COMBAT IN ARCTIC REGIONS

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On some future battlefield, the U.S. Army may face a dangerous and unpredictable adversary — one that defeats the best tactics, the latest technology, and the best-trained soldiers, one that can strike without warning and with great ferocity, and one that can methodically deplete resources until units are combat ineffective. This adversary is the arctic winter, and the Army must prepare now to conquer that foe if it hopes to defeat a modern enemy who may be better able to harness the arctic winter's unique characteristics.

The threat posed by the arctic climate has long been a topic of interest and myth for students of military history. Our Army first experienced arctic combat during World War I in northern Russia in 1918-1919 when Allied troops occupied the ports of Murmansk and Archangel. During this brief period nearly 5,000 soldiers fought the Red Army. The primary lesson we learned from that experience was the not-so-original observation that defensive operations are preferable to offensive operations in the arctic. The Red Army troops reportedly suffered severely as they relentlessly attacked through devastating cold and deep snow in attempts to seize well-fortified Allied positions.

Our brief experience with combat operations in the Aleutian Islands during World War II is not a good example of arctic winter combat because the ground combat took place during the summer. And geographically speaking, the islands are not typical of all arctic regions. (They are typical of other high — and low — latitude archipelagoes with windy, wet, and cold climatic conditions.) Few lessons learned during those operations, therefore, are directly applicable to combat in other arctic regions.

Combat operations in North Korea during the winter of 1951-1952 provided yet another opportunity to study the effects of arctic weather on men, weapons, and equipment under combat conditions. Our forces were not prepared to conquer the Siberian cold especially when it allied itself with the North Korean and Chinese armies, which proved far more capable of enduring the winter weather. It was a severe test, and numerous U.S. casualties were directly attributed to frostbite, respiratory ailments, intestinal disorders, and dehydration. In fact, these non-battle casualties often outnumbered actual battle losses. Additionally, weapons frequently froze shut and winter issue clothing was inadequate for the task.

Today, the Army tests its arctic abilities during bi-annual interservice exercises in Alaska. These Brim Frost (or Arctic Warrior) training exercises provide a test bed for arctic region tactics, equipment, and interservice operations. The record-setting weather of Arctic Warrior 1989 provided an especially severe test of the modern Army's ability to operate under arctic conditions. Many of the all-time record cold temperatures for Alaska and single periods of severe sustained cold were set during this exercise. For example, the site for the Army's major force-on-force battle (the Tanana Flats near Fort Wainwright) experienced an ambient low of minus 76 degrees Fahrenheit — the lowest ever recorded in Alaska. Additionally, the sustained three-week deepfreeze of -50 degrees Fahrenheit or lower truly tested the soldiers and their equipment.

The lessons learned from this exercise, combined with those learned from previous arctic combat experiences, require serious study and future application. They must influence the way the Army equips and trains soldiers for future conflicts that may take place in arctic regions.

The arctic is a foreign concept to the average American, who believes that it is a place of eternal cold, vast wildernesses, uncharted mountain ranges, sparsely populated areas, icebergs, persistent snowstorms, glaciers, spectacular auroral displays, polar bears, penguins, reindeer, and strange people who eat whale blubber as a staple. Much of this is true, and the arctic is also a place of few roads and railroads and little other infrastructure. These combined characteristics partially explain why the arctic regions are probably some of the toughest areas in which to fight wars.

Areas that are included under the "arctic region" umbrella are not well defined. For example, the Arctic Circle is a common, though wholly arbitrary, regional boundary that does not correspond to any physical attributes. Areas within this arbitrary boundary do share at least one common element — the sun does not rise on at least one day a year and does not set on at least one day a year.

Arctic regions are more often referred to as those areas beyond the northern (or southern) limit of trees and the northern (or southern) limit of continuous permafrost. For purposes of this article, arctic regions include the areas generally within the littoral lands of the northern hemisphere: Canada, Alaska, Greenland, Northern Scandinavia, North Asia, and Tibet. They also include the continent of Antarctica, a region south of 60 degrees latitude that is governed by the Antarctic Treaty of 1961.

STRATEGIC IMPORTANCE

The northern arctic regions are of particular strategic importance to the United States. They offer vast non-renewable resources — crude oil, natural gas, coal, nickel, diamonds, zinc, copper, silver, gold, and phosphates. They also have renewable resources such as fur, timber, and fish. The southern arctic regions also have vast non-renewable resources such as crude oil, iron, natural gas, and copper. These regions are likely to experience a major expansion of industrial activity in the future.

They are also important for national security reasons. The northern arctic areas provide a platform from which unfriendly naval movements through northern region "choke points" such as the Bering Strait and the Greenland-Iceland-United Kingdom (GIUK) Gap can be limited. The southern arctic region is equally significant because it dominates the lines of communication between the Atlantic and Pacific Oceans.

The polar areas also offer convenient launching points to any place within the hemisphere. Alaska, for example, is closer to Berlin than New York is and closer to Tokyo than Seattle is. This means troops and equipment stationed in Alaska can move rapidly to more temperate areas within the hemisphere. In most cases, this can be accomplished quicker than similar deployments from locations in the continental United States.

The lessons that have been learned from past arctic combat operations and from the severe test of Arctic Warrior 1989 are presented here in terms of the battlefield operating systems:

Maneuver. Maneuver in the arctic is complicated by vast distances and severe weather conditions. Mobility, the first of the two dimensions of maneuver, is the cardinal principle of arctic operations.

Although ground transportation in the arctic is restricted by the limited road network, it is still the most reliable. Operational planners must therefore work with the knowledge that distance can be as difficult to overcome as the enemy. Cross-country movement on foot, skis, or snowshoes is especially slow when there are extremely low temperatures, because soldiers must often pull heavy akhios (small sleds) or carry rucksacks burdened with their survival shelters and supplies. Planners must also factor in warm-up time before, during, and after a move.

Cross-country movement by foot in deep snow is practically impossible. Soldiers quickly become incapacitated by the sheer magnitude of their efforts at forward progress. In contrast, skiing is a desirable alternative, because skis afford speed and the ability to negotiate deep snow. Proficiency with military skis is a skill that soldiers can usually master in three to four weeks.

SKIJORING

A complementary skill for trained skiers is skijoring, in which troops mounted on skis are towed behind vehicles with cross-snow capabilities. The number of soldiers that can be pulled by a vehicle is limited by the terrain, the skill of the skiers, and the pull power of the vehicle.

Snowshoes are a slower but useful alternative to skis, especially when restrictive terrain must be negotiated. Snowshoes are generally the best cross-snow item for air assault and airborne troops because they are less cumbersome to transport than skis or cross-snow vehicles.

Long range movement or force projection is a common requirement in arctic regions, and tactical airlift operations often become the lifeblood of many remote military sites. Unfortunately, air operations are dramatically curtailed by weather peculiar to the arctic: ice fog, severe cold, and extreme high pressure. (Ice fog occurs around inhabited areas that produce water vapor when the ambient temperature falls below -35 degrees.) These factors affect such associated operations as essential cargo delivery system (CDS) resupply and airborne assaults.

Helicopters play an important operational role, but they too are hampered by arctic cold. They can be especially difficult to start in extreme cold temperatures — specifically, the batteries that reach low ambient temperatures (become cold soaked) often fail to start the aircraft. This problem can be mitigated if the batteries are removed and placed in warming tents or if auxiliary heating systems are used. The latter can require a great deal of preparation, however, and they are also subject to cold weather starting problems.

Helicopter operations are limited by the ice fog created by the rotor wash and the engine exhaust, and an aircraft's payload is reduced by the weight of the aircraft-mounted skis and the required survival equipment. In temperatures below -20 degrees, crew performance is limited because internal heating systems are often inadequate to maintain cockpit heat at a reasonable level. The primary concern is the reduced manual dexterity of the pilot due to cold hands and the associated difficulties involved in the wearing of heavy gloves.

Helicopter refueling and rearming can be a limiting factor in any environment, but especially in arctic regions. Fast or hot refueling operations are normally stopped when temperatures fall below 0 degrees. In these situations, a helicopter must be shut down, refueled, and then restarted. The refueling equipment is also subject to start-up problems. Finally, standard hoses, gaskets, and seals begin to crack at -30 degrees.

In tactics, the second component of maneuver, the defense is normally superior to the offense in the arctic because the attacker must contend with the debilitating exposure to the frost and wind chill caused by moving through deep snow, the general lack of available shelter, and the lack of concealment.

The defense has its own problems. Preparing defensive positions, for instance, is a major engineering effort that requires numerous resources. Manning those positions in the extreme cold requires the frequent rotation of personnel to limit their exposure time to the elements. Equipment can become cold soaked, which increases the incidence of mechanical failure.

OFFENSIVE OPERATIONS

Offensive operations in the arctic generally include breaching enemy lines near key terrain. In the arctic, key terrain often consists of road junctions, railroad tracks, buildings, or other man-made features. Most offensive operations will be conducted at night and during periods of limited visibility (ice fog, snow, and blowing snow), and night vision devices can play a key role in these operations. Short violent attacks are typical of arctic offensive operations; rapid exploitation and pursuit are rare.

Fire Support. During the Russo-Finnish war of 1939-1940, the Finnish soldiers concentrated their firepower on the Russians' campfires and destroyed their field kitchens. As a result, the Red Army soldiers could not get the needed caloric intake, could not warm up, and sometimes died of exposure.

Fire support equipment is also severely affected by arctic cold. Mortar units usually note an increase in breakage of firing pins and cracking of base plates. The towed howitzer's traverse and elevation mechanism stiffens at -40 degrees Fahrenheit, and the howitzer itself also may not return to battery when it is fired at low temperatures. Batteries for the ground laser locater designator (GLLD) do not work below 0 degrees.

Other weapon systems are affected by severe cold, too. The missile guidance system (MGS) battery assembly for the TOW, M220, and the night sight battery power conditioner do not work in severe cold. Wing nuts on the MGS battery break because moisture freezes to the battery base. Finally, the rubber eyeshields on the TOW sight freeze and crack at low temperatures.

Munitions and fuses are especially sensitive to the cold. The 60mm mortar round is not as effective when used at temperatures below 0 degrees. The 2.75-inch rocket performs erratically when used at temperatures below -30 degrees. The howitzer's munition tables only go to -40 degrees, yet during Arctic Warrior 1989 there was a two- to three-week period when the temperature never rose above -40 degrees. Point detonating fuses are less effective in deep snow, and some types of variable timed fuses malfunction at low temperatures.

LESS EFFECTIVE

Target acquisition systems are less effective. The TOW and Dragon night sights experience significant thermal distortion during periods of severe cold. These fire and track systems become almost useless. Too, a gunner often cannot see his target because of the fog generated by the missile's exhaust. Falling snow also affects the performance of all electro-optical systems because of the attenuation and degradation of electromagnetic radiation in the atmosphere.

These acquisition systems are also affected by the limited amount of solar light available during the arctic winter. Snow cover reduces a gunner's depth perception and obscures ground features and landmarks. Ground bursts fired for adjustment are especially difficult to observe on snow-covered terrain. The use of airbursts or colored smoke may help (subject to the environmental limitations of these rounds). Aircraft are often the best observation platforms, but they are just as vulnerable to many of the same environmental conditions.

Fire support system mobility is critical. To support maneuver forces these systems must keep pace. Position options and avenues are limited, and special oversized tires are required for the towed howitzers. Light tracked vehicles such as the upgraded small unit support vehicle (SUSV) — a fiberglass, tracked vehicle for movement over snow — are also necessary. Relocating howitzers by helicopter may be an alternative to using ground transport, but aircraft must also then be available to sustain those positions.

As operational distances increase, close air support (CAS) and joint air attack teams (JAATs) become increasingly important.

Intelligence. All available resources must be used to monitor an opponent in the arctic, and to deny him information concerning friendly forces. One source of friendly information that requires considerable operational security is the decidedly visible signature Army units generate even during routine operations. For example, in arctic regions, ice fog is usually associated with heavy weapons, engines, and heaters. Heat escaping from tents gives off a distinctive thermal image. Off-road movements are easy to spot because of the impressions troops or vehicles make in the snow. Additionally, aircraft produce significant sound signatures, especially during periods of temperature inversion (when warm air traps super-cooled air on the surface). Helicopters also produce large clouds of blowing snow or ice fog near pick-up and landing zones. These clouds not only hamper visibility, they provide easily identifiable signatures.

Terrain analysis in arctic regions is often difficult because many areas are not well mapped and units may have to call on local guides. Key terrain must also be considered differently — key terrain, for example, is most often a road, a rail line, a stream, or a village.

Local weather monitoring is absolutely essential and the information must be disseminated rapidly to the lowest levels. It is critical to the sustainment of life and the success of operations. Too, temperatures in low areas are often significantly below those on surrounding mountains and hills — an atypical weather phenomenon.

Some of the best combat intelligence is gleaned from two very different sources. First, human intelligence gathering becomes more critical as the electronic intelligence systems become less effective. Indigenous personnel can be useful. Second, air reconnaissance performed by satellites or aircraft can provide timely combat information when vast areas must be covered.

Command and Control. Command and control is extremely difficult on a spread-out arctic battlefield. Mission type orders must be the standard, and they must give subordinate commanders the greatest possible freedom to deal with their extended areas of responsibility, reduced troop density, battle area isolation, and electronic communication difficulties.

MAJOR CHANGES

The restrictions imposed on operations by the extremes of climate and terrain call for major changes in the way we plan and operate in temperate areas. Mobility considerations must be a prerequisite to all planning. Special factors that influence operational planning are low population density, available roads and railroads, lakes and waterways as natural routes of communication or as air strips, and the difficulty of navigation.

Large and irregular magnetic deviations often frustrate personnel who rely on magnetic compasses for guidance. The weather and the rate of cross-country mobility through rugged areas as well as over varying snow cover are all-important planning considerations. Since most operations will be conducted during the long nights, the lack of light and the numbing cold will invariably slow the rate of normal activities.

Communication systems must be redundant. Most electronic systems become especially fragile as the temperature drops. These systems are also vulnerable to ionospheric disturbances common to the earth's polar regions. Radios used before a long warm-up period often cease to operate, and the life of radio batteries is significantly reduced as the temperature drops.

By design, command and control in the arctic must be non-standard. The commander's intent grows in importance as the electronic communication systems' reliability declines.

Mobility, Countermobility, and Survivability. The Germans discovered in World War II on the Eastern Front that land mines often failed, because the deep snow cushioned a mine's fuse or delayed its action. Additionally, the constant cycles of melting and freezing snow around a mine often created an ice bridge over the detonator, which either kept the pressure sensitive mines from functioning or caused them to function prematurely.

But a combat engineer in an arctic region does more than set and retrieve mines. He constructs fortifications, maintains or constructs snow roads, drop zones, helicopter landing and pick-up zones, and airfields. These efforts consume a disproportionate part of any unit's expendable resources and resupply capability. But no one denies their overwhelming importance to the success of an arctic operation. Arctic roads can be hundreds of miles long. They may include ice bridges that cross large bodies of water (rivers or lakes). The science of siting and constructing ice bridges is an essential skill for arctic combat engineers.

Fortifications are especially difficult to construct in the arctic, because frozen ground takes four to eight times as much effort to excavate as thawed earth. Often heavy equipment or explosives provide the only timely means of moving frozen earth. Solidly packed snow is an alternative building material, but at least 6½ feet of solidly packed snow is required for adequate protection from most small arms fire. Water can be added to the packed snow to increase the snow density, but water is especially scarce, hard to transport, and as vital to the soldier in the arctic as it is to the soldier in the desert. Finally, snow becomes brittle and deteriorates rapidly under sustained fire.

Logistic support in the arctic is affected by the need to sustain widely dispersed forces usually located on rugged terrain connected by often unreliable ground communication systems. The sustainment of support is further hampered by the general absence of host nation civil and industrial facilities that can be used by the military services in time of war.

Combat Service Support. Combat service support is critical as it applies to selected classes of supplies, medical support, and maintenance.

Combat rations present an especially difficult supply problem in the arctic, and special care must be taken in storing them. Cold is especially hard on the meal, ready to eat (MRE). The ration containers often burst in severe cold, and the rations themselves can be thawed only once without spoiling.

The tray ration (T-ration) is a bulky alternative. Unfortunately, the mobile kitchen trailer (MKT), which is the primary field facility used to prepare the T-ration, is worthless in the arctic. More often than not, soldiers devise their own T-ration heating techniques such as heating a ration on top of a hot Yukon stove.

Water is one of the most precious resources in the arctic. The chief sources of water are generally rivers or lakes, but retaining liquified water in containers is especially difficult. Auxiliary or swingfire heaters — attachments used to winterize almost all equipment — must be kept burning constantly to keep the water trailers from freezing. Too, in spite of what seems an unlimited supply, snow is seldom used as a water source because it takes 17 cubic inches of snow to produce one cubic inch of water. For this reason, melting snow is not recommended for supplying water except in emergencies.

The soldiers' clothing and equipment must be specially designed to protect them against the elements. Unfortunately, our individual arctic clothing and equipment leave something to be desired.

For example, although the Army-issued Gortex parka is effective in cold and wet climates, it may crack when exposed to dry arctic cold, and the metal fasteners can cause frostbite when touched. The hood will not pull over the helmet, and it needs a ruff to help retain the heat. The important vapor barrier (BV) boot is generally effective down to about -40 degrees. Below that even the newest boots get dangerously cold. The metal arctic canteen is worthless in severe cold — it freezes almost as fast as temperate climate canteens. Finally, the Type II sleeping bag provides insufficient protection below -35 degrees, and many arctic soldiers buy commercially available sleeping pads and sleeping bags or inserts to help fight the severe cold.

Medical support is especially difficult in the arctic, because the evacuation of casualties is plagued by the same problems as other transportation systems. Dehydration is an especially serious problem. Leaders must force their soldiers to increase their water consumption as their level of activity increases.

Frostbite, though, is probably the most common arctic medical problem. Generally speaking, good leadership, personal hygiene, and dry clothing can prevent most frostbite injuries.

The cold can subject most equipment to stresses and strains it was not designed to endure. Fan and alternator belts frequently snap; batteries cannot sustain the drain of energy; vehicle and aircraft seals are more likely to fail during start-up procedures at temperatures below -40 degrees. Vehicles must be kept running for extended periods, and vehicles that are not moved may freeze to the ground. Tires often develop flat spots when left in place too long, and these tires may then shatter if they are not properly used. Fuel lines crack and break. Even high viscosity lubricants congeal in very cold weather. Diesel fuel begins to gel at -58 degrees. JP-4 (aircraft fuel) gels at -75 degrees; the Herman Nelson heating system is unreliable below -35 degrees.

Finally, in the arctic, it takes up to five times as long to do even the simplest maintenance task. For example, it takes five men eight hours to establish a maintenance tent at 60 to 70 degrees, and those same five men 40 hours to establish the same tent when the temperature falls to -40 degrees.

CSS in arctic regions requires great initiative, more time, and larger amounts of all classes of supply as the temperature falls. Operational planners must listen to and heed the sage advice of the arctic logistician.

The Soldier. Although not a formal battlefield operating system, the soldier is a critical aspect of preparing for and winning in the arctic.

An arctic warrior must be in outstanding physical condition. He must be fit to carry heavy loads over long distances, up and down mountains. He must be capable of traversing glaciers, and of crossing vast areas of tundra and windswept frozen lakes to find and destroy the enemy. He must understand arctic weather and how to sustain himself using the available resources.

An arctic warrior must also understand small unit operations. He must understand that command in the arctic is, by nature, decentralized to insure maximum flexibility for all leaders. He must be resourceful and prepared to take the initiative to follow through with his commander's intent. He understands that success in the arctic means detailed planning and preparation. He appreciates thorough preparations.

The arctic regions are especially enticing to a resource-hungry world and may become the final earth-borne frontier to be exploited. The race to exploit the wealth of these regions will be won by the strongest and most innovative country. As the economic competition begins, the U.S. Army must be prepared to provide an arctic capability that can protect the United States' interests. It should do this by continuing to emphasize joint service arctic region exercises that familiarize its personnel with the severity of the arctic climate. It should update its old and outdated field and technical manuals with the latest arctic information. It should also test and field equipment that is capable of sustaining a modern force against the rigors of the earth's most formidable climates.

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