

New approaches to the study of Arctic warfare

Pasi Tuunainen

PhD, Docent of History, University of Eastern Finland

Abstract: This article uses the Russo-Finnish Winter War of 1939–1940 as a case study to introduce several approaches that can be employed when studying Arctic warfare in winter. The study of Arctic warfare is a highly context-related field: the Finnish-Russian border area had a character of its own. Combat here essentially was sub-Arctic forest fighting. Unpreparedness for such peculiarities and special conditions, in particular for the harsh sub-zero weather, ice, deep snow and shortened days of winter, complicated military action and even led to military failures. Many historical antecedents show that those armies that have adapted and correctly realised the implications of the effects of adverse weather on terrain and of the northern environment on soldiers, materiel, organisation and operations could prevail. Unlike in many places, the hostilities normally have not ended in the Far North of Europe as the winter set in. Winters were utilised for offensive combat operations provided that the attacking force had secured its over-snow mobility and logistical support. The Finnish case demonstrates that the terrain and weather not only dictated the operational capabilities in northern forests but also that better preparation in the utilisation of the possibilities offered by military geography explained the eventual outcome of military operations. Arctic warfare is an important research area with wider significance. Surprisingly, the literature on the topic is scant.

Keywords: Arctic warfare, the Winter War (1939–1940), northern operations, winter tactics, forest fighting, military geography, terrain analysis

Introduction

“The features peculiar to the theater of operations in the Far North of Europe have given the recent wars in the Finnish area a character all their own. Terrain and climate always have a decisive influence on warfare. The tactical rules which had been worked out on the basis of experiences in central European theaters of war and which are adapted to normal conditions were applicable only to a limited extent in the cases of Karelia and Lapland. In many respects warfare in the Arctic follows rules of its own. The German High Command

did not realize this fact until after the war was in progress. The German troops which were sent to Finland during World War II were not prepared for the special difficulties they encountered in combat in that trackless wilderness, in the endless virgin forests, and during the long Arctic night. Only after paying dearly for their experiences did they become adjusted to the requirements of that theater” (Erfurth 1951, 19).

General Erfurth was a German liaison officer in the Finnish High Command during the Continuation War (1941–1944), and his text confirms that the Wehrmacht soldiers stationed in Finland ignored military

geographical factors of the Arctic regions at their peril. The German (Austrian) Mountain Jaegers had been trained to fight in mountainous surroundings, and were unable to perform their offensive tasks in the Finnish-Soviet border areas as the northern flank of Operation Barbarossa even in summer, let alone in winter. The correct appreciation of weather, terrain and daylight conditions have proved to be of paramount military importance as they set the limits on operations and relate to the ability of the individual soldier and his unit to live, work, move and fight in the sub-Arctic and Arctic. Unpreparedness for such peculiarities and special conditions, in particular for the harsh sub-zero winter weather, ice, deep snow and shortened days of winter, could complicate military action and even lead to military failures. Many historical antecedents show that those armies that have made winter an ally and systematically exploited weather and climatic conditions could compensate for inferior numbers and achieve success. This is exactly what the Finns managed to accomplish in World War II, especially in the Russo-Finnish Winter War of 1939–1940, a famous contemporary armed conflict in the age of total war fought in its entirety in the Arctic winter.

This article uses the Winter War as an example to introduce some novel approaches to the study of Arctic warfare. I will explore what Arctic warfare was in the Nordic context, and how it can be studied. What kind of factors need to be taken into account when researching various aspects of Arctic warfare and what could be possible explanations for Finnish military

effectiveness in winter? Arctic operations could be conducted in all seasons but in this essay I will focus on military action in winter. To this end I will look at preparations and training in the Finnish Army. I will also demonstrate how geographical factors affected the planning and execution of winter operations in northern regions. Terrain analysis is investigated in depth as it may explain why commanders and soldiers acted as they did.

Military geographical characteristics of the Finnish-Russian border areas as cold regions

At the time most of the Finnish territory was forested sub-Arctic i.e. the forested cold weather regions south of the actual Arctic that include most of Alaska, Canada, Iceland, northern parts of Scandinavia, Siberia, northern Mongolia, and even the northernmost areas of the British Isles. Only one third of the Finnish territory lies above the Arctic Circle and constitutes treeless tundra, with just a few mountains. Finland has reasonably high summer temperatures, cold winters and snow cover for over half of the year. The summer days are long, but in winter darkness prevails. The Arctic regions have been battlefields in all seasons, often in winter. The existing natural obstacles (such as swamps, marshlands, lakes, rivers etc.) have presented a serious hindrance to movement in summer conditions. Likewise the autumn and spring thaws caused by the melting of snow, ice and permafrost can lead to huge difficulties.

The Finnish-Russian border area, extending 1400 kilometres in the 1940s, was characterized by long distances, underdeveloped road networks and vast wilderness areas. Physical geographical factors shaped military operations in many ways, and topography determined all operations. The terrain constrictions channelled movement, shaped the battlefields, and influenced events. Climatic conditions and seasonal changes could create advantages and disadvantages or obstacles to military forces. The weather and terrain could help one side or become their worst nightmare. Success in northern operations depended on the ability to adapt to conditions, to overcome and to exploit them.

In cold regions (including mountainous areas receiving snowfall) the armies have two adversaries: the cold and the opposing force. Cold weather reduces the efficiency of men and machines. Appalling weather could be fatal to soldiers and make weapons dysfunctional. This placed requirements on the preparation and training of soldiers and units. The effect of the northern environment could be hard on personnel, matériel, organization and operations. The soldiers needed to be issued with the right kind of protective clothing and equipment. They also needed to be taught to adapt their use of weapons and equipment to the circumstances. Moreover, the soldiers had to be acclimatized, tempered and taught relevant survival skills and field craft, and needed to be physically and mentally fit to be able to survive and fight in the adverse weather conditions of the North (Nelson 2006, 13–20).

There are numerous examples of how ill-prepared armies have suffered serious military setbacks. Training, equipment and overall preparation, particularly logistical support, have been the keys to effective military performance in the Arctic and sub-Arctic. Many of the non-combat casualties were due to the cold. “General Winter”, as the harsh cold Russian winter weather is known, has contributed to the demise of many invading armies, including the Swedish Charles XII’s attack in 1707, Napoleon’s campaign of 1812 and Hitler’s Eastern Front in World War II (O’Sullivan & Miller Jr. 1983, 65–66; Winters *et al.* 1998, 74–96).

In most wars larger scale fighting ceased as the winter set in and armies went to winter quarters. In northern Europe, however, winter operations have been conducted for centuries. Winters have been utilized for offensive operations provided that the attacking force had secured its over-snow mobility and logistical support. The best time has usually been from midwinter to early spring prior to the breakup period. For instance, the Russian Army started its war against Sweden-Finland in the winter of 1808 because the defence of the reign’s Eastern provinces was based on the arrival of reinforcements from Sweden, and, with the freezing of the Baltic Sea, boats could not sail. The Gulf of Finland rarely froze completely, except suddenly during the extremely harsh winter in early 1940, offering the Red Army the opportunity to advance along the ice of the Bay of Vyborg to the right flank and rear of the main Finnish forces. The opening of this “ice front” seriously threatened the Finnish

supply lines. The Finns could only contain the bridgehead by the end of the Winter War with difficulty.

Logistics, shelter, clothing, weaponry and equipment

Logistical preparation and support were then the key military considerations in winter operations. These could require an up to 50% increase in supplies compared to summer operations. Diet and nutrition requirements grew. Exposure to extreme cold could cause accidental hypothermia, and soldiers could even freeze to death. Sometimes winter soldiers also risked dehydration, snow blindness and sunburn. These dangers posed additional challenges to logistical support units and field medical care.

The training program is worth studying because it reveals the actual preparedness to conduct winter operations. It is surprising that the Red Army that invaded Finnish territory in 1939 was not equally well prepared. Some of its units were in summer uniforms. In contrast, the Finns had accepted the geographical conditions as a basis for the war plans and tactics, so equipment and training had been developed and purchased accordingly. All Finnish conscripts, regardless of their role, underwent the winter training program designed to make everyone capable winter fighters. The effectiveness of training is, to a large extent, an organizational and cultural matter. Therefore, it could be studied from a comparative viewpoint. The armies can, for example, be viewed as learning organizations.

The proper ability to conduct winter operations depended on technical tests and experiments. The results of the Finnish developmental activities were published in *Talvisotakäsikirja – T.S.K.K.* (Winter Warfare Handbook) in 1928. The Finnish Army, the Border Guards and the Civil Guard Defence Corps had systematically improved their capability to orienteer and bivouac in a trackless wilderness. They had manufactured heated tents and portable box stoves, allowing the troops to operate in a wintery forest for a sustained period of time. In the Winter War the Finns, having secured their own well-being, employed scorched earth tactics in the border areas thus leaving the Red Army with no shelter. Their ability to keep warm, wear dry and clean clothing and eat hot meals contributed to their ability to maintain combat effectiveness all year around. Finnish Army personnel were provided with proper clothing and special footwear to prevent frostbite. Garments were practical: they protected the soldiers against climatic factors by dressing in insulating and ventilated loose layers and used traditional tried and tested items, such as Laplander's beak boots. This way they could balance heat production, loss and moisture, protecting the skin and the body. One of the basic principles of keeping warm in winter clothing was avoidance of overheating. Equipment had to be kept to a minimum. Axes, billhooks and bucksaws of ideal sizes and light weight were constructed for military usage (Partanen, Pohjonen & Tuunainen 2007, 85–93).

The Finnish Army did not favour technological determinism. Instead it had chosen not to overly rely on the mechanized approach, and weapons were relatively

low-tech, designed to offer reliability in adverse conditions. The battles in the northern forests proved the usefulness of the Finnish made 9 mm Suomi submachine gun, ideal for combat at close range. Light mortars were also handy. The equipment was winterized. Weapons needed proper maintenance in the cold. The Soviets used petroleum lubricants that often jammed their weapons. The Finns went for a mixture of alcohol and glycerine or none at all. To avoid freezing, the weapons had to be kept outside the warm shelter. Many technical devices had not been designed to operate in freezing temperatures. Special measures were taken because radio batteries froze easily. Radiators had to be filled with antifreeze, and vehicle engines needed to be started and kept running frequently to ensure their functioning in cold weather. The men wore white camouflage suits and equipment was painted white.

Movement on snow

A researcher of Arctic warfare should place emphasis on movement. Mobility was the main tactical principle of winter operations in the Arctic for the Finns. This is logical as the wide and empty spaces of the Arctic regions permit almost unrestricted manoeuvre and movement for those troops that possess over-snow mobility.

There is a long tradition of military skiing in the Nordic countries and Russia. In an attempt to indoctrinate them, all Finnish conscripts of the interwar period were told about the peasant ski troops enveloping a much larger Russian foe in March 1555 at Joutselkä. By the Great Northern War the

Russians had also begun to deploy ski units. When suppressing the Karelian uprising in the beginning of the 1920s the Red Army used ski troops. It is striking that in the Winter War very few Soviet soldiers could ski. In the 1930s practically all the Finns could ski, and army personnel were trained to operate on and off skis.

The Finns favoured economical cross-country (Nordic) skiing but the skiing speed was to be kept low in cold weather to avoid undue perspiration in order to keep the men fit for battle. The skis were fitted with bindings without heel straps, allowing for quick dismounting (30 centimetres of snow was the limit for effective movement by a foot soldier). The Finnish skiers hauled ahkios, the boat-hull deep snow toboggans or sleds. Ahkios were utilized to evacuate the wounded, to transport munitions and equipment, and as a firing platform for machine guns. With pack horses the Finnish Army duplicated the methods of farmers and loggers. The horse-drawn sleighs transported heavy arms and even artillery pieces on sleighs. This provided them with manoeuvrability in a trackless terrain. The Winter War demonstrated that mechanized and armoured units tied to narrow unpaved gravel roads became a burden to the Red Army. Vehicular traffic was not possible along slippery icy roads in winter without clearing the roads first (even several times a day after blizzards).

Operations and tactics in cold weather and deep snow

The multi-faceted phenomenon of military effectiveness has been explained by scholars in many ways, mostly in non-quantifiable terms. Since success in northern operations is heavily dependent on certain skillsets, the art of war is a useful framework for studying Arctic warfare. The Finns noticed that successful operational art and tactics were based on the correct understanding and appreciation of the effects of the northern environment on the combat actions of troops. All operations and tactical methods needed to be adapted to the specific terrain and weather conditions. In the north the focus was on the action of small units. Yet even decisive battles were sometimes fought in the Arctic.

The military effectiveness of the Finnish Army in the Winter War was primarily linked to the exploitation of harsh and difficult forested terrain and climatic conditions. The Finns sought to place their own strengths against the weaknesses and comparative disadvantages of the Soviets. In addition, they aimed at inflicting heavy casualties on the Red Army while attempting to keep their own losses to a minimum. These are normally considered the signs of combat power, another possible research approach. The Finns had appraised the military geographical factors that would limit the Red Army's offensive capabilities and freedom of manoeuvre in the border areas in various seasons. It had been realized that the Soviet military would be unable to utilize their overwhelming firepower in winter. The effect of artillery shells in deep snow was practically nullified, and

their detonators would not function in the cold. Moreover, the Red Army soldiers could not benefit from their air superiority as snow blizzards and overcast skies often grounded planes. The Finns had correctly anticipated that operations would take time, supply lines would be overstretched and the width of the front would be increased. The poor road network favoured the defenders, and the advancing Red Army could not shift its point of gravity due to the lack of connecting roads.

Even though Finland was waging a defensive Winter War, offensive had achieved a clear primacy in Finnish tactical thinking. The use of envelopment gave them a chance to achieve the element of surprise, their leading tactical principle. In the North mobile ski troops could quickly mount surprise attacks deep into the unprepared enemy's most vulnerable points, its long flanks and rear, lay down enfilading fire, and then disengage without the threat of being pursued. They could also benefit from deception and the darkness typical of Arctic winters. Local knowledge was often vital, and the Finns could orienteer accurately even in the pitch dark. The Soviet troops lacking skis were often road-bound in long columns leaving most of their flanks wide open. In the Winter War operations north of Lake Ladoga the Finns cut off and encircled the Red Army units by the roads. These encircled units were divided into smaller segments, or *mottis*, to be destroyed piecemeal. This tactic is known as defeat in detail. In other encircling attacks the Finns were able to confuse the Soviet plans and break their battle array. The majority of the Finnish plans were targeted to cut the Soviet lines of supply and communication,

in order to hurt the Soviet troops suffering from the effects of cold. The Finns counted that combat fatigue due to cold associated with hunger and sleep deprivation as a result of continuous harassment would slacken Red Army discipline and could lead to apathy. Controlled by fear, however, very few besieged Soviet soldiers surrendered (Tynkkynen 1996; Tuunainen 2006, 107–108; Tuunainen 2013, 121–147).

The Finnish *mottis* bear a resemblance to a German tactical innovation, the storm troop tactics of the Great War. In determining what factors explain the speed of this adoption process, my research has been informed by Everett M. Rogers's book *Diffusion of Innovations*, whose theory has proved a useful interpretive framework to regard the Finns as adopters of German military innovation. I was able to identify the various channels through which ideas were transmitted since 1915 and finally tested in motti battles in early 1940. As the Finns considered manpower as their most important resource in costly frontal attacks, they found the storm troop tactics “cost-effective” (Tuunainen 2008).

Finnish tactics were, indeed, a European military art. Although strongly influenced by Swedes and Germans, the Finnish officers applied general principles to the Finnish conditions. Yet was this unique to Finland? A Swedish volunteer brigade was in charge of a quiet front in Lapland in early 1940. It is, however, not certain that the Swedish Army that was practically equally well prepared and accustomed to a similar terrain and weather could have fought with similar effectiveness in the Winter War as the Finnish Army did. It is impossible to say for sure in hindsight, and this kind of

counterfactual approach could turn out to be merely speculative reasoning.

A student of Arctic warfare can benefit from organizational theory. Knowledge transfer has proved a useful concept in investigating the activities and influence of a group of some 20 ex-Finnish officers who joined the US Army in 1947 as enlisted men. At first, they were assigned as cross-country ski instructors but at the same time they also developed winter equipment based on the Finnish models and lectured about winter tactics. These former Finnish officers disseminated their know-how by serving in various military schools, planning winter exercises and acting as umpires in them. They revised the US Army and US Marine Corps cold weather and Arctic manuals. The Finns tried, in vain, to argue that Arctic operations are separate from mountain operations, and that troops should receive special training for these. Their leader, Colonel Alpo K. Marttinen, remarked to *The New York Herald Tribune* in late 1951 on the possibilities of training US soldiers as “acceptable Arctic fighters” in eight weeks. He said: “If the weather dropped from twenty to forty degrees below, the only problem a (Finnish) commander had was whether to change the ski wax” (*The New York Herald Tribune*, December 1951). Finnish winter war expertise was incorporated into US-British-Canadian cold weather doctrines. The US manuals were re-written only after 60 years but they still retain much of the Finnish content (Tuunainen 2012, 205–280).

The Finns could not use similar tactics everywhere. The areas of operation were different in terms of military geography. The Finns had accurately predicted that

the Karelian Isthmus, between the Gulf of Finland and Lake Ladoga, would be the location of the main Soviet thrust, because it was closest to Leningrad and the terrain was suitable for tanks. The nature of the war there would be trench warfare and attrition. In all sectors the Finns enjoyed the advantages of the interior lines of operations and the space to manoeuvre.

Peculiarities of command and control in winter

The limitations posed by military geographical factors – the weather, the terrain and the daylight-darkness cycle – influenced the decisions of Finnish military commanders. It is vital to examine how commanders and staff took the effects of environment into consideration in their planning and decision-making processes. Neither aerial reconnaissance nor maps revealed the hidden features and real trafficability of the terrain in winter. Winter conditions also led to serious frictions, or, in Clausewitzian terminology, “the fog of war”. The key was how to cope with it (Lowry 2012; Tuunainen 2011b, 40).

Cold weather puts additional mental strain on individual soldiers. Close attention should be paid to factors such as the command culture and mentality. In the study of wartime sociological and psychological phenomena one needs to incorporate human factors, such as motivation and morale. Mental stamina and fortitude should be evaluated as the quality of individual soldiers is critical to fighting in the cold. The buddy system was in place in the Finnish Army but the leaders

were responsible for preventing casualties to frostbite. This was not always necessary since Finland was an agrarian nation in the 1930s. Most of the civilian soldiers of its reservist army were physically fit for frontline duty, and life at the fronts was not all that different from forest work, a very common source of additional income for the farmers in the wintertime. The soldiers were familiar with the terrain and weather conditions, and could protect themselves against the cold. Winter often increased march times but the leaders were ordered to make sure that no troops were left exposed to the effects of cold weather, in particular the wind-chill factor, for extended periods of time. This was not always possible, and the Finns also occasionally suffered non-battle casualties.

A psychohistorical approach could be useful here as forest fighting has a significant psychological dimension (Clayton 2012, xv). The Ukrainians participating in the Winter War even feared the snowy forests of the North. The environment was not the only demoralizing factor for them. The Finnish ski troops employing hit-and-run tactics added to these sentiments and the Soviet soldiers came to call them The White Death (Russ. *Belaya Smert*; Tuunainen 2011a, 240–241). The Finns had a long history of living in harmony with nature. They did not view the forests as a hostile environment but rather as a source of protection. This is in striking contrast to German idea of forests as a military nuisance (Tuunainen 2008, 48).

A typical conceptual framework in military history has been the “Great Man” approach. This focus on generalship does not apply to the Finnish case. The Winter

War was largely fought at the infantry company level. Large battle formations could not operate in forests because the terrain separated them, and they were easily in disarray. This made the coordinated action of larger units difficult. To study small-unit action one can draw upon a theoretical base and methodology from social sciences, and apply, for example, various small group theories and theories of group solidarity to assist in explaining motivation. The endurance and sustainability of the Finnish soldiers in the Winter War may also be explained by the strong social cohesion of the homogenous Finnish culture.

The Finnish Army command was also subject to external influences. The most important command principle was the German system of decentralized command (*Auftragstaktik*). With these mission-type orders small unit leaders (and even soldiers) were delegated powers to exhibit their initiative and independent action. The use of common sense and flexibility were encouraged, as were “bottom-up” improvisations, making way for the history from below approach. The Finnish military leaders made use of German tactical concepts and ideas but applied them to the local forest conditions (Tuunainen 2010, 66–67).

Terrain analysis is the process of analysing a geographical area to determine the effect and hindrance of natural and manmade features on military operations. The OCOKA system of Western armies is a good analytical tool that can be developed into a descriptive theory. With an awareness of the dangers of anachronism, OCOKA terrain analysis can be applied to a specific historical case as it allows the researcher

to reconstruct and interpret the actual events as seen through the eyes of a military commander and the geographical limitations and opportunities he faced when appraising the situation and making his decisions at the time. OCOKA refers to the elements of a battle plan and involves deliberation of trafficability effects. The acronym stands for: O = observation and fields of fire, C = cover and concealment, O = obstacles, K = key terrain, and A = avenues of approach or withdrawal (Vicksburg National Military Park: Cultural Landscape Report 2009, 243–245).

Field of fire refers to an area that has a direct line of sight that a weapon may cover or lay effective fire from a given position within its range. It is related to observation. The land which cannot be observed or fired upon is dead space or ground. Observation and fields of fire are affected by contour and vegetation. While the treeless Arctic is open terrain, in subarctic boreal forests visibility is extremely limited, particularly in old growth spruce forests. Even though the long spells of darkness restrict visibility and observation capabilities, moonlight over a snowy terrain produces a contrary effect. The accuracy of fire is affected by foliage. The branches cause bullets to ricochet. The use of hand grenades became complicated making engagements close-quarter. The artillery shells usually detonated in tree trunks when the shell burst was directed downwards. In the Finnish-Russian border areas there were many tree-covered hills. The higher ground attracted fire but enabled good observation, although it was impossible to see into the forests between the hills.

Boreal forests could provide excellent concealment and thus protection from enemy observation and surveillance. Cover is protection against enemy fire, both direct and from shelling. Camouflage (in winter white) can hide men and equipment, help to prevent the detection of hidden units and thus minimize casualties. In forests attackers could achieve surprise, which often guaranteed their success. This was helped by the long periods of darkness typical for the northern winter.

Snow and ice are natural obstacles that might prevent, restrict, divert, or delay military movement. There are also manmade terrain features, existing or reinforcing, that determine the degree to which a certain terrain is restricted. Swamps (or other wet surfaces), woods, and rivers that already exist on the battlefield are not real obstacles in winter. Heavy snow cover impedes movement but as the ground and waters freeze in winter the battlefield becomes larger. Certain terrain might be unfavourable. Yet hardly any terrain is totally impassable. Urban areas are existing cultural obstacles that slow down military action. The enemy movement could be stopped, slowed down, or controlled (diverted) by placing reinforcing obstacles such as earthworks, barriers and abattis. Permafrost might complicate digging in. Yet if supported by mines, barbed wire and booby traps they require much effort to clear. Flooding is another useful method of creating obstacles, also in winter. For example, letting additional water onto the ice of a lake was an effective factor in slowing down the advance of infantry units, as keeping one's feet dry and warm was essential to combat effectiveness.

Key terrain is an area the control of which gives one side a significant advantage over the other. Normally it could be a high ground, a river crossing or a bridge, mountain pass or road junction. In Arctic regions road networks (lines of communication or "life lines") and villages and urban areas are few, and thus the most important terrain features such as the lack of adequate shelter in winter may lead to non-combat casualties and reduce the impact of firepower. These added logistical requirements dictated the key terrain. A dense wood or river network could also be designated a key terrain if it anchored the flank of a battle line. Ice roads to facilitate off-road movement could also be constructed along lakes and rivers when the ice was thick enough.

An avenue of approach is a relatively unobstructed ground route that leads to an objective or key terrain. These could be lines of communication and supply such as roads, rail lines, or rivers. A proper avenue of approach must allow rapid movement all along its length. In the north avenues of approach were mainly man-made roads or trails. Skis aided movement but the emphasis was on trail breaking to ensure that the troops were not road-bound.

A note on sources

Literature on the topic is scant. Thus a historiographical approach is not worthwhile. The sources for the study of Arctic warfare (or military action in the northern forests) are abundant yet scattered. Primary unpublished sources include official documents and personal

files. Most of the relevant archival sources, such as training and operational planning documents, orders, various after-action and other reports and correspondence are deposited in the Finnish National Archives (Kansallisarkisto). War diaries are all available online. In Finland, the archival system, some museums and historical societies hold oral history transcripts. The papers of individual actors could prove useful since individuals, not organizations, developed the art of war and winter techniques. These persons might also have published memoirs.

The study of military art is close to the history of ideas and intellectual history. Military instructional literature and the articles and debates published in military professional magazines are among the relevant sources.

The most important secondary published sources are winter warfare manuals, guidebooks, and regulations. Close reading of this instructional literature is revealing as it provides doctrinal guidance (on tactical doctrine and how to take the effects of the environment into consideration) and is produced to disseminate codified explicit knowledge. In Finland, however, manuals were considered as a basis for application rather than as set rules and methods.

Non-textual sources and remains might prove useful. Visiting the battlefields could give the researcher additional insights into the conditions and what the troops could or could not see and do in that specific kind of terrain. The OCOKA terrain analysis – indicating the connection between the terrain and features of the battlefield landscape and the military tactics employed by army commanders – could be conducted

on site. The seasons do matter: The best time to visit the battlefields would be winter. This way the researcher could avoid the impact of undergrowth on visibility. On the other hand, the landscapes of war, if still uninhabited, could look quite different after 75 years. It would, therefore, be wise to compare the actual wartime archival documents, photographs and maps with current images and cartography. In this GIS might also prove useful.

Conclusion

Warfare in the north has been, as we have seen, geographic in nature. The Finnish experience from World War II clearly shows how distinct weather and terrain significantly affected military operations. Therefore it is important to incorporate some military geographical considerations into the study of Arctic warfare. A geographical perspective can even act as an overall research framework. Mountain and winter warfare have often been considered common fields of historical inquiry. This does not, however, apply to the Finnish case. Winter combat practiced in Finland has essentially been sub-Arctic forest fighting. The illustrative examples discussed above suggest that the terrain and weather conditions of the far north of Europe and the Finnish-Russian border area had, indeed in a military sense, a character of their own. Even though it is possible to draw limited parallels and make some generalizations based on the Winter War, it is fair to say that the study of Arctic warfare is a highly context-related field.

Furthermore, the Finnish case indicates that success in Arctic warfare and the prevention of non-battle casualties could be achieved by meticulous planning, thorough training effort, and preparations. Many historical cases demonstrate that if a belligerent correctly realized the implications of the effects of adverse weather on terrain and of the northern environment on soldiers, equipment, weapons, and operations and allied himself with the winter, he could prevail. The Finns demonstrated on many occasions that with securing over-snow mobility and logistics one could compensate for numerical weaknesses and thus fight effectively against a formidable but ill-prepared adversary. Contrary to the common conception that in winter snow and ice or forests constituted a hindrance, the Finns viewed them as an aid to operations and to rapid and surprise movement of troops. Forests also gave some protection to the soldiers and units exposed to the elements. The Finnish case discussed above seems to confirm that the circumstances, terrain, weather, and short daylight hours not only dictated the operational capabilities in northern forests but also that better preparation in their utilization explained the eventual outcome of military operations.

Arctic warfare requires great mental stamina. Therefore motivational interpretations focusing on sociological and psychological phenomena are possible. The Finnish military culture could also invite culturally-oriented societal explanations for military effectiveness. Nevertheless, the wider context should not be disregarded: the winter warfare experiences obtained by the Finns in World War II along the

Finnish-Russian border in northern Europe, where the Arctic East met the Arctic North, were a part of the evolution of land and forest warfare in Europe. Arctic warfare is an important research area with wider significance, which can be studied by employing many different approaches. Amazingly, the topic has so far received very little research attention.

References

- Clayton, A. (2012). *Warfare in Woods and Forests*. Indiana University Press, Bloomington, In.
- Erfurth, W. (1951). *Warfare in the Far North*. US Department of the Army Pamphlet No. 20–292, Washington D.C.
- Field, M. (1951). *Basic Arctic Manual*. (FM) 31–70. US Department of the Army, Washington D.C.
- Gregory, B. (1989). *Mountain and Arctic Warfare: From Alexander to Afghanistan*. Patrick Stephens, Bath.
- Lowry, M.J. (2012). *The Enemy, the Weather, and the Terrain: The Effects of Weather on Historic Battles*. Outskirts Press, Denver, Co.
- Nelson, B. (2006). *General vinter: Vinterkrig genom tiderna*. Svenskt militärhistoriskt bibliotek, Hallstavik.
- O'Sullivan, P. & J.W. Miller Jr. (1983). *The Geography of Warfare*. Croom Helm, Guildford.
- Partanen J., J. Pohjonen & P. Tuunainen (2007). *Erkki J. Raappana: Rajan ja sodan kenraali*. Otava, Keuruu.
- Rogers E.M. (1983). *Diffusion of Innovations*. Third Edition. The Free Press, New York.
- Swinzow, G.K. (1992). *On Winter Warfare*. U.S. Marine Corps Fleet Marine Force Reference Publication (FMFRP) 12–48. US Department of the Navy, Washington D.C.
- Talvisotakäsikirja* (1928). Otava, Helsinki.

- The Army Tactics, Techniques, and Procedures* Attp 3–97.11 / Marine Corps Reference Publication McRp 3–35.1d: Cold Region Operations 2011. US Departments of the Army and Navy, Washington D.C.
- The New York Herald Tribune* (1951), 9 December.
- Tuunainen, P. (2012). *Marttinen: Kahden armeijan soturi*. Otava, Keuruu.
- Tuunainen, P. (2011a). Raatteen tien taistelu ukrainalaisveteraanien kokemana. In Alenius K. (ed.): *Talvisota kokemuksena*, 227–243. Oulun yliopiston historian laitos ja Pohjois-Suomen historiallinen yhdistys, Oulu.
- Tuunainen, P. (2010). *Tahtojen taisto: Alpo K. Marttinen ja Hjalmar Siilasvuo talvisodassa*. Otava, Keuruu.
- Tuunainen, P. (2006). The Battle of Encirclement at Ilomantsi in July–August 1944. An Example of the Application of the Idea of Cannae in the Finnish Art of War. *Journal of Slavic Military Studies* 19:1, 107–122.
- Tuunainen, P. (2012). The Finnish Army at War: Operations and Soldiers, 1939–45. In Kinnunen T. & V. Kivimäki: *Finland in World War II: History, Memory, Interpretations*, 139–188. BRILL, Leiden.
- Tuunainen, P. (2013). Motti Tactics in Finnish Military Historiography since World War II. *International Bibliography of Military History* 33:2, 121–147.
- Tuunainen, P. (2011b). Suojärvi sodissa 1939–1944: Suojärvellä käydyt sotatoimet sotilasmaantieteellisestä näkökulmasta tarkasteltuina. In Hämynen T. (ed.): *Omal mual, vierahal mual: Suojärven historia IV*, 34–59. Suojärven pitäjäseura. Saarijärvi.
- Tuunainen P. (2008). *Syöksyjoukot ja talvisodan mottitaktiikan synty: Suomalaiset saksalaisperäisen hyökkäystaktisen ja -taisteluteknisen innovaation omaksujina ja soveltajina*. Maanpuolustuskorkeakoulu, Helsinki.
- Tynkkynen, V. (1996). *Hyökkäyksestä puolustukseen: Taktiikan kehittymisen ensimmäiset vuosikymmenet Suomessa*. Maanpuolustuskorkeakoulu. Helsinki.
- Vicksburg National Military Park: Cultural Landscape Report* (2009). National Park Service. US Department of the Interior. Atlanta, Ga.
- Winters, H. A., G. A. Galloway Jr., W. J. Reynolds & D. W. Rhyne (1998). *Battling the Elements: Weather and Terrain in the Conduct of War*. Johns Hopkins University Press, Baltimore.