel could be distributed to the trains east of Lake Baikal and train engines cracked in the bitter cold (i.e., logistical capabilities decreasing). This forced the cancellation of troop transports for ten days and supplies for 23 days.³¹ Keeping the engines warm while waiting on supplies and troops to make it across the frozen Lake Baikal unfortunately increased the fuel requirements. The Russian resorted to using 3,000 horses to pull supplies on sleighs across the lake while troops marched across the lake.³² Thus at the same time logistical requirements increased during the cold winter with increased fuel and fodder requirements for the trains and horses, Russian logistical capabilities decreased due to the Lake Baikal bottleneck. As a result of the harsh climate, the Russian logistical system remained unable to adequate support operational requirements. The extreme temperature range only exacerbated this logistical problem due to uniform and caloric requirements (i.e., logistical requirements increasing).

For the cold winters, Russia issued its forces greatcoats, hats, and boots that were not designed for the summers. During the summer heat exceeding 100 degrees Fahrenheit retreating from the Yalu River, Russian forces suffered sunstrokes due to the hats designed for winter not providing protection from the sun.³³ While continuing the retreating from Japanese forces after the battle at Liaoyang in September 1904, Russian troops left their heavy greatcoats that were weighing them down behind. Furthermore, the stubble left behind from harvested millet ripped the Russian boots designed for winter to shreds after less than 20 miles of marching.³⁴ Russian forces chose to wear Chinese cotton padded coats and shoes to have something to wear. As a

result by December 1904, General Kuropatkin proclaimed that he would not enforce uniform regulations.³⁵ The harsh climate also impacted hygiene as well.

With the cold winter setting in while Russian troops were in Mukden, diseases spread amongst the hungry soldiers who were not supplied with proper gear and nutrition. Russian soldiers complained that they had no blankets for warmth. With inadequate food, improper clothing, and inadequate quantities of blankets, diseases spread. Dysentery spread so fast that doctors falsely claimed it was influenza for morale purposes.³⁶ The weakened Russian forces actually outnumbered the better supplied Japanese forces at the Battle of Mukden but lost due to the cumulative effects of culmination.³⁷ Kuropatkin's ill-sustained forces suffered 41,000 casualties in comparison to 20,000 Japanese casualties.³⁸ These harsh climate effects still affected Soviet logistics performance in the Soviet-Afghan War despite the advances in technology of mechanization and aviation.

Afghanistan possesses a harsh climate characterized by temperature and altitude extremes. The southwestern part of the country consists of dry desert terrain while mountain ranges divide the central and eastern regions of Afghanistan. The elevations in the mountainous areas often exceed 10,000 feet.³⁹ Furthermore, Afghanistan's dry climate produces dust and rock slides that affected equipment performance. As a result of this harsh climate, Soviet forces remained dependent on logistical support systems for higher quantities of food, water, fuel, and spare parts than initially planned (i.e., logistical requirements are increasing).

In this harsh operating climate, the isolated Soviet bases in Afghanistan required innovative ways to distribute food and supplies that were difficult to maintain. With the dry climate, Soviet forces depended on logistics to distribute rations that were being consumed faster

than planned due to the higher altitude and temperature extremes in Afghanistan. This need actually drove Soviet forces to start using helicopters for logistical missions to provide rations to isolated bases.⁴⁰ Soviet logistics transported higher quantities of rations than initially planned and as a result, spare parts and fuel deliveries suffered. The Soviets actually set up fuel lines to transport gasoline in pipelines to free up trucks for rations deliveries.⁴¹⁻⁴² The lack of spare parts directly impacted Soviet operational readiness in the harsh Afghanistan climate (i.e., vehicles breaking down decreased logistical capabilities).

The Soviet Union did not account for Afghanistan's harsh climate in its logistical maintenance plans and as a result experienced unexpected vehicle break downs. The Soviets planned on maintenance rates based on their experiences in Europe which is a more moderate climate in comparison to Afghanistan. In fact, the vehicle breakdown rates in Afghanistan exceeded the eastern European rates by up to three times.⁴³ With the lack of spare parts due to the logistical system focusing on the increased rations requirements, vehicle maintenance was routinely delayed until vehicles actually broke down. So many vehicles broke down that Soviet maintenance reorganized to have repair technical specialists at the company level instead of at the battalion level as their doctrine called for.⁴⁴ The Soviet Union was trying to reduce the number of abandoned or towed vehicles for convoys which consisted of between 100- 300 trucks typically.⁴⁵ Afghan Mujahideen routinely targeted convoys with towed vehicles because the towed vehicles slowed down the convoys moving along the mountainous roads. Furthermore, the immature transportation infrastructure in the Iberian Peninsula and Russia for the Napoleonic Wars, Manchuria and Eastern Russia, and Afghanistan only added to the logistical difficulties caused by the harsh climate effects.

Immature transportation infrastructures create challenges for logistical systems to distribute supplies to troops. In the Napoleonic Wars, logistical transportation mainly consisted of wagons pulled by horses and barges travelling on waterways such as canals. With technology advancing, the Russian logistical system depended on railroads and ships powered by coal. Further technical advances enabled the Soviets to use mechanized vehicles and aviation assets to distribute supplies in Afghanistan. During the Napoleonic Wars, the immature transportation infrastructure in the Iberian Peninsula and Russia increased the logistical difficulties in sustaining French forces already experienced due to the ill-suited climate for requisition and foraging. When foraging and requisition fail to provide sustenance, large armies need supply trains to distribute food. This large scale distribution of supplies encountered tremendous difficulties in the Iberian Peninsula and Russia during the Napoleonic Wars.

The Iberian Peninsula's transportation network consists mainly of narrow roads winding through mountains and incapable of handling major supply trains necessary to sustain large armies fighting in operational campaigns when foraging and requisition are difficult. The Pyrenees mountain range separates the Iberian Peninsula from France. These mountains block most land roads capable of handling logistical supply trains. In fact, this geography only allows two major roads into Spain: one from Bayonne along the Bay of Biscay eventually leading to Madrid and the other from Perignan along the Mediterranean leading to Barcelona. These roads drove French conquests to focus on the interior of Spain near Madrid initially and left the coast protected by English naval forces and Spanish ground forces. The narrow roads in the Iberian Peninsula routinely turned into mud and blocked French logistical trains. The Pancorbo between Burgos and Miranda de Ebro exemplified how bottlenecks slowed down logistical supplies along the main road from Madrid to France.⁴⁶ In the mountains, soldiers often only got one meal a day

delivered by mules because there was no other way to sustain them on the winding narrow paths.⁴⁷ These logistical difficulties negatively impacted French army movements and led to the embarrassing surrender of an entire corps by Marshal Dupont.

Marshal Dupont conquered Cordoba after departing from Toledo in 1808 but his progress was hampered by the poor roads. The French troops sacked Cordoba and seized tremendous amounts of loot from the Spanish. However, Dupont lacked initiative and remained in the area wasting nearly a month from 18 June through 15 July 1808.⁴⁸ Eventually, Dupont decided to withdraw north; however, the poor roads slowed down his supply train convey loaded down with loot. The famous historian Charles Oman noted that the two and a half mile long convoy had 500 wagons pulled by oxen on narrow roads.⁴⁹ With Dupont's movement hindered by the poor roads, Spanish forces and guerillas outmaneuvered the French forces and attacked from the front and back. Dupont's surrender represented the first major defeat of a French corps under the Napoleonic system. The poor roads in Spain directly factored into this defeat because it hindered the maneuver warfare needed for Napoleonic warfare. Poor roads in Portugal also hindered Soult's invasion of Portugal from Spain.

Marshal Soult failed in the second invasion of Portugal due to the immature transportation infrastructure in the Iberian Peninsula. Due to heavy rains, the French army could not cross the Minho River because an adequate bridge did not exist there. As a result, Soult traveled to Orense in February 1809. The mountainous and muddy roads in Galicia and northern Portugal hindered the movements for the wagons and heavy guns; therefore, the wagons and heavy guns were sent back to Tui.⁵⁰ Without the heavy guns to conduct sieges and wagons to bring supplies, Soult found it difficult to capture fortified cities. Without supply wagons for sustainment, Soult remained unable to feed his men and horses due to the inability to adequate

forage in the harsh climate as discussed earlier unsuccessfully. The inadequate transportation infrastructure also impacted Massena's invasion of Portugal.

In the fall of 1810, Marshal Massena led the third invasion of Portugal and faced difficulties getting reinforcements and supplies across the Codes River to defeat Wellington at the Lines of Torres Vedras. As a result of Wellington's scorched earth policies and climate ill-suited for foraging, Massena's men started to starve by November 1810. French forces could not cross the Codes River to get supplies to Massena even though they were only 20 kilometers (km) apart.⁵¹ This inability to deliver supplies 20 km due to a river clearly illustrates how the lack of a mature transportation infrastructure negatively impacted French operations. Understandably, Massena withdrew his forces before they all starved to death. Russia's immature transportation infrastructure also negatively impacted the ability of Napoleon to sustain his forces.

The northern route Napoleon chose to invade Russia with consists of several rivers and sandy roads that turn to mud during rain that negatively affected the French logistical distribution system. The Russian immature transportation infrastructure caused logistical difficulties in the actual distribution of food and water to the men and animals.⁵² The rivers in western Russia turned out to be shallower than those used by Napoleon in central Europe for barges and also routinely alternated between liquid water and frozen ice due to huge temperature variations. Also, Napoleon used standard four horse wagons and horseshoes to distribute goods on the poor Russian roads.

During the invasion of Russia, Napoleon advanced forward at a pace the logistical system was unable to support on the poor roads and shallow rivers. Torrential downpours during the first two weeks caused the sandy roads to turn into muddy bottomless pits. The standard four horse

wagons used by Napoleon's logistical system proved too heavy for the mud and routinely sank or had broken axles.⁵³ Furthermore, the Vilnya River turned out to be too shallow to allow barges to ship goods on.⁵⁴ As the French reached Moscow, Napoleon's logistical train struggled to distribute supplies over 600 miles from the Polish border along muddy roads that caused backups. With the climate unable to support foraging and the logistical system unable to transport adequate quantities of supplies to Moscow, Napoleon retreated.

During the retreat from Russia, the muddy roads turned slippery in the ice and snow. Napoleon's logistical system issued standard horseshoes for the horses despite the cold winters in Russia. Without winter horseshoes equipped with spikes for traction on ice, the horses slipped going downhill, fell underneath their loads, and then broke their legs.⁵⁵ Once the horses broke their legs, Napoleon's starving men carved them up for dinner. Without enough horses, the logistical supply distribution problems only worsened and caused more men to starve. Similar transportation issues caused logistical difficulties in the Russo-Japanese War.

The Russian ports of Vladivostok and Port Arthur relied on utilizing only two different methods of transportation infrastructure: the Trans-Siberian Railway and sea trade. However, the Trans-Siberian Railway consisted of a single track line capable of only four pairs of trains a day in contrast with the required 90 to meet Russian logistical operational requirements.⁵⁶ In addition, the Russian fleet became more of a fleet in being after the Japanese surprise attack at Port Arthur. The Russian Baltic fleet did not arrive in the eastern region until the end of May 1905 due to its voyage around Africa.⁵⁷ Consequently, the Russian forces in northern Manchuria, eastern Russia, and northern Korea depended on the immature Trans-Siberian Railway for logistical support.

The immature transportation infrastructure of the Trans-Siberian Railway resulted in frequent delays in distributing supplies to Russian forces that directly affected their health. Harbin routinely saw train delays due to congestion from where the Trans-Siberian Railway branched to either Vladivostok or Port Arthur. These delays typically exceeded 48 hours.⁵⁸ As a result of the single track line incapable of supporting logistical requirements along with the Lake Baikal and Harbin bottlenecks already mentioned, Russian forces suffered shortages of hospital supplies, ammunition, clothing, and food. The shortages of hospital supplies, clothing, and food contributed to the spread of diseases (e.g., dysentery in the winter) as already discussed. In addition, ammunition shortages resulted in direct operational impacts.

The Russo-Japanese War experienced the use of breech loading rifles and machine guns that require tremendous quantities of ammunition. With the Trans-Siberian Railway bottlenecks due to Lake Baikal, Harbin, the single track, and high gradients, Russian logistics remained unable to adequately provide its troops with ammunition. The railroad track was laid quickly and shoddily alongside mountains east of Lake Baikal. Unfortunately, this resulted in gradients that restricted train speeds to six miles per hours (i.e., only about twice as fast as horse drawn carriages).⁵⁹ Russian forces retreated from two different battles because of ammunition shortages (i.e., they ran out of bullets to fire). At the battle of Nanshan, Russian batteries started out with 10 rounds each and ran out of ammunition by noon on 26 May 1904.⁶⁰ After the Russian retreat, Japanese forces seized Dalny and isolated Port Arthur, which eventually fell in January 1905 due to not being sustained properly (e.g., starvation and diseases like scurvy). Similarly, the Russian forces ran out of ammunition, water, and food while defending Manju Yama.⁶¹ After losing Manju Yama, Russian forces retreated 40 miles north to Mukden. Afghanistan also suffers from an immature transportation infrastructure that hindered Soviet logistics.

Afghanistan mostly consists of narrow trails winding through mountainous regions incapable of allowing large logistical convoys to efficiently distribute supplies. The entire country's paved roads reached a length of only 1,553 miles in the 1980s.⁶² The three major roads include one 300 miles in length from Termez in the Soviet Union to Kabul, another from Kabul to Jalalabad, and the third from Herat through Kandahar to Kabul. The road from Kabul to Jalalabad remains the only major route going east-west. Additionally, Afghanistan possessed no railways and only two major airfields: Kabul and Bagram. Additionally, the primary road into Afghanistan from Termez passed through the Salang Tunnel due to the mountainous terrain.

The Salang Tunnel and road from Termez became a choke point for Soviet logistics due to the immature transportation infrastructure. In 1982, the infamous Salang Tunnel explosion caused 1,000 casualties and resulted in a complete logistics stand still.⁶³ Furthermore, the road from Termez passed through rocky, mountainous terrain. Convoys that consisted of between 100 – 300 trucks routinely took 14 days to traverse 300 miles.⁶⁴ Aviation allowed Soviet forces to transport supplies into the airfields but did not help in adequately distributing supplies to the isolated bases.

Soviet aviation transported logistical supplies into Bagram and Kabul airfields regularly; however, as discussed earlier, the road infrastructure in Afghanistan remains lacking. With only a few roads, Soviet logistical convoys only possessed a few options for distributing supplies from the airfields to the isolated bases. This immature transportation infrastructure enabled Mujahideen fighters to know which way Soviet convoys had to go because there were few roads capable of handling Soviet trucks (i.e., immature transportation infrastructure actually enabled irregular threats to the supply lines).

With the climate and transportation issues, the irregular threats to supply lines formed a triad of logistical issues that prevented the proper sustainment of French troops in the Iberian Peninsula and Russia, Russian troops in the Russo-Japanese War, and Soviet forces in the Soviet-Afghan War. Irregular threats to logistical systems remain another element of the logistical triad that has produced challenges regardless of technical advances.

Spanish guerilla troops and Russian Cossack cavalry deliberately attacked French supply convoys because the harsh climates and immature transportation infrastructures made the supply lines an easy, important target. The French forces needed supply convoys because foraging was inadequate. Unfortunately, the immature transportation options limited the speed and routes available for the supply convoys. Thus, the Spanish guerillas and Russian Cossacks produced significant logistical difficulties for the French troops by disrupting their supply lines.

The Iberian Peninsula campaign experienced a relatively new form of asymmetric warfare for the early 1800s where guerillas deliberately targeted French supply lines to prevent their logistical sustainment. The French campaign plan called for Marshal Junot to conquer Portugal while other French commanders such as Dupont and Moncey were to surreptitiously conquer Spain by pretending to support operations in Portugal. In accordance with this plan, Napoleon arranged for most of the Spanish royal family to be deposed and placed his brother Joseph on the throne. This seminal event, El Dos de Mayo, led to tremendous popular revolts against any Spanish leaders who wanted to cooperate with the French⁶⁵. These popular revolts eventually turned into guerilla warfare against the French. In fact, the word guerilla came into the English language from the Spanish forces which constantly harassed French supply lines and foraging parties⁶⁶.

The first invasion of Portugal failed because Marshal Junot was unable to protect his supply lines. Due to the harsh climate and immature transportation infrastructure in the Iberian Peninsula, Junot depended on sustenance provided by his slow moving logistical system under protection from rear forces. After guerilla forces severed Junot's supply lines with Madrid, he diverted troops to Elvas to try to re-establish supply lines.⁶⁷ Since Junot was unsuccessful at protecting his long supply lines from guerillas, he surrendered to the British General Dalrymple before his troops starved in the Iberian climate ill-suited for foraging.⁶⁸ Similarly, the Spanish guerilla Ballesteros prevented the capture of Cadiz by severing the Spanish supply lines.

Even though Marshal Soult captured Seville and most of the cities in Andalusia from 1810- 1812, French troops under Marshal Victor failed to capture Cadiz because of Spanish guerilla attacks on their supply lines. In fact, the Spanish guerilla leader Ballesteros captured so many supply conveyances that even couriers needed 200 men to guard them.⁶⁹ Using British Gibraltar for sanctuary, Ballesteros turned the situation around 180 degrees by constantly harassing French forces that tried to utilize supply lines for delivering messages or distributing supplies in Andalusia. Instead of being the besiegers, the French effectively became the besieged unable to distribute sustenance securely because of the pervasive guerilla attacks on supply lines. With French troops bogged down in Andalusia fighting guerillas and unable to protect their supply lines, King Joseph ordered Marshals Soult and Victor to withdraw and help him fight the British General Wellington. Similarly in Russia, the failure to protect supply lines negatively affected Napoleon's logistical system performance.

While Napoleon's forces remained in Moscow, the Russian General Kutuzov focused on attacking the French supply lines. Kutuzov ordered the armed peasant militias and feared Cossack cavalry to intercept any French supplies coming into Moscow.⁷⁰ With the lack of food

due to the harsh climate, Napoleon depended on supply wagons to bring sustenance from Smolensk to Moscow. Unfortunately, the poor transportation infrastructure slowed down the heavy wagons which became easy prey for the Cossack cavalry.⁷¹ Thus, Napoleon's forces began the long retreat towards Germany because of the logistical failures.

During the retreat, the Russian Cossack cavalry routinely looked for soft targets such as supply wagons and logistical convoys to attack. These attacks became so prevalent that French discipline in the rear guard rapidly disintegrated.⁷² The Cossacks mistook Napoleon's convoy for a supply convoy and almost captured him until the Imperial Guard chased them away.⁷³ With these frequent cavalry attacks, the retreating French forces remained unable to resupply and reached Smolensk in near chaos. The utter failure of this logistical system resulted in the French troops ransacking their own supply depot in Smolensk; therefore, the chaotic French retreat continued. This irregular threat to supply lines also negatively affected Russian logistics in the Russo-Japanese War.

Japan deliberately planned on using irregular forces to threaten Russian logistical supply lines. Even before the war started, Japan sent men and women disguised as Chinese peasants into Manchuria. The Chunchuses deliberately targeted ammunition depots, food storage facilities, and rail lines for the Trans-Siberian Railway. Furthermore, irregular forces incited revolts in Finland and Poland and labor strikes at industry supporting the war.

Colonel Akashi directed Japanese irregular activities under the guise of being a military attaché in Europe. His primary goals included disrupting the Trans-Siberian Railway and the means to support the war within the Russian Empire.⁷⁴ Akashi supported Lenin whose revolutionary writings instigated the St Petersburg ironworks and electricity industry went on

strike in January 1905.⁷⁵ These industries provided the means necessary to fight (e.g., guns and railway carriages). Furthermore, Akashi incited Polish insurrections that took 300,000 Russian troops to quell.⁷⁶ Additionally, Japanese irregular forces disrupted logistics on the Trans-Siberian Railway.

Approximately 71 irregular Japanese forces organized in six squads operated behind Russian lines to disrupt Russian logistics.⁷⁷ They were so successful that Russian leaders thought 10,000 Japanese soldiers were operating against Russian logistical supply lines.⁷⁸ The Japanese forces succeeded by dressing as Chinese peasants to include using pigtailed as part of their disguises. By deliberately targeting the railways, ammunition depots, and food storage facilities, the Chunchuses added to the total chaos on the Trans-Siberian Railway. These commando raids led Russian generals to report that Japanese forces were trying to seize Harbin.⁷⁹ These irregular threats enabled the Japanese victory at Mukden by contributing to the Russian culmination as discussed earlier. Similarly, Soviet forces suffered from irregular threats to its supply lines during the Soviet-Afghan War.

Due to the few transportation options available, Afghan Mujahideen fighters routinely ambushed convoys on roads and bridges. The Panjshir Valley offered an excellent place to operate irregular forces from for attacking the Salang Tunnel and road from Termez. For example, Ahmed Shah Massoud, the Lion of Panjshir, damaged three bridges on the Salang highway and ambushed a fuel convoy slowed down by the bridge damage in April 1984.⁸⁰ Mujahideen raids and ambushes became so successful that three fourths of Soviet forces were tied down protecting supply lines instead of conducting offensive operations and cargo planes had to land at night instead of during the day.⁸¹⁻⁸² By the end of the war, Soviet forces lost over

11,000 trucks from logistical convoys to Afghan irregular forces.⁸³ Soviet operations tried to fight this irregular threat unsuccessfully.

The largest combined action of the Soviet-Afghan War, Operation Magistral, aimed to open supply lines from Gardez to Khowst.⁸⁴ This Soviet operation only managed to open the road for 12 days because the Soviet troops did not use proper tactics against irregular forces retreating into the mountains.⁸⁵ The Soviet Union did not use helicopters to drop forces for cutting off the retreat. Additionally, the Soviets did not secure the road passing through the valleys beyond sending forces through to Khowst and back. Afghan forces successfully used tactics based on the geography and transportation infrastructure to disrupt Soviet logistics.

Afghan Mujahideen irregular forces decided to prevent the sustainment of Jalalabad with Operation Ghaskey. They successfully shut down a 70 kilometer stretch of highway between Jalalabad and Kabul for over two weeks. First, they maintained rocket attacks on Kabul's airport and blockaded the road by destroying the Khairokhel, Istekham, and Debili bridges.⁸⁶ After Soviet troops forced their way through the two narrow gorges at each end of the valley, they sent logistical convoys through. However, the Afghan forces planned on this course of events and ambushed the convoys by destroying the first and last vehicles first. This one ambush cost the Soviets over 42 tanks, nine artillery pieces, and 65 trucks.⁸⁷ By utilizing the harsh climate and immature transportation infrastructure, Afghan Mujahideen successfully attacked Soviet supply lines using irregular forces.

The Napoleonic Wars, the Russo-Japanese War, and the Soviet-Afghan War provide examples of how the synergistic logistical triad elements resulted in operational defeats if not adequately prepared for beforehand. The harsh climates in the Iberian Peninsula and Russia for

the Napoleonic Wars, eastern Russia and Manchuria during the Russo-Japanese War, and Afghanistan for the Soviet-Afghan War did not produce adequate sustenance for foraging and experienced extreme temperatures that tended to enable the spread of illnesses in hungry men. Additionally, the harsh climate caused a logistical gap because requirements were increasing while capabilities simultaneously decreased (i.e., increased caloric requirements when animals and equipment do not perform as well). Without adequate food and clothing, the immature transportation infrastructures only exacerbated the logistical difficulties in supplying the armies because supply convoys could not properly sustain (e.g., not enough ammunition could be distributed). Furthermore, the failure to protect supply lines from irregular threats in these campaigns further intensified the logistical shortcomings due to the harsh climates and immature transportation infrastructures because enemy forces were preventing sustenance from reaching the starving men. These three factors synergistically formed a logistical triad that led to Napoleon's defeats in the Iberian Peninsula and Russia, Russia's defeat in the Russo-Japanese War, and the Soviet Union's defeat in Afghanistan. These three logistical factors have influenced operational campaigns across technological advances and need to be planned for in future campaigns.

This logistical triad still influences operational campaigns in modern warfare. Due to the climate in Afghanistan that is ill-suited for supporting large armies with foraging and requisition, the United States (US) and the North Atlantic Treaty Organization (NATO) depend on logistics to supply their troops with the increased calories required to properly fight. The immature transportation infrastructure in Afghanistan restricts how the US and NATO logistical system transports these supplies because so few of the roads are paved and can handle heavy vehicles. The challenge to protect supply lines from irregular threats also affects operations in Afghanistan

because supply convoys in Pakistan have been held up or destroyed. Furthermore, insurgents target supply convoys that utilize the few paved roads with explosive devices. Therefore, the logistical system tends to utilize air mobility forces for distribution of supplies. If irregular forces threatened cargo planes, the logistical challenges would only increase.



End Notes

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1. Rothenberg, 34.
 2. Rothenberg, 34, 98-101.
 3. Elting, 554.
 4. Elting, 561.
 5. Forrest, *The Soldiers of the French Revolution*, 128.
 6. Connelly, 93.
 7. Elting, 564.
 8. Elting, 566.
 9. Jukes, 6.
 10. Army Regulation 40-25, 4.
 11. Army Regulation 40-25, 4.
 12. Army Regulation 40-25, 4.
 13. Lipscombe, 112.
 14. Lipscombe, 198.
 15. Lipscombe, 248.
 16. Lipscombe, 254.
 17. Gates, 207.
 18. Connelly, 168.
 19. Connelly, 170.
 20. Connelly, 176.
 21. Van Creveld, 70.
 22. Connelly, 180-181.
 23. Connelly, 182.
 24. Gates, 216.
 25. Connelly, 183-184.
 26. Connelly, 189.
 27. Warner and Warner, 138.
 28. Warner and Warner, 166.
 29. Jukes, 16-17.
 30. Warner and Warner, 450.
 31. Warner and Warner, 450.
 32. Warner and Warner, 137.
 33. Warner and Warner, 322.
 34. Warner and Warner, 390-392.
 35. Warner and Warner, 389-390.
 36. Warner and Warner, 387.
 37. Loucks, 7.
 38. Warner and Warner, 400.
 39. Baumann, 134.
 40. Russo, 9.
 41. Tanner, 247.
 42. Russo, 12.
 43. Russo, 14-15.

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44. Russo, 15.
 45. Russo, 10.
 46. Esdaile, 28.
 47. Forest, *The Soldiers of the Revolution*, 151.
 48. Oman, 132.
 49. Oman, 189.
 50. Lipscombe, 112.
 51. Lipscombe, 180.
 52. Gates, 209.
 53. Van Creveld, 65.
 54. Van Creveld, 65.
 55. David, 3.
 56. Menning, 146.
 57. Menning, 155.
 58. Warner and Warner, 386.
 59. Jukes, 17.
 60. Warner and Warner, 291-292.
 61. Warner and Warner, 371.
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 63. Russo, 11.
 64. Russo, 11.
 65. Lefebvre, 250-253.
 66. Esdaile, ix.
 67. Lipscombe, 56, 64.
 68. Esdaile, 30.
 69. Esdaile, 55.
 70. Connelly, 180.
 71. Van Creveld, 65.
 72. Van Creveld, 65.
 73. Connelly, 182.
 74. Kujala, 261.
 75. Warner and Warner, 453.
 76. Kujala, 277.
 77. Warner and Warner, 450.
 78. Warner and Warner, 450.
 79. Warner and Warner, 450.
 80. Tanner, 260.
 81. Jalali and Grau, 147-148.
 82. Tanner, 267.
 83. Jalali and Grau, 149-150.
 84. Baumann, 149.
 85. Jalali and Grau, 172.
 86. Jalali and Grau, 179-181.
 87. Jalali and Grau, 184.



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