Arctic Forge 25

NO.25-1049
July 2025

Center for Army Lessons Learned

The Center for Army Lessons Learned leads the Army Lessons Learned Program and delivers timely and relevant information to resolve gaps, enhance readiness, and inform modernization.

CONTACT US

10 Meade Ave.
Bldg 50
Fort Leavenworth
KS 66027

DSN: 552-9533
913-684-9533

DIRECTOR
COL Scott Allen

AUTHORS
CPT Spencer Cavotti
1LT Eric Shields
1LT Trevor Ingraham
1LT Tanner Kublick
2LT Karlyn Ponsness

CALL Analyst
SFC Joshua Meek

Arctic Forge Reflections

CPT Spencer Cavotti: Company Commander

Introduction

Arctic Forge 2025 was a multi-national NATO training exercise with three main purposes:

- Validate the rapid over-the-pole reinforcement of NATO allies in the arctic
- Deter adversarial aggression within the high north
- Provide an opportunity for NATO allies to train together

In preparation for the February exercise, HHC, 2-14IN sent 25% of its Soldiers to Fort Drum to attend the Cold Weather Operations Course (CWOC), led by the Fort Drum Mountain Training Group. The remaining Soldiers honed their skills through physical training sessions on snowshoes and military cross-country skis.

As part of reception, staging, onward movement, and integration (RSOI), the company deployed to Fort Wainwright, Alaska two weeks before joining TF Blackhawk and deploying to Finland. While in Alaska, they completed 11th ABN DIV CWOC Training, focusing on fieldcraft and survivability. On February 17th, 2025, TF Blackhawk deployed to the Sodankylä Training Garrison in Finnish Lapland.

TF Blackhawk integrated the 5-1 Cavalry Squadron Headquarters, A/5-1 Cavalry Troop, a Canadian Direct Fire Support (DFS) Platoon (Anti-tank) from the 3rd Royal Canadian Regiment (Petawawa), a Finnish Infantry Company from the Kainuu Brigade (Kajaani, Finland), and HHC, 2-14IN. HHC, 2-14IN then uniquely constructed Team Headhunter, a 100-Soldier unit comprised of a standard light infantry mortar platoon, a sapper platoon, a dismounted anti-tank assault platoon, a scout platoon, and the company headquarters.

During the first week in Lapland, TF Blackhawk conducted familiarization training on standard Finnish equipment, including the BV-206 (Small Unit Support Vehicle), sport utility snowmobiles, Finnish arctic tents, Nordic cross-country skis, and ahkio sleds. A three-day field training exercise then pitted TF Blackhawk against a Finnish Company Team from the Jaeger Brigade, consisting of light infantry soldiers and Leopard 2A4 tanks.

Left: BV-206 Troop Transport Vehicle; Right: Scout Snow Mobile Training

Left: Mortar Squad Pulls Loaded Ahkio Sled; Right: Finnish Arctic Tent

Throughout the exercise, Observer-Controller/Trainers (OC/Ts) emphasized that rather than simply enduring a short-term training exercise, the Finnish arctic environment and potential adversaries demand a focus on prolonged arctic combat operations. While OC/Ts acknowledged that TF Blackhawk could sustain its operational tempo for three days, they noted that they would struggle to maintain that intensity over three weeks or longer. This observation highlighted a key difference between typical US training exercises – with defined start and end dates – and the open-ended nature of large-scale combat operations (LSCO).

The ongoing Russo-Ukrainian War, now in its third year, underscores the need to prepare for prolonged conflict. Finnish soldiers prioritize sustainment and survivability in static defensive positions and tailor offensive tactics to overcome numerically superior forces. They demonstrate a commitment to equipment maintenance and fieldcraft to maximize their battlefield endurance.

The following sections of this paper present reflections from the Mortar, Scout, Assault, and Sapper Platoon Leaders, as well as company-level insights, detailing how each unit overcame the challenges of the arctic environment. Each leader discusses the unique obstacles they faced, their tactical responsibilities, and their adaptations for success. Although all platoons encountered similar challenges – mobility, cold-weather survivability, and sustainment operations – their specific missions led to diverse solutions.

Employment of Mortars in Extreme Cold Weather

1LT Eric Shields: Mortar Platoon Leader

Introduction

While operating in extreme cold weather conditions provides significant challenges to every Soldier, these conditions pose additional challenges to a mortar platoon. As outlined in ATP 3-90.97, *Mountain Warfare and Cold Weather Operations,* this environment presents unique challenges that directly impact individual and unit performance:

- Movement of personnel and equipment through deep snow using unfamiliar equipment (snowshoes, Ahkios, snow machines, etc.)
- Environmentally unique sustainment factors (temperatures, water requirements)
- Environmental effects causing increased physical and mental strain during extended operations

Stress and Fatigue of Cold Weather Situational Training Exercises

Each mortarmen began the exercise carrying their standard sustainment load plus three 81mm rounds – an additional 30 pounds (10 pounds per round). Additionally, gunners carried the cannon tube (31 pounds), assistant gunners the bipod (18 pounds), ammo bearers carried the baseplate (23 pounds) and a M240L machine gun (22 pounds). Leaders supplemented their gear with extra rounds, radio, and spare batteries, resulting in rucksack weights exceeding 80 pounds for each mortarmen.

Moving with these loads is challenging in any condition, but deep snow and below-freezing temperatures dramatically increased fatigue and stress for all Soldiers during the operation. Continuous operations in the austere arctic environment risk serious degradation of combat effectiveness, a consequence of the mission's inherent physical and mental demands.

This risk is particularly severe given how fatigue differentially impacts various abilities. As the U.S. Army Research Institute for the Behavioral and Social Sciences noted in 1985, "performance does not degrade equally across all duty positions.[1] Roles requiring significant cognitive effort – determining, calculating, thinking, and decision-making – degrade faster than those that are primarily physical. Consequently, Soldiers in the Fire

[1] Kopstein, F., Siegel, A., Conn, J., Caviness, J., Slifer, W., Ozkaptan, H., & Dyer, F. (1985). Soldier Performance in Continuous Operations: Vol. ARI Research Note 85-68 (p. 10) [Review of Soldier Performance in Continuous Operations]. U.S Army Research Institute for the Behavioral and Social Sciences. https://apps.dtic.mil/sti/tr/pdf/ADA160470.pdf

Direction Center (FDC), due to their demanding mental workload, were more susceptible to rapid mental fatigue during continuous operations than others with more physically demanding duties.

This difference became evident as the exercise progressed. While gun crews experienced increasing physical fatigue during movement and setting up firing positions, it was the Fire Direction Center (FDC) that suffered from escalating mental fatigue and sleep deprivation. The Platoon operated less effectively during the operation, relying on plotting boards to calculate and confirm fires.

To ensure accurate calculations and firing grids, the FDC confirmed calculations on two separate plotting boards. Because of the mental fatigue experienced by the Platoon, the firing data on each plotting board was frequently off, forcing the Platoon to recalculate and slowing fire processing time. The limited number of Infantry Mortar Leader Course (IMLC) graduates further exacerbated the situation, contributing to overall workload challenges.

The initial movement to the Mortar Firing Point (MFP) highlighted the severity of the conditions. While dismounting from the Bandwagon 206 (BV-206), only 150 meters from the MFP, crews instantly sank up to the waistline in snow. Even utilizing the BV's packed tracks to mount skis and snowshoes, a movement that should have taken five minutes stretched to 45 minutes. Dismounted movement with the mortar systems proved untenable.

The combined weight of their equipment further hampered the ammo bearers and gunners, with snowshoes sinking almost two feet in the snow (post-holing), rendering them ineffective. Soldiers were repeatedly stuck, post-holing and falling within the first 20 meters of movement.

To establish a stable firing mortar firing position, already fatigued Soldiers cleared a 3-meter circle of snow down to the ground, removing approximately 11 cubic meters of snow. They then used sandbags filled with snow and pine boughs to create a buffer beneath the baseplate to mitigate recoil.

Following this initial effort, the crew constructed their stage one mortar pits, building a 1.5-meter wall from snow and fallen brush, and then adding personnel bunkers to elevate the position to stage two. The immense energy expended simply emplacing the gun left them with no time to build thermal shelters or address other priorities. By the second day, the signs of fatigue were undeniable. The platoon processed and fired 20 fire missions, displacing every 3-4 missions, but Soldiers exhibited a slowed response to critical displacement criteria, potentially reducing the platoon's survivability.

The challenges of this exercise underscore the critical need for enhanced sustainment planning and self-sufficiency in large scale combat operations (LSCO) in an arctic environment, where platoons may face 96-hour or longer periods without resupply. Adapting to these conditions and integrating robust planning factors into routine training is essential to maintaining combat effectiveness.

The best practices we found to occupy our mortar positions were:

- Move to the MFP without our mortar equipment, creating a beaten trail to each position using skis and snowshoes.
- Make multiple trips to move equipment, minimizing post-holing.
- Plan for extended timeline due to additional steps required for emplacement.

Importance of Sustainment in Fighting Fatigue

At the beginning of the exercise, each Soldier started with one gallon of water on their person, with twenty additional gallons available in our vehicles. Within the first 36 hours, the platoon consumed over 45 gallons of water, 127% of our UBL. Cold-weather MREs require around 12 ounces of boiled water to heat the main meal. For the 14 Soldiers to eat one day’s meals, it required almost three gallons of water.

The platoon boiled snow to procure water. A factor we did not previously consider was the manpower required to sustain a platoon in a cold-weather environment with an adequate water supply. The loss of manpower and the time required to identify a suitable location to boil water added more stress and fatigue to the already burdened Soldier during cold-gun shifts.

The Mountain Safety Research Inc. Whisperlite “Squad stoves” were the primary means used to boil snow; a 24-ounce canteen cup of snow took an unsustainable 45 minutes to boil. Switching to a four-quart pot allowed only one Soldier to generate enough water for five Soldiers for eating and drinking. This action decreased the water refit time from four hours down to one and a half and nested easily into the priorities of work.

The shift to LSCO will offer challenges in sustainment and require units to maintain self-sustainability for longer periods of time. Platoons accustomed to sustainment operations for a 48-hour period could face a 96-hour or longer period without resupply. This is a critical planning factor that units must adapt and develop into routine to maintain combat effectiveness.

Techniques to combat fatigue and sustain combat performance

Recognizing these challenges, the platoon adapted tactics typically employed with 120mm mortars and trailers. Specifically, adopting a herringbone vehicle formation with the BV-206s significantly reduced the workload during emplacement. Further streamlining the process, the BV-206s were used to pack down the snow within the MFPs, creating a firm foundation.

We utilized snowmobiles to establish trails between gun positions and crew serve areas, minimizing physical exertion and accelerating emplacement times. This packed snow also enhanced the MFP's survivability, providing increased resistance to fragmentation and direct fire compared to undisturbed snow.

To further reduce workload and maximize efficiency, we modified the construction of stage two mortar pits to integrate personnel bunkers and thermal shelters into a single structure. This allowed Soldiers to shelter from the elements and enemy fire, as well as rest, directly adjacent to the mortar system.

Maintaining continuous firing capability required a deliberate operational rhythm. Implementing a "Hot/Cold" gun routine, where one gun team answered all initial fire missions while the others rested, proved crucial. This schedule rotated every six hours, ensuring each team received a minimum of four to five hours for rest, weapon maintenance, water procurement, hygiene, and meals. With two shifts per day, each squad sustained continuous operations. These adaptations demonstrate the importance of proactive planning and flexible tactics in mitigating the challenges of cold-weather mortar operations and maintaining combat effectiveness

Conclusion

Wherever the next fight takes us, the ability to provide timely and accurate fires to maneuver elements and conduct survivability moves will degrade as sustainment operations are stressed. Planning considerations for gun section movements, ammunition management, physical fitness levels, combat fatigue, and element conditions are a must. Though mortar fundamentals do not change in the arctic, the above considerations will help to provide units deploying to the arctic a successful head start.

BEST PRACTICE:

- Move to the MFP without mortar equipment first, create a beaten trail to each of the baseplate locations and crew served weapon positions on skis
- Develop work-rest cycle with consideration to the environment
- Identify a mass means of melting snow for troops, allowing for limited personnel to be away from mission critical tasks
- Treat 81mm mortars as 120mm, utilize trailers for movement
- Personnel bunkers should double as thermal shelter for crew, to limit additional emplacement tasks

Arctic Considerations for Scout Units

1LT Trevor Ingraham: Scout Platoon Leader

Introduction

Arctic environments present a multitude of unique challenges for any operational unit attempting to tactically plan, execute operations, and function within them. This became increasingly apparent for the Scout Platoon executing basic reconnaissance tactics during Arctic Forge 25. The Arctic presents unique challenges to a typical mission for a scout platoon; the freezing temperatures and dense, snow-covered terrain made ‘elementary’ tasks exhausting. The following are lessons learned with respect to arctic movement techniques, communication, and self-sufficiency/survivability for scouts.

Movement

Movement, specifically dismounted arctic movements, challenged the endurance of the platoon in uphill movement and through wood lines. Terrain that would typically be unrestricted is unusable because of the waist-deep snow, making almost all terrain restricted for dismounted movement. For this reason, the use of cross-country skis and snowshoes was crucial for dismounted mobility.

While snowshoes and skis made dismounted movement more feasible, they impacted the speed at which the platoon was able to move. For example, a 200-meter snowshoe movement to an observation post (OP) took roughly one hour. In this instance, the terrain and natural obstacles prevented the platoon from using cross-country skis.

Deliberately conducting an in-depth time-distance and terrain analysis during the planning phase of arctic operations is a vital output for reconnaissance leaders, especially when dismounted.

Not only did snow depth affect our dismounted speed, but weight distribution requirements severely impacted movements. Rucksacks filled with operating, and sustainment supplies increased Soldiers’ load weight to 100-120 pounds. Arctic Forge 25 clearly demonstrated the need for mounted capabilities within reconnaissance units conducting arctic operations.

Snow Mobiles

The use of snowmobiles to move personnel and equipment when establishing mission support sites (MSS) and observation posts was critical throughout the operation. Snowmobiles provided the ability to rapidly move through the terrain while maintaining a smaller audio and visual signature than other vehicles. Additionally, they gave reconnaissance teams the ability to pack deep snow, creating trails that supported longer dismounted movements for following scouts.

At no point were the snowmobiles solely for scouting, although through observations, scouts from the Finnish Jaeger Brigade did use snowmobiles specifically tasked to conduct reconnaissance and security operations. Snowmobiles gave Jaeger scouts the ability to move quickly between positions and a mission support site, making visual contact with enemy positions before retrograding and calling for fire.

Small Unmanned Aircraft System (SUAS)

During the exercise, the platoon observed how units overcame dismounted movement challenges using handheld Unmanned Aircraft Systems (UAS) to confirm route suitability before expending ground troops on foot. Implementation of handheld UAS alleviated the need for units to make unnecessary dismounted movements. These systems offer units the ability to rapidly gather intelligence and report without physically having Soldiers at the reconnaissance objective.

Working with 3rd Battalion, Royal Canadian Regiment (RCR), the platoon had the opportunity to understand different tactics of sUAS employment in Arctic environments. RCR employed a dedicated technology sergeant, whose sole focus was on drone operations for the Platoon Commander.

This capability offered the 3rd RCR the ability to receive and report real-time information to higher echelons or call for indirect fires on enemy positions. The challenges with dismounted movements made it clear that Scout units require handheld UAS systems at the team level to support and mitigate exhaustion in arctic environments.

Communication

In the arctic, the weather, terrain, ionospheric disturbances, and satellite access limitations will severely impact radio communications. Access to satellite links is limited by polar night (longer periods of darkness during winter months), increased cloud coverage, and geostationary satellite coverage in the arctic.

Communication and reporting are essential tasks of reconnaissance. Frequency Modulation (FM) and Tactical Scalable MANET (TSM) were preferable for communication at shorter ranges, offering little disturbance. TSM was less reliable over medium-to-long distances and posed problems when trying to troubleshoot.

At longer distances, using the AN/PRC-160 High Frequency (HF) radio and SINCGARS RT-1523 Very High Frequency (VHF) radio provided reliable communication with Company HQ. FM radios were able to communicate over longer distances but often had disturbances when transmitting.

The Android Team Awareness Kit (ATAK) system also offered an effective form of communication and increased awareness of the battlespace. However, wet conditions can degrade the performance of these digital systems. The continuous presence of arctic snow affected the phone charging port, and sub-freezing temperatures impacted battery life.

There were continuous challenges with battery life for all radios, except for the AN/PRC-160 and SINCGARS RT-1523. These systems lasted the duration of the training exercise, while smaller (7.0 Ah and 8.0 Ah) batteries lasted significantly less time. With limited opportunity to charge batteries, utilizing communication/transmission windows reduced radio use and increased battery longevity. This exercise demonstrated the need to employ a robust PACE plan during arctic operations.

Self-sufficiency & Survivability

Self-sufficiency and survivability are crucial elements of Scout platoon success while conducting reconnaissance operations. The arctic sub-freezing temperatures prevent extended time occupying an observation post, making MSSs essential. The mission support site offers opportunities for Soldiers to build warming thermal shelters and consume a hot meal.

MSS allows for rotational observations schedules, given soldiers rest periods included warming activities through uniform layering, constructing thermal shelters, and boiling snow for food and water. Deliberately planned work-rest considerations and constant re-evaluation are a must while in an arctic environment.

The weather, terrain, and communication troubles also impact the resupply function. Snowmobiles enable and assist the platoon with sustainment. The snowmobile gave scouts the ability to tow and cache supplies that were vital to our survivability. This was specifically important for food and water (Class I) and fuel (Class III).

Arctic temperatures and strenuous movements double physical output, which increases the consumption of food and water. Three MSR squad stoves were barely enough to maintain the amount of water needed for every Soldier in the platoon. For arctic scouting operations, every Soldier needs an individual stove to boil their own water supply throughout the operation.

Conclusion

The arctic poses unique problem sets for military organizations attempting to operate. The environment is unforgiving and requires in-depth planning to have success. Challenges that include movement, communication, and self-sufficiency/survivability are only some of the areas in which dismounted reconnaissance units need to focus their training when preparing to operate in arctic environments.

BEST PRACTICES:

- Deliberately conducting an in-depth time-distance and terrain analysis during the planning phase of arctic operations is a vital output for reconnaissance leaders, especially when dismounted
- Emphasize individual physical fitness and only pack the mission-essential items
- Utilize handheld Unmanned Aircraft Systems to confirm route suitability before expending effort clearing ground on foot
- Employ a robust pace plan during arctic operations, as communications platform effectiveness varies so greatly with respect to terrain and the environment
- A mission support site is essential, as the weather can significantly impact observation post shifts or rotations
- Soldiers need an individual stove to boil their own water supply

Arctic Forge Catalyst Paper

1LT Tanner Kublick, Assault Platoon Leader

During Arctic Forge 25, the anti-tank platoon faced significant mobility challenges in the harsh arctic environment of Sodankylä while conducting a mobile area defense to protect a key bridge. The platoon, consisting of 38 personnel and equipped with four Javelins, two N-LAW's, two M2A1's, two M240L's, one CARL-G, and utilizing two BV-206 troop transport vehicles with one cargo trailer, identified snow mobility as the primary obstacle to rapid, efficient maneuver. This report details best practices for personnel, machine guns, and anti-tank systems in a mobile defense.

Key Findings: Arctic operations drastically increase physical exertion and time required for movement. Planning must account for significantly slower speeds – 2-3x slower without load, and 3-4x slower with load – and the potential for complete Soldier exhaustion.

Personnel Movement

Effective dismounted arctic maneuver requires proficiency with snowshoes or skis, though both present challenges.

Snowshoes: Require minimal training, are slowest, but useful for trail breaking, packing snow, and makeshift shovels. Typical movement times in less than 2ft of snow is 2 kilometer per hour, greater than 2ft of snow 1 kilometer per hour. The addition of the Ahkio sled in less than 2ft of snow is 1 kilometer per hour, greater than 2ft of snow is 600m per hour.

TTPs: Rehearse donning/doffing with various gloves. Securely position on ruck/pack for easy access. Pre-fit straps, adjusting only the heel strap.

Skis: Offer speed but demand high proficiency (minimum 30 hours practice). Finnish skis (approx. 6ft x 3in) require a specific technique.

TTPs: Package/stack for transport. Utilize experienced skiers as point. Store skis outside to promote snow adhesion.

BV-206: (Finnish equivalent of US BV-S10 Beowulf) Versatile, fast, and capable of carrying a squad-sized element and equipment. Requires ~20 hours driver training. Travel time consideration for movement on improved/hard ball roads is 25km per hour, Offroad/in wooded areas 5-10km per hour.

TTPs: Use to pack trails for dismounted movement. Maximize internal/external cargo capacity. Conduct LMTV driver training to simulate BV-206 operation.

The platoon found a combination of BV-206 for longer distances and snowshoes for dismounted movement most effective. Full-unit ski proficiency was deemed impractical due to logistical complexity and individual sizing.

Machine Gun Movement

Leaders must balance speed and security when maneuvering heavy machine guns. Mounted capabilities are limited in the arctic.

Infiltration: BV-206 is the preferred method, minimizing energy expenditure and establishing potential retrograde routes.

Ahkio Sled: Viable alternative, requiring a three-person lead team to break trail in a vee formation, followed by a second team to pack the snow.

Load Limits: Max 100lbs per sled (two M240s w/ tripods or one M2A1 receiver/barrel + 2 ammo cans) depending on snow depth. Multiple trips are preferable to overloading.

Retrograde: Prioritize packed snowshoe trails or BV-206 tracks. Dismounted retrograde with the M2A1 is extremely difficult and should be avoided. The M240L is the heaviest weapon feasible to carry during a dismounted retrograde.

Anti-Tank Weapon System Movement

Anti-tank systems are more maneuverable than machine guns due to their lighter weight and sling systems.

Infiltration: BV-206 prioritized, followed by ahkio sled support.

Retrograde: Teams should abandon expended munitions at battle positions.

General: Javelin and N-LAW teams can effectively maneuver on foot.

Recommendations & Conclusion

This exercise highlighted critical areas for improvement in arctic operations:

Cross-Training: Soldiers require proficiency in all over-snow transportation methods.

Force Composition: Utilizing an anti-tank platoon as a frontline mobile defense force is suboptimal due to mobility limitations. A layered defense with light infantry forward and anti-tank teams positioned for overwatch is recommended.

Snowmobile Integration: Snowmobiles offer superior speed and versatility compared to BV-206s and should be prioritized when available.

Time Management: All tasks take significantly longer in the snow. Leaders must adjust timelines accordingly.

Physical Fitness: Soldier fitness is paramount for successful arctic maneuver.

In conclusion, successful arctic operations require deliberate planning, realistic training, and a thorough understanding of the challenges posed by the environment. Prioritizing mobility and adapting tactics to account for the unique demands of the arctic terrain are crucial for mission success.

BEST PRACTICE:

- Pre-fit the front three straps of the military snowshoe, making the heel strap the only point of adjustment.
- Store skis outside, when possible, as the change in temperature from inside to outside will make the snow on the ground freeze to the ski.
- When using the Ahkio sled, load with no more than 100lbs of equipment.
- Fire teams should abandon expended munitions at their battle position before retrograding.
- Soldiers need to be comfortable with every mode of over-the-snow transportation.

Arctic Forge '25 Catalyst Paper

2LT Karlyn Ponsness: Engineer Platoon Leader

Introduction

As the Sapper Platoon Leader of 2nd Platoon, 63rd Combat Engineer Company-Infantry, 41st Engineer Battalion, 10th Mountain Division (Light Infantry), I led a platoon consisting of three Sapper squads equipped with M4 rifles for this exercise. While typically operating in alpine terrain focused on wire obstacle placement and breaching, the deep, heavy snowpack in Finland necessitated adjustments to planning considerations, gear loadout, and operational procedures to maintain effectiveness.

This discussion will detail how deep snow, and limited mobility affected the platoon's ability to install wire obstacles, how tactics were adapted using vehicles and surface-laid mines, and why anti-tank mines proved a more effective solution than traditional wire. I will also highlight some key fieldcraft techniques learned from Finnish Soldiers – including tent anchoring in snow, battery conservation, and obscuration considerations.

Furthermore, this report outlines key lessons from subsequent training at the Swedish Subarctic Winter Warfare School. Throughout the month-long course, Soldiers trained in arctic survival and dismounted movement on Nordic cross-country skis. A summary of best practices regarding cold-weather soldier care, thermal signature reduction, vapor barriers, patrol base and movement tactics, and ski/weapons maintenance in arctic conditions will conclude this report.

Dismounted Movement and Obstacle Emplacement

Within the first few hours of the force-on-force mission, it became apparent that the platoon's snowshoe proficiency was insufficient for effective operation in the deep snow. The five to six feet of wet snow significantly hampered even basic movements, and tasks requiring gear transport took considerably longer than anticipated.

On the second day, the platoon attempted to establish a protective wire obstacle as part of the company's engagement area development. Utilizing snowshoes, a two-Soldier team led the way, breaking trail while the remainder of the team followed, pulling an ahkio sled loaded with C-wire. Installation of one hundred meters of single-row C-wire required two hours – a rate too slow and inefficient to sustain throughout the exercise. In a non-arctic environment, a squad of Sappers can on average emplace the same length of C-wire in approximately 10 minutes without pickets, underscoring the significant impact of arctic conditions on obstacle emplacement.

To create a more consistent rhythm the platoon decided to use the SUSV to break the trail and tow the sled with C-wire behind it. The platoon stopped periodically to drop rolls of C-wire as the SUSV moved, saving significant time by eliminating the need to break trail and manually carry the wire on foot.

SUSV breaking trail for engineers.

Due to the dense forests prevalent in Finland, Finnish Engineers have adapted their tactics, prioritizing mines for counter-mobility operations over traditional concertina wire and pickets. During Arctic Forge, the platoon adopted this practice, employing anti-tank mines to impede enemy mounted movement along key avenues of approach. The snowpack necessitated surface-laying all mines, as burying them significantly reduces their effectiveness by dampening the blast effect.

The platoon emplaced mines after sharp bends in roads and within line of sight of our battle positions, forcing the enemy to halt their Leopard tanks and deploy engineers to clear the obstacles. This tactic provided TF Blackhawk's Anti-Tank Platoon the necessary time to engage and destroy the Leopard tanks before maneuvering out of the engagement area.

Sapper platoons should have the Surface-Laid Anti-Mine (SLAM) systems when operating in arctic environments. SLAMs enable the efficient creation of tactical obstacles, particularly in terrain where traditional obstacles are difficult or time-consuming to deploy. These systems with their remote detonation feature will significantly enhance a platoon's ability to shape the battlefield, especially in the arctic, where rapid deployment and flexibility are critical.

Compared to C-wire emplacement – whether on foot or with the SUSV – mine emplacement proved exponentially more efficient, requiring approximately 15 minutes to establish a 100-meter by 20-meter minefield. Transporting the mines via the SUSV further streamlined operations.

To maintain effectiveness, elevate SLAMs above the snow by securing them to trees or man-made structures, and emplace blasting demolition kit (BDK) charges on tripods. The M19 anti-tank mine is optimal for catastrophic kills, while the M21, with its tilt rods, provides a reliable alternative; however, both are only effective when surface-laid in compact snow, as loose snow significantly reduces or negates their impact.

Although the platoon did not conduct offensive operations, smoke obscuration is a standard engineer consideration during breaches. Deep snow significantly reduces the effectiveness of delivered ordnance – including mines, mortars, grenades, and smoke canisters – by causing loss or burial. Smoke grenades may settle unevenly in loose snow, hindering smoke screen deployment. Therefore, hand-thrown smoke grenades are the most reliable method for obscuration in arctic conditions.

Field Tactics

The platoon utilized a Finnish field tactic to anchor warming tents with snow. Soldiers dug holes, placed wood anchors, wrapped tent ropes underneath, and packed snow tightly to maintain tension. This method allowed flexible tent placement and quick teardown, as the wood anchors were expendable. Covering tents with snow provided aerial camouflage and concealed thermal signatures – a tactic applicable to all battle positions.

Cold temperatures drastically reduce battery capacity; batteries in freezing conditions provide only about one-third the performance of those at normal temperatures. To maximize battery life, keep radio batteries warm by storing them close to the body or insulating radios and batteries.

Lessons Learned from Sweden

Following Arctic Forge ‘25, select Soldiers attended the month-long Subarctic Swedish Winter Warfare School, focusing on Swedish winter warfare tactics and foundational arctic survival skills. The course emphasized Nordic cross-country skiing and dismounted squad movements in extreme cold. Key lessons included concealing thermal signatures, maintaining weapons in subzero temperatures, and managing the tactical implications of compacted snow when establishing battle positions.

Cold Weather Soldier Care

Maintaining warmth was the primary challenge during operations in Finland. Training at the Swedish Winter Warfare School emphasized cold-weather injury (CWI) mitigation, with a key principle being the consistent use of contact gloves (thin wool insulating glove inserts). Handling ski poles and metal weapon systems with bare skin significantly increases the risk of frostbite. While insufficient for prolonged exposure, contact gloves prevent contact frostbite. The platoon also utilized a two-thermos system for rapidly warming potential hypothermic casualties, supplemented by individual thermos use for additional warming.

Footwear and Vapor Barriers

While cold weather insulated Army boots proved adequate for dry snow conditions in Alaska, operations in the wet snow of Sweden and Finland necessitated reliance on vapor barrier (VB) boots. However, a compatibility issue arose: VB boots did not fit standard Nordic cross-country ski bindings, forcing Soldiers to revert to cold-weather suede boots. This resulted in boots becoming saturated with water during the day and freezing overnight. Thawing during subsequent skiing re-wetted socks, perpetuating moisture retention.

Both Canadian and Swedish soldiers enhanced their uniform’s insulation with additional vapor barriers. They layered thin socks, improvised vapor barriers (such as cut Ziplock bags or contractor trash bags), and thick wool socks. Thicker plastic materials are preferable as vapor barriers due to their increased resistance to friction damage.

The concern regarding vapor barriers trapping sweat is valid. Some Soldiers preferred using them only during stationary periods, while others argued that slightly damp socks from a vapor barrier are preferable to thoroughly soaked, cold socks. Ultimately, in damp snow environments where VB boot use is limited, standard boots will become wet, increasing the risk of cold-weather injuries.

Thermal Management & Hydration

Maintaining a low thermal profile while obtaining potable water is critical in the arctic. The Swedish employ a two-thermos system, ditching the standard canteen. Soldiers boil snow for water during halts and before movement, ensuring a constant supply of hot water for both hydration and food preparation. During movement, one thermos holds drinking water, the other holds water for food. Short halts (15 minutes) occur hourly, with longer halts (60 minutes) every three to four hours, effectively managing hydration and thermos discipline.

Fire Starting

Finding dry fire starters in the arctic is challenging. Swedish and Finnish forces utilize birch bark or dried moss, recommending Soldiers carry a supply. Cotton balls soaked in Vaseline or hand sanitizer are also effective.

Insulation & Personal Warmth

Swedish soldiers follow the principle of “puffy on, puffy off,” immediately donning their ECWCS Level 7 (Heavy Cold Weather Jackets) during halts to trap body heat. They keep insulating layers readily accessible on top of their rucks and change socks during long halts, drying damp socks close to the body.

Concealment

Soldiers deliberately smoothed all harsh edges in the snow when digging battle positions, setting up tents, and creating ski trails. This minimizes shadows, improving both aerial and ground concealment by obscuring elevation changes and human activity.

Tent Concealment

To reduce aerial thermal signatures from tents, the Swedish utilize a standoff system. Young, flexible birch trees are anchored in snow walls surrounding the tent and lashed together to create a lattice. This lattice is then covered with an arctic camouflage net and snow. The resulting one-foot standoff allows for warming fires and stove use without significantly increasing the tent’s thermal signature, as heat dissipates upwards.


Birch lattice over Squad tent for heat standoff.

Battle Position Construction

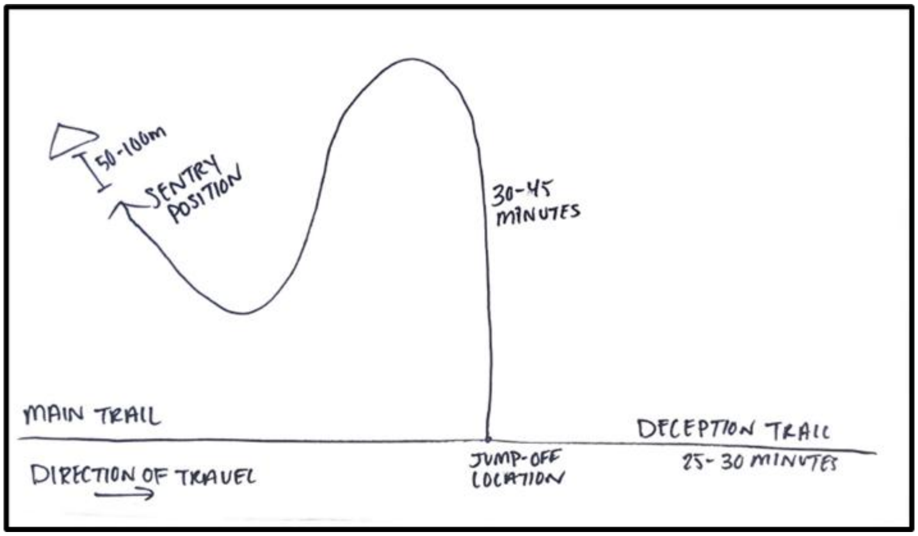
During training at the Swedish Subarctic Winter Warfare School, Soldiers discovered how effectively compacted snow protects battle positions. They constructed two test lanes – one with compacted snow and one with loose snow – and positioned targets one meter apart in depth. From approximately four meters, they fired a M240L at both lanes. The 7.62mm rounds failed to penetrate two meters of compacted snow but penetrated three meters into the loose snow. Compacting snow significantly increases the protective strength of battle positions, providing at least a 33% improvement in resistance to 7.62mm rounds.

Ambush battle positions with smoothed edges.

From left to right: two lane compacted snow test shoot with 240L, one meter and two-meter targets on compacted snow lane, one through four-meter targets on non-compacted snow lane.

Patrol Base and Movement TTP

Swedish soldiers established patrol bases with strict discipline. At the jump-off location, they turned 90 degrees off the main trail towards their intended base. Two soldiers then moved down the main trail for 25-30 minutes, creating a deception trail before returning to camouflage the jump-off trail with snow shovels and pine branches. The main element continued along the jump-off trail for 30-45 minutes and established a sentry position. Sentries faced away from the direction of travel, and the patrol base was located 50-100 meters behind them.



Sketch of deception trail to patrol base occupation.

Swedish soldiers taught US Soldiers key arctic patrol base practices. They advised against using ski poles, as pole holes are harder to conceal than ski tracks and reveal troop numbers. Soldiers also covered urine spots with pine needles to mask their presence.

Ski Caches

Swedish soldiers maintain ski effectiveness by creating a dry storage platform. They place pine trimmings under their skis to elevate them off the snow and prevent ice buildup on the ski face. Any coating on the ski face quickly reduces performance. They store poles on top of the skis for rapid departure.

Ski cache.

Weapons Maintenance in Arctic Conditions

Weapon maintenance is a critical planning consideration for arctic operations. Preventing rust and contact frostbite is essential for mission success. Canadian weapons, utilizing more polymer materials, experienced fewer issues than U.S. systems in cold temperatures. Soldiers operating in Sweden for extended periods gained significant experience in arctic weapon care.

Soldiers used white athletic tape to insulate exposed metal and prevent contact frostbite, avoiding moving parts and heat-generating components like the M4A1 selector switch. They also taped sharp edges, such as heat guards, to protect camouflage. Improvised barrel and optic covers were constructed from coke cans, foam, tape, and bungee cords. Swedish soldiers carried alcohol-based solution to de-ice weapons while mobile.

M4 arctic modifications.

Conclusion: Building Arctic-Capable Sappers for the Future Fight

Arctic Forge '25 highlighted critical gaps in our engineering capabilities for cold-weather operations. The challenging terrain in Alaska and Finland demanded a shift in mindset and skillset, revealing a need for deliberate, focused Arctic training.

Improvisation is insufficient; proficiency requires sustained, realistic training. Limited prior ski training hindered mobility, while a week of consistent training in Sweden yielded significant improvements. Standard alpine/temperate techniques proved ineffective in deep snow, necessitating adaptation – utilizing tracked vehicles for wire emplacement and surface-laid mines for efficient obstacle creation.

Interoperability with Finnish, Canadian, and Swedish forces proved invaluable. Their institutional arctic knowledge significantly enhanced our fieldcraft, camouflage, and survival techniques. The Swedish Winter Warfare School emphasized discipline – hydration, gear management, and thermal regulation – as crucial for combat effectiveness.

Success in the Arctic requires Sappers to become cold-weather tacticians, capable of shaping the battlefield while maintaining combat power. Arctic Forge challenged our assumptions and underscored the importance of multinational training to build readiness for future operations.

BEST PRACTICE:

- Arctic environments provide an opportunity to utilize surface mines more effectively due to terrain.
- Keep radio batteries close to your body to keep them warm and increase their longevity or fabricating insulating covers for your radios and batteries.
- Hand-thrown smoke is the most reliable option for obscuration during a breach in Arctic Conditions.
- One foot of the standoff between the tent layers and the external layer greatly diminishes the heat signature.
- Do not use the ski poles while skiing to the patrol base location, to detract from enemy force understanding how many Soldiers are in the formation.
- The use of white athletic tape to cover any exposed metal, helping to create a barrier for contact frostbite.
- I strongly recommend including anti-tank mines, Selectable Lightweight Attack Mines (SLAMs), and Blast Demolition Kit (BDK) Conical Shape Charges in the standard loadout for any Sapper platoon deploying to an Arctic environment.

Team Headhunter Reflections

CPT Spencer Cavotti: Company Commander

Introduction

This section details recommendations and observations from the Arctic Forge after-action review. These insights, gathered from exercise observers and throughout the exercise, apply to all Team Headhunter elements – Platoons and Company Headquarters – during both the force-on-force exercise and the Reception, Staging, and Onward Movement (RSOI) period in Finland. Key areas of focus include sustaining combat power, overcoming tactical challenges against opposing forces, improving coalition planning, and recommendations for future Arctic Forge iterations.

Survivability

TF Blackhawk adopted a temperature-based approach to utilizing the Finnish arctic tents. Team Headhunter learned to construct individual thermal shelters during RSOI in Alaska, planning to use them between 32°F and 10°F, and reserve the tents and stoves for temperatures below 10°F. This strategy prioritized mobility – thermal shelters are quicker to abandon than tents – while still providing necessary environmental protection. However, the force-on-force exercise experienced unseasonably warm temperatures (20°F – 35°F), causing the TF to view the tents as a luxury. Consequently, units used them sparingly, often deploying the tent without the stove.

The warmer temperatures and constant snow prompted a shift from ECWCS Level V (insulated, but not waterproof soft-shell layers) to Level VI (less insulation, but waterproof). Team Headhunter planned for each Soldier to carry 72 hours of clothing in their rucksacks, sufficient for changing into dry clothes without relying on warming tents for drying. By the exercise's end, most Soldiers had depleted their supply and would have needed a stove to dry clothing. Soldiers used the MSR WhisperLite for water and meal preparation and rarely used the Finnish wood-burning tent stove.

Individual Thermal Shelter: Tree-Branch Frame, Tarp, and Snow Cover
Taught during 11th ABN CWOC Course

US Soldiers were significantly more exhausted and affected by the elements than their Finnish counterparts, who could likely sustain the same operational tempo for weeks, while the company would have struggled beyond the remainder of the week.

Finnish OC/Ts criticized this limited tent usage, emphasizing their importance for maintaining morale and combat power during prolonged operations. Finnish doctrine emphasizes close proximity between fighting positions, supply points, and rest areas – typically 200m between each. They consistently use tents during winter training, ensuring access to warming, drying, and rapid displacement capabilities via BV-206 or snowmobile. Even scouts utilize lightweight, pole-less tents and small stoves, constructing poles from local tree limbs.

The Finnish view the tent as crucial for sustained arctic operations, regardless of temperature. They believed the US reluctance to use tents was viable only because of the exercise's short duration. A prolonged scenario would have demanded greater reliance on provided equipment and training. This difference in approach was evident at the exercise's conclusion: U.S. Soldiers were significantly more exhausted and affected by the elements than their Finnish counterparts, who could likely sustain the same operational tempo for weeks, while the company would have struggled beyond the remainder of the week.

Tactical Lessons Learned

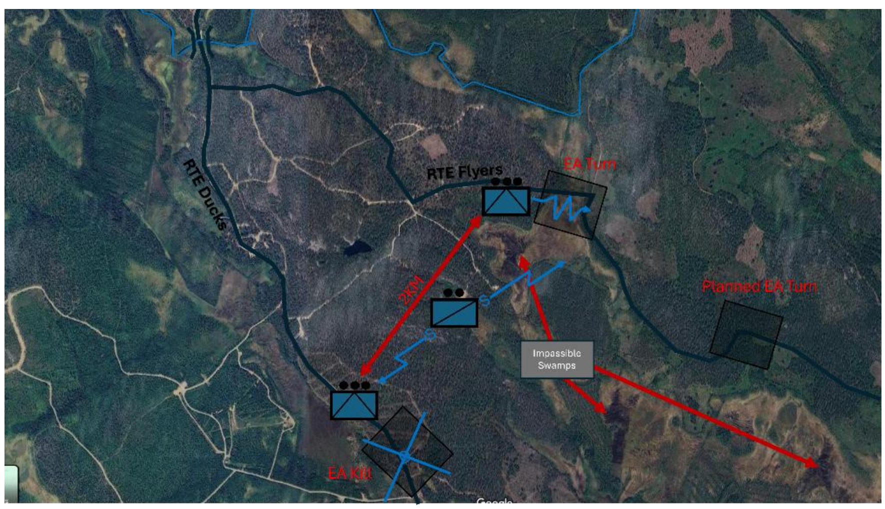
Drawing from the Winter and Continuation Wars (1939-1945), where outnumbered Finnish units successfully engaged superior forces, the exercise highlighted the effectiveness of infiltration, envelopment, and flanking tactics. These techniques allowed Finnish units to preserve combat power, consistently attack US platoons from unexpected directions, and dictate the terms of engagement.

Finnish reconnaissance teams, typically consisting of two to five Soldiers on snowmobiles, focused on identifying traversable seams between US defensive positions to enable bypasses of main engagement areas and subsequent flanking maneuvers. A secondary task was to fix U.S. main battle positions with indirect fire, facilitating rapid infantry infiltration.

Finnish infantry demonstrated exceptional mobility over snow, a critical factor in offensive effectiveness. The BV-206, a lightly armored, rubber-tracked personnel carrier with a pintle-mounted heavy machine gun, proved highly maneuverable, allowing units to bypass roads and trails. TF Blackhawk's initial terrain analysis underestimated the BV-206's capabilities, orienting defensive positions around road networks.

The task force later adapted, concentrating engagement areas within forested terrain. Finnish platoons rapidly deployed to identified seams, dispersing vehicles in a wedge formation, providing mounted fire support, and dismounting onto skis to maneuver on the flanks of U.S. positions. They then remounted and quickly moved to the next objective.

A key critique of the initial defense plan was excessive dispersion. The company area of operation spanned three kilometers of frontage and depth, bounded by two north-south roads three kilometers apart at the southern edge, narrowing to one kilometer at a critical bridge. Prioritizing coverage of both roads (RTE Flyers and RTE Ducks) led to gaps of two to three kilometers between the Assault and Canadian platoons, precluding mutually supporting fires. We initially used dismounted scout observation posts with dedicated fire support to bridge these seams. A shift in tactics followed, repositioning engagement areas once we fully understood mobility of the Finnish units. (See graphic below.)

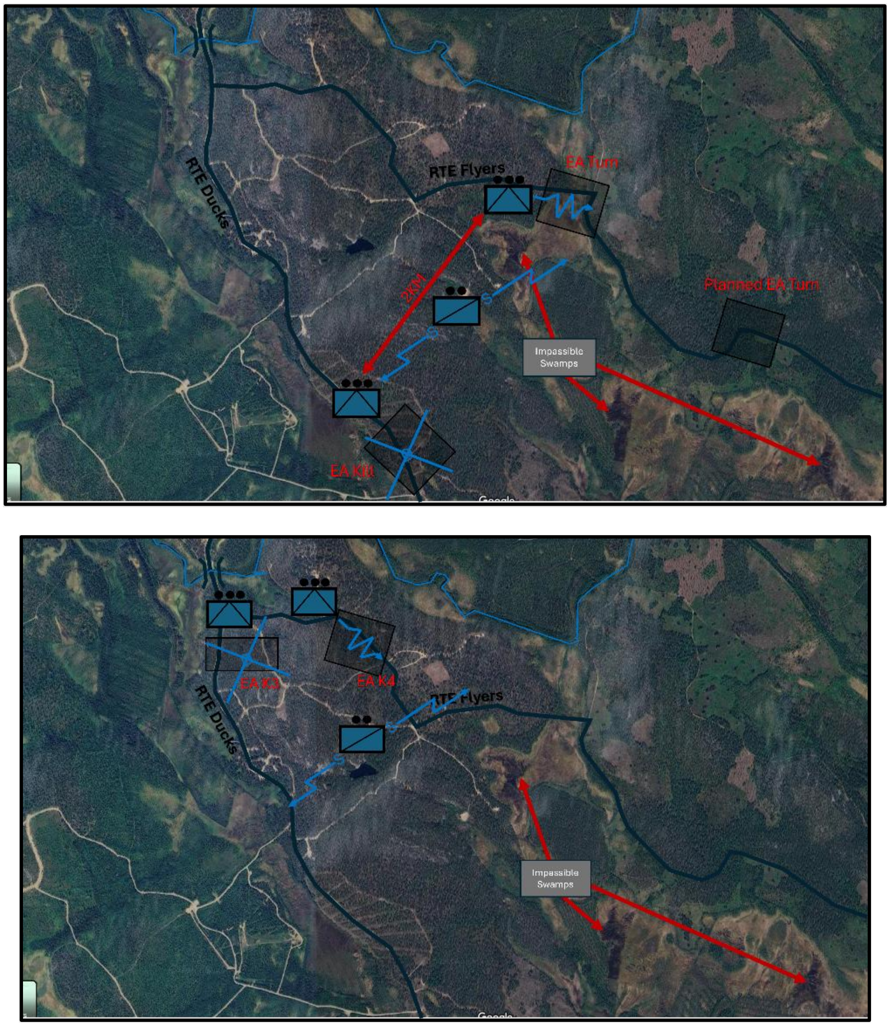


TM Headhunter defense plan

Initially, the Assault Platoon task was to destroy the enemy within EA Kill, while the Canadian Platoon would fix in EA Turn along RTE Flyers. Scouts occupied observation posts between the engagement areas, supported by Company 81mm mortars. The intent was to identify and suppress flanking maneuvers. However, the battle revealed that the enemy was unlikely to utilize RTE Flyers or the surrounding terrain. Swamps restricted movement for both dismounted troops and BV-206s, and reconnaissance confirmed no viable avenues of approach for armored vehicles.

Consequently, TF Headhunter narrowed the defensive front to just over one kilometer, reducing the distance between platoon battle positions. This allowed leaders to conduct joint reconnaissance, identify seams, and establish clear boundaries. Previously, platoon leaders lacked situational awareness of adjacent units; after the repositioning, they had a shared understanding of the defense.

Integration with adjacent Finnish anti-tank teams further enhanced the defense, bridging communication and creating a more robust, mutually supportive posture. Though sacrificing two kilometers of terrain, the abandoned area offered no tactical advantage due to its restricted nature. Repositioning reduced reaction times from over an hour (Canadian Platoon from EA Turn to EA K3) to minutes. Trading tactically insignificant terrain for a more effective defensive position proved beneficial.



TM Headhunter's adjusted defense plan.

To counter an enemy focused on exploiting seams, mutually supporting battle positions are essential. TF Blackhawk's initial terrain analysis, failing to account for restricted terrain and underestimating enemy attrition, prioritized defending a wider front over mutual support. The OPFOR's tactics exploited these flaws, flanking the assault platoon's position.

The OPFOR's attacked with less combat power than anticipated, failing to effectively mass forces at weak points. However, the task force adapted throughout the exercise, repelling the culminating assault with a combined force of mutually supporting fires from the assault platoon, Finnish anti-tank teams, the Canadian platoon, and 60mm mortars.

The Finnish approach to obstacle emplacement differed significantly from TF Blackhawk's. Facing armored threats, Finnish units employ anti-tank mines across entire routes, aiming to completely block avenues of approach. U.S. doctrine favors concentrated minefields tied to engagement areas. While TF Blackhawk utilized both strategies, Apex Troop's dispersed mine placement proved effective, forcing enemy tanks to dismount and interrogate each mine, allowing for engagement by anti-tank teams. The enemy bypassed Team Headhunter's concentrated minefield in EA Kill due to early detection.

Continuous Planning Adjustments

This exercise underscored the critical importance of maintaining continuously updated running estimates at both the staff and company levels. Initial MDMP and troop leading procedures identified key terrain and avenues of approach that ultimately proved insignificant.

For example, the Battalion's defensive focus centered on a bridge, believed to be the sole crossing point of a major river south of Sodankyla. This flawed assumption – that the bridge was the only viable crossing for tanks and BV-206s – shaped the initial plan.

However, reconnaissance revealed the bridge to be an unimproved wooden structure incapable of supporting armored vehicles. Leopard 2A4s easily forded the shallow river at numerous other locations, and the Scout platoon identified several smaller bridges suitable for BV-206s and snowmobiles.

Despite disproving these foundational assumptions, we did not adjust the ground tactical plan. We fought the initial battle period with a flawed plan, resulting in a retrograde of three kilometers to a position south of the river. Had we adjusted the plan immediately upon verifying the inaccurate assumptions, a more decisive engagement, potentially preventing the enemy from advancing within three kilometers of the river, may have been possible.

Transitions

Effective transitions between offensive and defensive operations are critical for success in force-on-force exercises. Units that consolidate combat power and rapidly redeploy to advantageous terrain can capitalize on tactical momentum and achieve decisive results. However, these transitions are particularly challenging in the arctic environment due to the difficulties of moving personnel and equipment through deep snow and complex terrain. The exercise highlighted two instances where slow transitions hindered our ability to exploit success, both in defensive reinforcement and in preparing for a counterattack.

First, the Canadian platoon's retrograde from their primary engagement area to reinforce the assault platoon near the river took nearly three hours to cover just two kilometers. Despite relocating only key weapon systems and personnel – leaving supplies and support platforms behind – the slow movement nearly allowed the Finnish assault to overwhelm the assault platoon before reinforcements arrived. This underscored the critical need for proficiency and speed in over-snow maneuver.

Similarly, the assault platoon struggled to fully exploit their success after repelling the culminating attack. The weight and size of their weapon systems, combined with unfamiliarity with the terrain, limited their ability to pursue the retreating enemy. The Task Force's limited mobility assets – only four snowmobiles and five BV-206s, allocated primarily to the Mortar and Scout Platoons – constrained their options.

In retrospect, rapid displacement of heavy weapon systems would have required snowmobile support, either through towing or direct carriage. Prioritizing snowmobile allocation to platoons equipped with heavy weapons is essential for future iterations of this training. These platforms are crucial for bridging the mobility gap between coalition forces and their Finnish opposition, enabling successful transitions and the exploitation of tactical advantages.

Recommended Changes

The most significant improvement for future iterations of this training event would be to extend the in-country preparation timeline with organic equipment. Strategic air movement delays are predictable; planning must account for these disruptions, as reduced preparation time drastically impacts readiness. Our equipment arrived on February 24th at 1800, instead of the planned February 18th prior to the February 23rd exercise start, and movement didn't begin until February 25th at 1200.

This compressed timeline forced us to prioritize merely reaching operational capacity instead of achieving true readiness. Exercise planners responded by accelerating the Task Force occupation, resulting in our company operating through the night before movement to meet minimum standards. Our RTO began loading encryption into radios at 2000 and continued until 0500 on the first day of the exercise, while leaders spent the entire night inventorying equipment and installing MILES gear. The Company commenced the force-on-force exercise with a significant and unrecoverable sleep deficit.

This rushed preparation also severely limited our communications capabilities. As our company operated within a different battalion task force, our Integrated Tactical Network

(ITN) required integration with the TF Blackhawk Mission Plan – a pre-programmed communications infrastructure. While we successfully validated the ITN framework during our RSOI in Alaska, re-establishing it in Finland proved impossible due to the compressed timeline and the need to clear encryption for transport.

We maintained communication via FM and HF but were unable to fully test ITN compatibility with the partner unit. An extended in-country preparation period would have allowed for thorough equipment troubleshooting, a Battalion-level communications validation exercise, and ensured full access to our intended communication tools.

Finally, I recommend achieving parity in troop transport vehicle numbers between coalition units and the Finnish opposition. The limited availability of snowmobiles significantly hindered our maneuverability compared to our adversaries. Increasing our access to mounted platforms would have enabled more effective task organization and provided critical maneuverability to our fighting platoons.

Conclusion

Arctic Forge 2025 proved an invaluable experience for the Soldiers and leaders of HHC, 2-14IN. The exercise challenged us to refine our preparation for operations in austere environments and to strengthen interoperability with our NATO allies. While ultimately successful, our proficiency was hard-earned, requiring constant adaptation to the challenging environment. The reflections, tactics, techniques, and procedures (TTPs) detailed in this report represent fundamental concepts for arctic operations, as well as skills honed by allied nations through decades of experience.

Our intention in compiling these lessons learned is to provide light Infantry formations with a head start in preparing for and sustaining combat operations in austere and arctic environments. Had Team Headhunter had access to a similar document during our preparation, we would have adjusted our training progression accordingly. The climate of Fort Drum, New York, though cold, cannot replicate the conditions we encountered in Alaska and Finland. While we attempted to mitigate this gap through ski training and BV-206 driver's training simulations, we only fully realized the true impact of the environment during the exercise. This collection aims to bridge that knowledge gap for future units, enabling greater proficiency and complexity in US Army arctic operations.