Howitzers on High Ground: Considerations for Artillery Employment in Southwest Asia

A Monograph
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AY 2009

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	30-11-2009	Monograph, JAN 2009-DEC 2009

4. TITLE AND SUBTITLE
Howitzers on High Ground: Considerations for Artillery Employment in Southwest Asia

5. FUNDING NUMBERS

6. AUTHOR(S)
Major Joseph A. Jackson

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

School of Advanced Military Studies,
Advanced Military Studies Program
Eisenhower Hall
Fort Leavenworth, Kansas 66027

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Command and General Staff College
ATTN: ATZL-SWD-GD
Fort Leavenworth, KS 66027-2301

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 Words)***

The current U.S. Army involvement in Afghanistan requires an expanded field artillery arsenal of weaponry and munitions. This expansion should include rockets, medium and light howitzers, and pack howitzers. These weapon systems offset the limitations that the rugged mountainous terrain of Southwest Asia and enemy tactics place on the effectiveness of aircraft and infantry. Enemy exploitation of the mountains and the environmental conditions creates a dynamic that increases the demand and reliance for field artillery of all calibers in the region. Historical case studies validate the necessity, utility, and efficacy of artillery use in the region. These studies center on the Soviet Union's invasion of Afghanistan, the India-Pakistan conflicts upon the Siachen Glacier and around the city of Kargil, and the early experience of United States forces during Operation Anaconda. Insights from these examples establish artillery as an essential capability that supports conventional and asymmetrical operations in this region.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Afghanistan, Field Artillery, mountain warfare, India-Pakistan Siachen Glacier, Kargil, Kashmir.	58
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
(U)	(U)	(U)	(U)

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Joseph A. Jackson

Title of Monograph: Howitzers on High Ground: Considerations for Artillery Employment in Southwest Asia

This monograph was defended by the degree candidate on 15-October-2009 and approved by the monograph director and reader named below.

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Abstract

HOWITZERS ON HIGH GROUND: CONSIDERATIONS FOR ARTILLERY EMPLOYMENT IN SOUTHWEST ASIA. by MAJOR Joseph A. Jackson, USA, 64 pages.

The current U.S. Army involvement in Afghanistan requires an expanded field artillery arsenal of weaponry and munitions. This expansion should include rockets, medium and light howitzers, and pack howitzers. These weapon systems offset the limitations that the rugged mountainous terrain of Southwest Asia and enemy tactics place on the effectiveness of aircraft and infantry. Enemy exploitation of the mountains and the environmental conditions creates a dynamic that increases the demand and reliance for field artillery of all calibers in the region. Historical case studies validate the necessity, utility, and efficacy of artillery use in the region. These studies center on the Soviet Union's occupation of Afghanistan, the India-Pakistan conflict for the Siachen Glacier and around the city of Kargil, and the experience of the United States in Afghanistan. Insights from these examples establish artillery as an essential capability that supports conventional and asymmetrical operations in this region.

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SECTION ONE INTRODUCTION

> Pre-occupied with protection of our own forces, we have operated in a manner that distances us -- physically and psychologically -- from the people we seek to protect. . . The insurgents cannot defeat us militarily; but we can defeat ourselves.
>
> General Stanley A. McChrystal
>
> The Washington Post, September 2009

The United States Army continues to fight a protracted war in Afghanistan. Throughout the past eight years, this powerful and well-funded force has been engaged in a chaotic and increasingly unpopular conflict. The duration of the hostilities comes not from the challenge offered by a superior enemy, but from the reluctance of the United States to commit the necessary troops and appropriate weapons in significant numbers to prosecute the war. The United States Department of Defense continues to ignore the quantitative and technological advantages that the United States' global position offers even though it possesses a defense budget in excess of six hundred billion dollars.[1]

The United States Army is no stranger to mountainous and high-altitude fighting. American history contains several instances of successful mountain conflicts. The Italian Alps during WWII, the Taebaek Range of Korea, and the Annamite Range in Vietnam have provided ample instruction in mountain warfare. Yet this time, fighting in the mountains is proving to be a greater challenge than anticipated. To conclude the fighting in Afghanistan, the United States can ill afford to disregard the historical insights of other nations.

The Army has implemented self-limiting measures in Afghanistan. This formidable institution refuses to commit its full spectrum of combat capabilities to overwhelm the enemy

[1] Department of Defense, Office of the Secretary of Defense, the Undersecretary of Defense (Comptroller), *Defense Budget Materials FY 2009*, http://www.defenselink.mil/comptroller/defbudget/fy2009/index.html.(accessed September 19, 2009) 1-24.

forces, but continues to deploy its weapons in piece-meal fashion, arriving with too little too late. Nowhere is this more obvious than in the employment of the United States Field Artillery.

Multiple issues prevent quick resolution to the conflict. U.S. forces in Afghanistan combat the Taliban at long-range distances ideally suited for artillery. However, expeditionary brigades continue to deploy with less than their full complement of cannons. The current arsenal lacks mobility. U.S. artillery limits itself to only two calibers, 105mm and 155mm to engage the Taliban. Although these have proved effective in conventional wars in the mountains of Afghanistan, two is not enough. The other choice of weaponry, the Multiple Launch Rocket System (MLRS), provides a significant capability but fires at targets well beyond the immediate reach of the infantry.

Other weapons systems that the U.S. has chosen are the same ones used by the insurgents. Creative Taliban tactics, however, allow them to attack fortified positions from a distance that prevents effective retaliatory fire by riflemen. Their tactics enable a small group to attack and pin down a much larger force in a fixed position using mortars, rockets, rocket-propelled grenades, and machine guns. The distance created by the insurgents using these weapons ensures that the majority of rifleman cannot range them with their small arms.

The result is that two divergent tactical fights develop. The first fight belongs to the infantry, fighting in platoon or squad-sized actions at ranges of one kilometer or less. The second fight is well within the purview of the artillery as it attempts to fight a much deeper battle against selected pinpoint targets out to 30 kilometers. A capability gap lies in between these distances.

Beyond fighting for the defense of forward operating bases and smaller combat outposts, the artillery presently at work in Afghanistan cannot move along with the infantry on the ground. As infantry platoons and companies seek to engage and destroy the Taliban in increasingly remote areas, howitzers remain confined to the bases, unable to move farther forward. To counteract this deficit, the United States Field Artillery must expand its current family of weapons systems and calibers. The US does not need to produce these new weapons at home.

Many systems already exist for purchase on world markets today and have been environmentally and combat tested for demanding conditions such as those presented by Afghanistan. The U.S. Army can successfully prosecute this war if it employs the correct assortment and employment of weapon systems.

In Afghanistan, the terrain and weather dictate the tactics. Significant mountain ranges such as the Himalayas and the Karakoram rise in the east. The Hindu Kush towers in the center of the country. The Suleman and Kirthar ranges jut toward the eastern border with Pakistan and extend into Baluchistan. Finally, the Paghman Range shrouds the capital city of Kabul. These ranges elevate more than two-thirds of Afghanistan's territory above 5,000 feet. These ranges and their elevations provide natural concealment and protection for the insurgent fighters. American forces need weapons that can destroy a smaller force in terrain not suitable for the current arsenal.

Fighting in extremely mountainous terrain and at high-altitudes is not linear. While forces move along pre-designated phase lines as on flat terrain, difficulties arise in maintaining continuity between units as they methodically scale from one point to the next. Fronts do not necessarily follow contiguous and sequential sets of ridges; they may even require simultaneous attacks on crests, ledges, and tactical objectives in opposite directions. A valley floor lying several thousand meters below may provide the only geographical point of continuity.[2]

Most armies train and equip themselves for conventional warfare on terrain that facilitates effective command and control and allows efficient employment of combined arms. Ideal terrain for mechanized forces are wide plains, rolling hills, plateaus, deserts, or sparsely populated regions that favor the linear and contiguous properties of maneuver warfare. None of these conditions is present in the bordering highlands between India and Pakistan or, by extension, along the eastern length of Afghanistan.

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[2] Lester Grau and Lieutenant Colonel Hernán Vázquez, Argentine Army. "Ground Combat at High Altitude," *Foreign Military Studies Office*, Fort Leavenworth, KS. http://fmso.leavenworth.army.mil/products.htm#casia. (accessed March 20, 2009) 4.

Extreme terrain constrains fire support weapons. Artillery faces limitations imposed by steep road gradients and sharp bends that prevent deployment of the support vehicles and guns. To maintain the employment of guns as far forward as possible, batteries disperse into sections, one or two guns per position, to maximize coverage to the supported units. To optimize the usefulness of the artillery, forces position their guns in terrain folds and on reverse slopes. Other positioning options include road heads, near villages, and along valleys. Deployment of artillery is often constrained because of logistics to support their use. Time remains a consideration in the positioning and moving of guns due to narrow roads and limited airlift capability to support maneuver plans.[3]

Meteorological implications affect artillery use at higher elevations. Low air pressure, cold temperatures, and high wind speeds make standard firing tables ineffective.[4] These conditions increase inaccuracy. The lack of adequate maps and surveyed locations and the lack of precise meteorological reports increase the probability of error in range and altitude. Spotting rounds at high-altitude requires extra observers to walk rounds onto targets and to make drastic shifts to achieve accurate fire.

Artillery augments operations in mountainous terrain. The narrow mountaintops and steep valleys only permit a limited volume of cached supplies and numbers of troops to operate there, Infantry battalions in a high-altitude mountain defense typically occupy a 7-8,000-foot wide front. Subsequent companies occupy a frontage of approximately 3,000 to 4,500 feet. While these intervals at first glance appear reasonable, difficulties arise when trying to interlock fires between positions. Sudden changes in vertical elevation limits the effectiveness of all weapons systems. Lack of physical space places greater dependence on artillery to support fixed positions with protective fires. Extreme terrain usually does not contain large marshalling areas for the

[3] Ibid., 9.

[4] Ibid., 6.

forming of a significant operational reserve. Instead, smaller mobile units near the point of expected attack or counter attack necessitate artillery compensation with sustained and lethal fires. These are often in direct fire mode.

Positioning of artillery becomes even more important when defending mountainous terrain. The drastic changes in elevation and uneven ground make maintaining a continuous line of units tied together along their flanks difficult. A reverse-slope defense poses problems as well. While these positions mask unit movements and strengths, troops often lack sufficient overhead cover. Positions become susceptible to artillery fire and airbursts showering positions with fragmentation.[5]

Other weapons systems do not improve these circumstances. In fact, their limitations reinforce the demand for an artillery capability. Aircraft are of limited utility in high-altitude operations. Atmospheric conditions such as heavy rain, blizzards, fog, high winds, and low oxygen density limit performance. Camouflaged ground troops use the natural contours of the mountains that include deep shadows and overhanging ledges to prevent visual identification by aircraft. Aircraft use in valleys is dangerous; pre-positioned air defense weapons and massed small arms fire force aircraft to fly higher. This technique creates a visual positive identification problem and increases the risk of fratricide. Helicopters serve as good artillery spotters but weather and elevation limit their usefulness. Noise from approaching aircraft provides advance warning for units giving them time to hide among the rocks.[6]

Human endurance must factor into the problem as well. Men cannot endure temperatures ranging from as high as 128°F and as low as -15°F in the central highlands of Afghanistan and greater Southwest Asia. Prolonged exposure at high-altitudes depletes the strength of infantry

[5] Ibid., 5.

[6] Ibid., 6-9.

units and requires frequent rotations of the troops.[7] This condition places greater responsibility for augmentation by the field artillery. Firepower must compensate for the aggregate reduction in troop strength. The tactical, geographical, and physical conditions interlock. Continued exploitation of the environmental conditions by the insurgents who are accustomed to these extremes allows them to engender more credibility than their weaponry and troop strength warrant.

Further compounding the issues in Afghanistan is the U.S. Army's failure to consider the history of fighting in Southwest Asia. Military archives clearly record the painful lessons of nations that responded too slowly to address unanticipated threats. The Soviet occupation of Afghanistan, the Indo-Pakistani conflicts, and the United States' fighting in Afghanistan reveal the difficulties inherent in ferreting out groups positioned in fortified mountain positions. These examples point directly to the need for artillery within the region and its utility in facilitating combat operations.

Operational planners, artillery professionals, congressional staffers, and military acquisition officers should examine these relevant histories, review doctrine, and consider their implications. These sources serve as a guide to develop successful and sustained operational approaches to combat the Afghan insurgency. They also provide a reference for adaptive tactics and procurement requirements for weapons needed in protracted high-altitude mountain warfare.

SECTION TWO
LEARNING FROM THE SOVIETS

The experience of the Soviet 40th Army and its artillery provides meaningful insights relevant to the current U.S. experience in Afghanistan. The army that the Soviet Union deployed did not immediately reflect the operational demands of Afghanistan's terrain, nor did they fully understand the charge that they had been given. Following the conclusion of World War II, the

[7] Ibid., 6-9.

Soviet Union adapted their operational forces to face a number of threats presented by NATO and China on her Eastern borders. The Soviet Union equipped, engineered, and structured its ground forces to fight a conventional war of maneuver across the wide plains and low sweeping hills of Central and Western Europe and Inner Mongolia. In Afghanistan, their mission would involve unconventional combat in a rugged environment.

The 40th Army that the Soviet Union deployed to Afghanistan eventually grew to over five divisions. Ultimately, this force failed. Soviet forces remained insufficient to control Afghanistan completely. Despite the results, the Soviets adapted their tactics and relied increasingly on their field artillery to balance tactical risks and to compensate for the deficiencies in other arms. Artillery was the cornerstone of Soviet Army, and Afghanistan affirmed the dominant role of their artillery systems.[8] Their example also offers a unique look at the ways in which a large contingent of artillery participated in, shaped, and often led combat actions against the Mujahedeen insurgency.

Artillery became the principle arm facilitating combat operations in Afghanistan. Through trial, error, and hard-fought experience, Soviet gunners adapted methods and developed tactics suited specifically for Afghanistan. These tactical changes often diverged from their core Cold War training. The Soviet Army's organizational structure and associated war-fighting functions emerged from their experiences in two world wars and their own civil war (See Appendix A). The lessons from these brutal and large-scale conflicts left little room in Soviet doctrine for the equally important experiences gained from fighting middle and low-scale conflicts in the Caucasus Mountains and Central Asia.[9]

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[8] The Russian General Staff, *The Soviet-Afghan War: How a Super Power Fought and Lost*. Translated and edited by Lester Grau and Michael A. Gress, (University of Kansas Press, 2002) 188-190.

[9] The Tsars and the Soviet authorities pursued intermittent campaigns in the Caucasus Mountain, Central Asia, and in Afghanistan from the 1870s through the 1930s. Notably, the Red Army conducted a successful campaign to defeat and subjugate the Basmachi to communism and establish the Uzbek,

The initial Soviet plan for Afghanistan called for the Afghan army to do the majority of the fighting. Soviet forces would provide a stiffening presence and logistical support to the Afghans. The Soviets garrisoned the major cities, airbases, logistics sites, and main routes of supply and communication. The Afghan communist government forces would then move into the countryside to battle the resistance. The Soviets would facilitate the Afghan efforts with logistics, aviation, artillery, and intelligence assets. The Soviets initially wanted minimal interface between Soviet forces and the Afghan population. Politically, this would keep an Afghan face on an internal Afghan problem and minimize Soviet casualties.

The tactical realities of Afghanistan however did not match the operational model that the Soviet Army anticipated. The Afghan government's inability to impose its will upon the disaffected Mujahedeen factions eventually required complete Soviet intervention. This entangled the Soviet Army in a nearly decade-long campaign against the Mujahedeen insurgency. The forces of the Soviet Union's 40th Army faced a daunting mission: stabilize Afghanistan.

Soviet ground forces, initially under the command of Marshal Sergei Sokolov, entered Afghanistan from the north on 27 December 1979. In the morning, the 103rd Guards '*Vitebsk*' Airborne Division landed at the airport at Bagram and the deployment of Soviet troops in Afghanistan commenced. The 40th Army consisted of five and two-thirds divisions. These included: the 5th, 108th, 201st Guards Motor Rifle Divisions, the 103rd Airborne Brigade, and a balance of separate and augmenting regiments and brigades such as the 860th Separate Motor Rifle Regiment, the 56th Separate Airborne Assault Brigade, and the 36th Mixed Air Corps. Within a week of the invasion, a combined Soviet force of 1,800 tanks, 80,000 soldiers and 2,000 armored fighting vehicles occupied key locations. In the second week, Soviet aircraft made 4,000

Turkomen, and Tajik (autonomous) Soviet Socialist Republics. These campaigns succeeded through a skillful and complex blending of civil and military campaigns to erode support, isolate, and force the Basmachi into remote areas devoid of supplies and needed recruits. Robert F. Baumann, *Russian-Soviet Unconventional Wars in the Caucasus, Central Asia, and Afghanistan*, (Washington: U.S. Army Center for Military History, 1993)100-104.

flights into Kabul. With the final arrival of two divisions, the total Soviet force rose to over 100,000 personnel (See Figure, 1).[10]

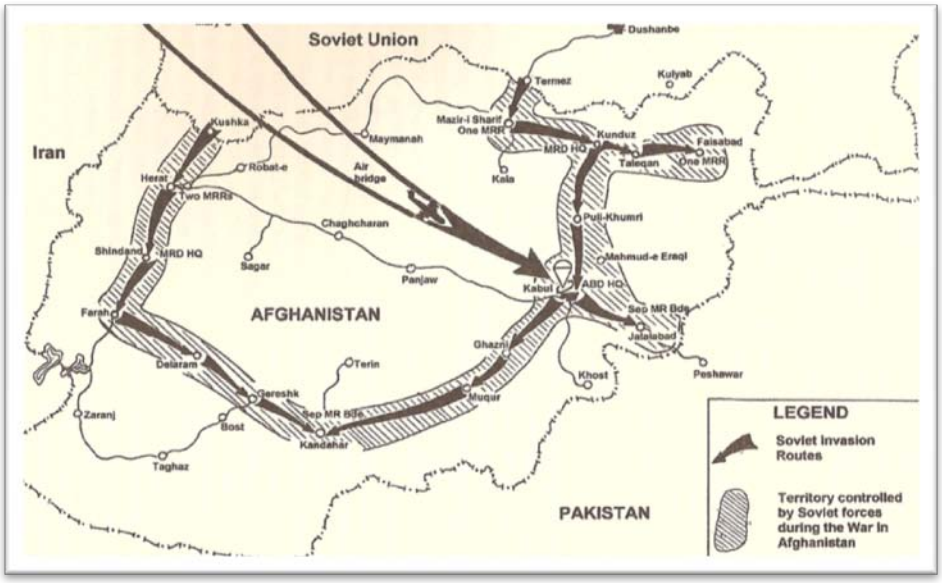

Figure 1. Soviet Invasion of Afghanistan. Seizure of Urban Centers and Main Lines of Communication.
Source: The Russian General Staff, *The Soviet-Afghan War: How a Super Power Fought and Lost*. Translated and edited by Lester Grau and Michael A. Gress, (University of Kansas Press, 2002).

The Afghan army, then known as the Democratic Republic of Afghanistan Army (DRA), nominally fielded a force of approximately 40,000 effective troops. The estimates over the ten-year period of occupation concluded that the highest level of DRA strength reached 120-140,000 arranged into three corps divided into 14 infantry divisions and three armored divisions.[11]

[10] The Russian General Staff, *The Soviet-Afghan War: How a Super Power Fought and Lost*. Translated and edited by Lester Grau and Michael A. Gress, (University of Kansas Press, 2002) 315- 318.

[11] The Afghan brigades comprised three Tank, one Mechanized, 11 Border Guards, one Air Defense Artillery, two Support, two Commando, one Guards. From 1980-83, the average infantry division

Despite the ensuing legacy that viewed Afghanistan as defeat, the Soviet army left Afghanistan with their forces intact. The DRA stood in better condition and contained better equipment than when the Soviets first arrived in 1980. The infusion of Soviet materiel to the DRA enabled the incumbent communist regime to hold on to power. Lacking support from the Russian Federation and pressure from Pakistan, as well as internal strife, led to the collapse of the Kabul government under President Mohammad Najibullah in 1992. The factional fighting witnessed the final destruction of the Soviet-era equipment and organization (See Figure 2).[12]

Figure 2. Soviet Equipment of the DRA in Ruins outside Kabul, Afghanistan. *Source:* Author's personal photo collection.

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strength averaged between 2,000-2,500 men. The armored divisions usually maintained a strength of 4,000 troops. By 1986, the actual effective strength of the DRA was approximately 35,000. J. Bruce Amstutz, *Afghanistan: The First Five Years of Soviet Occupation,* (National Defense University Press, 1986) 186.

[12] Lester Grau, "Breaking Contact Without Leaving Chaos: The Soviet Withdrawal From Afghanistan." *Foreign Military Studies Office*, Fort Leavenworth, KS (2007), http://fmso.leavenworth.army.mil/products.htm#casia. (accessed March 20, 2009) 21.

Despite the eventual outcome, the array and quantity of Soviet artillery in Afghanistan was impressive and exceedingly relevant even in a counterinsurgency conflict. The 40th Army headquarters retained control of the 1074th Artillery Regiment and the 28th Separate Multiple Rocket Launcher Regiment (MRL). In a typical Soviet Army configuration, this would amount to 48 tubes of 2S3 self-propelled howitzers, an additional 48 tubes of 2S5's or the towed M1976 howitzers.

Army level organic artillery also included 18 BM 27s (240mm heavy rocket launcher), and on an army front, the artillery might contain a brigade of 18 Scuds (23 SSM launchers).[13] This basic table of organization would allow an army level headquarters to directly coordinate and control the fires of approximately 168 various tubes and rockets before even considering the sizeable organic component of artillery assigned to a standard motorized rifle division. The 201st Motor Rifle Division fielded the 998th Artillery Regiment. The 479th Artillery Regiment accompanied the 108th Motor Rifle Division, and the 5th Motor Rifle Division utilized the fires of the 1060th Artillery Regiment. These four regiments of artillery brought the number of howitzers in use in each division to 72 tubes per division at the regimental level. This essentially provided 288 howitzers across the divisions. This does not include the amount of artillery solely allocated to the division above each regiment. Division level artillery contained four FROG launchers, 18 2S3, (152mm), 36 2S1s, (122mm) and 18 ballistic missile MRL launchers.[14] Combining these

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[13] Chris Bellamy, *Red God of War: Soviet Artillery and Rocket Forces*, (Washington: Brassey's Defense Publishing, 1986) 193-195.

[14] From 1980-81, the Soviet army fielded 73 maneuver battalions among the divisions occupying Afghanistan, only eight of these did not have assigned security or escort tasks leaving eight available for combat operations. In 1988, Soviet troop strength grew to field 93 maneuver battalions that conducted the same operations in the early 1980s, but 30 battalions remained uncommitted to conduct combat missions. By 15 October 1988, the number of maneuver battalions shrank to 56 with only five battalions available for combat. The total of artillery does not include any additional artillery units that appeared in theater outside of those listed on the standard organization table and it does not include the number of mortar tubes typically assigned to combat units or anti-tank guns. Soviet mortars ranged in caliber from the 82mm

figures, the Soviets could rely upon well over 500 pieces of traditional artillery and rocket systems to conduct their operations. With the deployment and use of separate brigades and airborne forces, the number of artillery pieces in Afghanistan would approach 1,000 tubes of all calibers and types.[15]

Looking deeper into the Soviet artillery, traditional fire planning utilized the battalion as the basis of fire consisting of 18 or 24 tubes depending on type. The preset nomograph formed the basis for tabulated firing (See Appendix B). In Afghanistan, these preconceived plans did not always match the tactical need and required the Soviets to adapt new methods.

Soviet military doctrine did find utility in specific instances in Afghanistan, despite the fact that combat in Afghanistan did not match their anticipated order of battle. Furthermore, the Soviet army realized that in an insurgent fight, decentralization of fire support systems down to platoon level provided greater flexibility to support the initial attack and withdrawal phases of operations. Soviet commanders also planned artillery fire in support of ground ambushes. These plans included illumination fire, fire on kill zones, fire on probable enemy assembly areas, and withdrawal routes and protective fires for friendly troops to break contact with the enemy.

The Soviet artillery maintained its heritage of being the center of the army formation in Afghanistan. Unlike the artillery of other armies, it did not remove itself from the close fight.

"podnos," to the medium 120mm "*Sani*" and the heavy 240mm *"tul'pan"* mortar, the *tul'pan* mortar was self-propelled. The caliber of Soviet mortars actually places the medium 120mm and 240mm in the spectrum of artillery calibers. The D-30 122mm howitzer is the first in table of technical characteristics. The 240mm mortar with a rocket-assisted projectile can range 19.8 kilometers. The 122mm howitzer system's maximum range is 15.3 kilometers. The Russian General Staff, *The Soviet-Afghan War: How a Super Power Fought and Lost*. Translated and edited by Lester Grau and Michael A. Gress, (University of Kansas Press, 2002) 315-322.

[15] These figures are approximate, but reflect the standard or typical allocation of artillery at each level. These figures do not contain the 240mm heavy mortars, or the 120mm mortars that also fall within the auspices of the artillery. They also do not account for 18 T12 anti-tank guns found within each motorized rifle division. Separate brigades and airborne forces contained their own artillery as well but of lighter calibers and numbers than those of the motorized force. For a full appreciation, a factor of ten percent would be useful in calculating the number of howitzers and launchers in depot for replacement and maintenance. Chris Bellamy, *Red God of War: Soviet Artillery and Rocket Forces*, (Washington: Brassey's Defense Publishing, 1986) 193-195.

Open-sighted artillery fire was common, even with rocket launcher batteries. Despite the topographical complexity of Afghanistan, the use of rocket-assisted munitions, heavy mortars, artillery systems, and rocket units maintained integrated positions of platoons and gun detachments far forward. Artillery battalions executed a wide range of missions including installation and convoy security operations all in addition to their primary fire support mission. Several examples highlight Soviet artillery and its ability to apply gunnery skills to a wide range of missions.[16]

Artillery Ambush

The successful artillery ambush conducted by Lieutenant V. Kozhbergenov, a D-30 (122mm) howitzer platoon leader, displays the accuracy that Soviet artillery operating in decentralized platoons could achieve through indirect and unobserved fire planning. This platoon conducted a successful artillery ambush in February 1986 near the town of Talukan in the northeast province of Takhar, Afghanistan. The platoon installed the *Realii-U* sensor near a Mujahedeen supply trail that was unobservable from his platoon observation post (See Figure 3).[17] Lieutenant Kozhbergenov plotted three artillery concentrations and numbered them 110, 111, and 112 along the supply trail. He computed the firing data for each concentration. The concentrations were spaced 100-150 meters apart. The platoon leader plotted his concentration

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[16] Several sources provide full details on numerous engagements that featured Soviet artillery in a central or defining role. The focus of this paper is to provide relevant examples that show the necessity for maintaining a wide range of weapons that possess the flexibility to shape tactical engagements. The ambush at Talukan is one such moment. For further examination of the Soviet occupation and campaigns in Afghanistan, see The Russian General Staff's, *The Soviet-Afghan War: How a Super Power Fought and Lost*. Translated and edited by Lester Grau and Michael A. Gress, (University of Kansas Press, 2002) and *The Bear Went Over the Mountain: Soviet Combat Tactics in Afghanistan.* 10th ed. Lester Grau editor, (Fort Leavenworth: Foreign Military Studies Office, 2005).

[17] The *Realii-U* is a seismic motion detector that allows the operator to determine the number and type of objects moving near it. The Soviet planners used the *Realii-U* to aid in the defense, monitor the security zone and to support the artillery ambush. The Russian General Staff, *The Soviet-Afghan War: How a Super Power Fought and Lost*. Translated and edited by Lester Grau and Michael A. Gress, (University of Kansas Press, 2002) 177-179.

111 at the narrowest part of a valley. He then periodically recalculated the meteorological report to adjust his firing data.

At night, the *Realii-U* operator reported that some 10-15 people, two trucks and pack animals were passing through the eastern most concentration, number 112. The platoon leader fired all three concentrations. As the Mujahedeen continued to approach concentration 111, the gunners fired a volley. Then, the first piece switched to fire concentration 110 and the third piece switched to fire concentration 112. Number 2 gun continued to fire on concentration 111. The platoon destroyed two Toyota trucks, four pack animals and six men as well as destroying small arms and ammunition.[18]

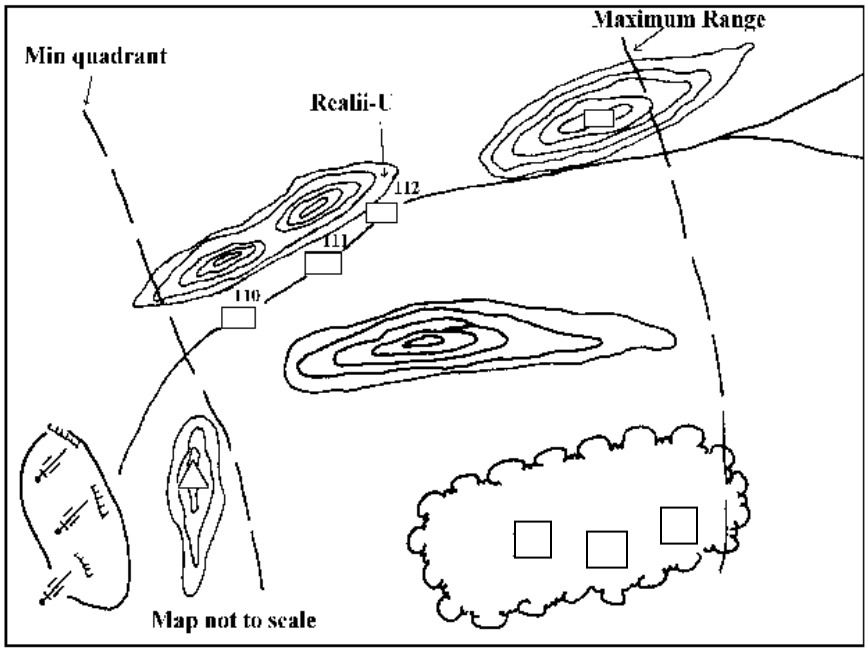

Figure 3. Diagram of the Artillery Ambush near Talukan, Afghanistan February 1986. *Source:* Foreign Military Studies Office, Fort Leavenworth, Kansas. http://www.ciaonet.org/cbr/cbr00/video/cbr_ctd/cbr_ctd_51.html (accessed 10 August 2009).

[18] Lester W. Grau, *Artillery and Counterinsurgency: The Soviet Experience in Afghanistan*, (Foreign Military Studies Office, Fort Leavenworth, Kansas, June 1997) 1-9.

Baghlan Province November 1985: Direct and Coordinated Artillery Fire

Not all doctrine of the Soviet army required immediate revision during the campaigns in Afghanistan. In fact, Soviet artillery and gunners made excellent use of standard coordinated indirect and direct artillery fire on a number of occasions. The action in Baghlan Province against a Mujahedeen defense in depth represents such an example.

The Mujahedeen entrenched and fortified themselves in a series of villages clustered in a valley. Rather than commit a large number of infantry to clear every building in house-to-house fighting, the Soviets employed synchronized artillery fires. They utilized direct fire and indirect concentrations to clear the enemy from their layered defense.

The Soviets made maximum use of a battalion of 152mm 2S3 howitzers. These howitzers employed direct fire across a wide front and moved forward by coordinated bounds by battery. Each successive bound brought the guns between 100 and 150 meters closer to their targets. The supporting towed 122mm, D-30 artillery battery groups continued to fire concentrations across a one-and-a-half kilometer front and a depth of three kilometers. These concentrations effectively pinned the enemy inside the valley and the fortified villages, while the maneuvering 2S3 batteries systematically reduced specific enemy targets. By matching the sequencing of the fire plan to map lines, the guns accurately shifted fires from one line to the next destroying the enemy-covered firing positions.[19] The integrated fire plan successfully suppressed the opposition and enabled the capture of the village with limited exposure of Soviet troops to enemy fire. It eliminated the village stronghold.

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[19] Soviet artillery proved not only extremely valuable in the offensive examples above, but also in support of infantry breaking contact with the Mujahedeen. The supporting artillery fired suppressing fires in front of withdrawing troops to keep the enemy from closing or immediately reoccupying their fighting positions. Additional suppressive fires targeted key terrain along the flanks preventing the infantry from being enveloped or from receiving enfilading fires. The Russian General Staff, *The Soviet-Afghan War: How a Super Power Fought and Lost*. Translated and edited by Lester Grau and Michael A. Gress, (University of Kansas Press, 2002) 173-74.

Soviet Artillery Considerations for Mountainous Terrain

Afghanistan's mountains posed problems for the application of conventional warfare techniques. However, the Soviets modified their tactics to employ as many types of artillery in the restrictive terrain as possible. Instead of relying on mortars alone and relegating their cannons to combat outposts or limiting the types of howitzers, they adapted their tactics, techniques and procedures to accommodate each system and make the best use of its capabilities.

In mountainous locations, the artillery and rocket units sacrificed the security of dispersion. They lined their guns up side-by-side to maximize their volume of fire. In locations that permitted only single rocket launchers, the Soviets rotated the launchers into and out of the position for firing and reloading.[20]

Topography also necessitated that batteries occupy and lay in circular formations that enabled firing in 360 degrees for self-defense. Artillery batteries and platoons deployed as far forward as possible and in exposed positions. This capability was essential to keep the raiding Mujahedeen pressured and wary of attacking directly. To accomplish these dual tasks, the artillery began operating using split-battery operations. The platoons of a single company would occupy a given area and orient their guns in two different directions utilizing two fire direction centers for computing firing data. In a highly centralized force such as the Soviet Army that prided itself on its ability to mass fires of multiple units rapidly, this technique was at first an unusual adaptation.

In areas of high ridges or escarpments, artillery batteries laid their guns by echeloning them with the topography. In this manner, guns within the same platoons might occupy higher or

[20] The Russian General Staff, *The Soviet-Afghan War: How a Super Power Fought and Lost.* Translated and edited by Dr. Lester Grau and Michael A. Gress, (University of Kansas Press, 2002) 182-183.

lower elevations relative to one another. Computational procedures would account for and correct these variances during firing.[21]

Summary

The geographical and operational limitations of Afghanistan reinforced the Soviet reliance on artillery as the centerpiece of their army formations. The complexity of fighting in Afghanistan produced an arguably counter-intuitive response. At first glance, the task of fighting an asymmetric enemy in largely uncharted territory would seem to warrant limited artillery formations in favor of lighter and more mobile forces. However, the experience of the Soviet artillery corps in the prosecution of the army's campaigns clearly denotes that it remained a central combat arm in counterinsurgency warfare. Despite the limited maneuver space, winding mountain roads, and narrow valleys, creative methods of utilization allowed the artillery in certain circumstances to fight with limited or no infantry support. Moreover, the Soviet infantry fully appreciated the necessity for maintaining adequate fire support assets on all types of missions given the limited numbers of infantry battalions to cover the entire country.

The Soviet artillery emerged battle tested, and even more relevant to the Soviet conceptualization of waging war. Despite the limited space for maneuver and dispersion, the Soviet artillery corps worked to integrate their weapons systems into the overall operational plan. Rather than work to the exclusion of other arms, such as mortars over howitzers or aircraft over cannons, the Soviets sought to integrate as many weapons systems of as many calibers as possible

[21] Selecting positions for artillery in mountainous terrain requires close coordination within the artillery battalion and the supported unit. Other technical factors affected firing capabilities. The Soviets devised innovative methods to obtain meteorological data. Since most of Afghanistan was unmapped, the Soviets collected and maintained logs of observed weather data daily to create meteorological reports to improve firing accuracy. Initially, they also lacked sufficient survey points in Afghanistan and determining firing unit locations in mountains proved difficult as well. Units determined their locations from map coordinates and use of compasses. While these techniques proved a valid means of firing, they also include some degree of error. In mountainous terrain, this might result in lateral errors of 10-15 degrees. Ibid., 183-190.

to execute a combat mission. The Soviets did not permit the Mujahedeen's tactical exploitation of the environment to dictate the terms of the utility of rockets and howitzers, both towed and self-propelled systems proved useful. The decentralization of the artillery to support infantry platoon, company, and battalion level operations reveal that Soviet Army officers became more adaptive and innovative over time. Though initially resistant to change, the Soviet Army proved increasingly flexible and adaptive out of tactical necessity.

SECTION THREE
INDO-PAKISTANI CONFLICTS: MOUNTAIN WARFARE ON THE SIACHEN GLACIER AND THE KARGIL WAR

The conflict in the Kashmir Region between India and Pakistan highlights the implications of ill-defined borders, insurgency operations, high-altitude fighting, and restricted mobility that limited artillery employment in Southwest Asia. The Siachen Glacier Conflict (1984 – Present) and the fighting in Kargil in 1999, as a subset of the ongoing Siachen struggle, displayed offensive and defensive combat fought at elevations nearing 20,000 feet. These examples further demonstrate the need for adequate artillery since it remains one of the most effective means of fire support in high-altitude combat.

These two important engagements provide detailed case studies. The initial Indian advancement of troops into the Siachen Glacier in 1984 set in motion a failed attempt for India to gain a territorial advantage in the Kashmir. However, it did set the conditions for the ensuing Kargil fighting of 1999. Presently, India and Pakistan continue to engage each other in artillery duels along the glacier. The Kargil conflict represents a failed attempt by Pakistan to bring about a decision to the larger Kashmir Region.

Siachen Glacier

The fighting in the Siachen Glacier resulted from India's hasty attempt to outmaneuver the Pakistani forces along the northwest end of the Line of Control (LOC) formed by the Simla

Agreement of 1972 (See figure 4).[22] The Indian army intended to gain control and claim the Siachen Glacier Region. The region, though largely inhospitable, held strategic implications for India. Control of the glacier region meant direct control of the headwaters of the Indus River. From India's perspective, control of the glacier would reduce a perceived vulnerability at the junction of the Pakistani and Chinese borders. Furthermore, the glacier dominated the entrance to the Ladakh and Nubra Valleys through the Karakoram Pass. These valleys provided the essential line of communication to the cities of Khaplu and Skardu under Pakistani control in the Kashmir.[23]

The Indian Army initiated Operation Meghdoot on 13 April 1984. India advanced the Kumaon Infantry Regiment onto Siachen and seized the two northern passes of Sia La and Bilafond La along the Saltoro Ridge before units of the Pakistani army arrived. Pakistan mobilized forces to counter the Indian incursion, but failed to reach the summit of the ridge. Pakistan initiated several counter attacks seize the ridge but there attacks failed to dislodge the Indians from their positions.[24]

The difficulties of attacking along jagged ridges and up steep slopes degraded the Pakistani counter attacks. The physical limitations of fighting at altitudes above 19,000 feet also

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[22] The Simla Agreement of 1972 emerged as the result of the Indo-Pakistani War of 1970. The Cease Fire Line (CFL) placed the areas of Baltistan, Gilgit, and Poonch under Pakistani control. Other significantly Muslim areas such as Jammu and Kashmir fell to Indian control. The CFL terminated at the glacier complex in the northeast section of the region. No defined borders existed for the glacier region. Though international consensus ceded the area to Pakistan, India considered The Siachen Glacier as an extension of the Jammu and Kashmir regions. Ibid., 25-26.

[23] Estimates of 1990-1 place the relative troop strength of India at 1.2 million troops, Pakistan's standing army numbered 580,000. In relative artillery strength, Pakistan fielded 1,500 artillery pieces compared to India's 3,860. Despite these larger quantities, the terrain often dictated the level of troops and material suitable for the conduct of mountain operations. Arvind Adityaraj, *In the Shadow of Gunfire: Dynamics of Ideology and Power Politics in Indo Pakistan Relations, 1980-1991*, (Ann Arbor: University of Michigan, 2001) 54-56.

[24] Though no further territory exchanged possession since 1984, Pakistan and India continue to shell each other's positions within the region. Approximately 3000 troops have died during operations on the glacier, most because of cold related injuries frostbite or accidents. Ishfaq Syed Ali, *Fangs of Ice: The Story of Siachen*, (Pak American Commercial, 1991) 26-31.

limited the effectiveness of the troops. While the Indian army occupied key peaks in the glacier region, the Pakistani army occupied its own defensive positions lower on the slopes and on adjacent mountains oriented to face the Indian positions. Neither side had the resources to commit to a full-scale campaign. The fighting shifted from infantry meeting engagements and devolved into an ongoing artillery duel that persists.

Figure 4. Siachen Glacier Complex and Disputed Area.
Source: Military Photos.net. (http://iMajor General231.imageshack.us/iMajor General231/5652/19zc.jpg).

Fighting for control of the glacial network proved difficult. Neither side could support significant numbers of infantry and necessary logistics to conduct an effective offensive. Each side resorted to positioning artillery to augment their forces and deter further offensives or

counterattacks. Due to the unexpectedly protracted engagement, India revised its conceptions of artillery employment in the rugged environment. India took the following five measures:

- India responded to Pakistani defensive improvements by introducing heavier shells with higher terminal velocity.
- Increased local troop levels in both armies underscored India's need for higher caliber weapons and higher rates of fire to offset the perceived numerical superiority of the Pakistani forces.
- India rationalized and reconfigured its artillery systems and is reducing the 14 different calibers of guns currently in use to essentially two, the 105mm, India Light Field Gun and 155mm Bofors howitzer. Additionally, the Indian Army also has Multiple Rocket Launchers consisting of the I50 and Pinacha launchers. Approximately 180 of the 220 Indian artillery regiments will field the 155mm gun in either a towed or a self-propelled version. The remaining regiments will use the light gun or rockets.
- India also streamlined its arsenal of weapons to achieve a balance between wheeled and tracked systems. Importantly however, India retained the use of mountain guns because of their portability and compact size. Pack animals provide transportation to the highest altitudes for their use.
- India plans to introduce precision munitions in an effort to reduce collateral damage when shelling near built up areas such as mountain villages.
- By 2010, Indian towed artillery will consist primarily of the M46 130mm howitzer, the FH-77B 155mm, and the 105mm light field gun. Additionally, a

select number of 75mm pack howitzers will continue in service beyond 2010 because of their portability and utility at higher elevations.[25]

According to Pakistan, the end of major combat operations after the Kargil campaign left India with a territorial advantage. Pakistan maintains that India claimed 900 square miles of Pakistani territory. However, from the Indian perspective, the Kargil fighting simply restored the regions' status quo. Both nations allege that control of the Kashmir Region remains essential to their national political and security interests.[26]

Kargil 1999

With the stalemate of positions between the Indian and Pakistani forces deployed in the Siachen Conflict along the line of control, each side reinforced the Kashmir with troops and equipment. In early May 1999, Pakistan launched Operation Badr to seize and hold key terrain in the Kashmir Region.[27] The territory, long in dispute, lies behind the Indian line of control. The Pakistanis' objective was to cut India's line of communication to the Siachen Glacier Region.[28] If successful, the Pakistani army would control the main supply route through to the glacier. India's Siachen positions would become untenable (See figure 5). To facilitate this simple but daring

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[25] The 75mm howitzer aligns directly with the fourth consideration. At elevations of 18,000 feet and higher the 75mm pack howitzer is essentially the only viable weapons system to employ. Sawhney, Pravin. "Himalayan Conflict Forges Artillery Doctrine." *Jane's International Defense Review*, (March 1999) 56-59.

[26] Fighting among the peaks within the Siachen Glacier complex continues intermittently today. Both Pakistan and India occupy outposts at altitudes at above 19,000 feet. Ishfaq Syed Ali, *Fangs of ice: The story of Siachen*, (Pak American Commercial, 1991) 22-23.

[27] The name Badr (full moon) reflects the historical battle between Muslims Arabs and non-Muslims in the Arabian Peninsula around 632AD. Muslims viewed the battle as one that determined how the Qur'an applied rules of war regulating prisoners, spoils, and furthering the cause of expelling Jews from the area. By extension, the campaign for Kargil represented the liberation of Muslims from the treachery of India and the claiming of Kashmir as the just rewards for the infiltration. S. K. Malik, *The Quranic Concept of War*, (Wajidalis Lahore, Pakistan. 1979) 80-82.

[28] India and Pakistan both claim the Kashmir Region. For a detailed account of the underlying political issues that precipitated both the Siachen and Kargil conflicts, see Arvind Adityaraj, *In the Shadow of Gunfire: Dynamics of Ideology and Power Politics in Indo Pakistan Relations, 1980-1991*, (Ann Arbor: University of Michigan, 2001) 16.

plan, the Pakistani army trained Afghani insurgents to infiltrate into the region to sever the line of communication between Kashmir and Ladakh.

The conflict had three major phases. First, the Pakistani Special Services Group and Northern Light Infantry Regiment overtly and covertly set up bases on the Indian side of the line of control. Kashmiri and Afghan guerillas augmented this formation. Essentially, the Pakistanis exploited a common practice of both armies. Their troops occupied temporarily deserted Indian observation posts left vacant during the harsh winter months. The Pakistani and insurgent forces entrenched themselves in the vacated Indian positions. The Pakistani troops reoriented the positions to face toward the direction of the expected Indian counterattacks. Similar to the Indian offensive in Siachen, Pakistan moved troops in first and occupied the important high points. This gave the Pakistani forces a temporary advantage of position and forced the Indian army to attack uphill.

Despite the advantage of position during the first phase, the Pakistani force faced political opposition from internal factions and from the international community. The Pakistani Army Chief of Staff, Pervez Musharraf decided to attack Kargil on his own initiative. Pakistani Prime Minister, Nawaz Sharif claimed no knowledge of the impending operation and blamed the army. This internal friction placed Pakistan in a difficult international position. The United States and China pressured Pakistan to withdrawal from the occupied territory. This pressure by nations, considered allies by Pakistan, greatly assisted India’s efforts.

Figure 5. The Kashmir Region Highlighting the Area of Operations around Kargil. *Source:* Vayu Sena, Indian Army, (http://vayu-sena-aux.tripod.com/kargil-maps1.html).[29]

The second phase began when Indian frontier forces discovered the infiltration and mobilized against it. The Pakistani infiltration proved successful until a shepherd in the Batalik sector reported the situation to the Indian authorities. India responded by mobilizing 200,000 troops under Operation Vijay. However, the difficulty of the terrain once again limited the scale of the fighting. Regiments and battalions fought piece-meal engagements. Most fighting occurred

[29] This map represents the Indian perspective of the Kashmir Region. The area noted as illegally occupied by China resulted from the 1962 Sino-Indian War. The conflict included the region of Aksai Chin, which the Chinese government regards as a part of China. China considers it a strategic link, via the China National Highway route G219, between the Chinese-administered territories of Tibet and Xinjiang province. The war ended when the Chinese captured the disputed area and declared a ceasefire on 20 November 1962.The Sino-Indian War is notable for the large-scale combat operations conducted at altitudes of over 4,250 meters (14,000 feet). This presented enormous logistical problems for both sides. Since 1981, border negotiations have occurred at high political levels. Vayu Sena, Indian Army, (http://vayu-sena-aux.tripod.com/kargil-maps1.html).

in company-size formations or smaller. Effective command and control of large formations proved impossible due to the terrain. Despite fighting along an international border, larger scale operations remained impracticable (See Figure 6). While India mobilized 200,000 troops, the terrain limited operations to only two divisions – approximately 20,000 troops and elements of the air force. Local militias also participated and increased Indian combined strength to approximately 30,000.

The Pakistani forces along with the infiltrating guerillas numbered around 5,000. The geography and the positional nature of the fighting created a heavy reliance on artillery. Lack of regional airfields, bad weather, high-altitude, and air defense rockets positioned on the mountains by the Pakistanis intended to limit the effectiveness of Indian air power.

The Pakistani forces, though outnumbered, held the high ground and quickly emplaced artillery to interdict any Indian movements along National Highway One. Pakistan provided their forces with rockets, 120mm mortars, and artillery support. Unmanned aerial vehicles and AN/TPQ-36 Fire-finder radars conducted Pakistani reconnaissance and provided targeting data.

Typical artillery support methods provide one artillery battalion (16 cannon) to support one brigade (approximately 4,000 troops). Due to the terrain, the artillery employed during the Kargil conflict far exceeded conventional support. Pakistan employed 18 artillery regiments, or more than 100 guns, in support of the 5,000 committed troops. To ease the limited space for the howitzers, Pakistani forces expanded firing positions by using dynamite to carve away parts of the mountain walls. Pakistani helicopters carried dismantled 105mm howitzers onto key outposts using the reverse slope of the mountains to cover their tight flight paths.[30]

[30] Pakistan Military Consortium, *The Kargil Conflict*, http://www.pakdef.info. (accessed March 15, 2009) 6.

Figure 6. Kargil Conflict Area of Operations.
Source: Vayu Sena, Indian Army, (http://vayu-sena-aux.tripod.com/kargil-maps1.html).

The third phase saw the Indian Army systematically reduce and recapture outposts and the final withdrawal of Pakistani forces. India focused and directed their counterattacks against the defenses along the national highway nearest to the town of Kargil. Recapturing the outposts secured the route and prevented the collapse of the Indian position in the Kashmir Region. The Indian Army then focused upon recapturing two vital positions: Tiger Hill and the Tololing Complex in Drass (See Figure 7). These two positions dominated control of the Srinager-Leh route. Next in importance was the Batalik-Turtok sector, this area contained dominating outpost 4590 and 5353. These fell under Indian control on 14 June 1999. This marked the turning point in

the conflict. Throughout the month of June, the Pakistani and insurgent tactical advantages eroded.

The final assaults on occupied positions resulted in hand-to-hand combat after intense artillery barrages. The barrages in total expended more than 250,000 rounds. Approximately 300 guns fired 3,000 rounds daily into the Pakistani positions to dislodge and destroy enemy personnel, rocket and artillery emplacements.[31]

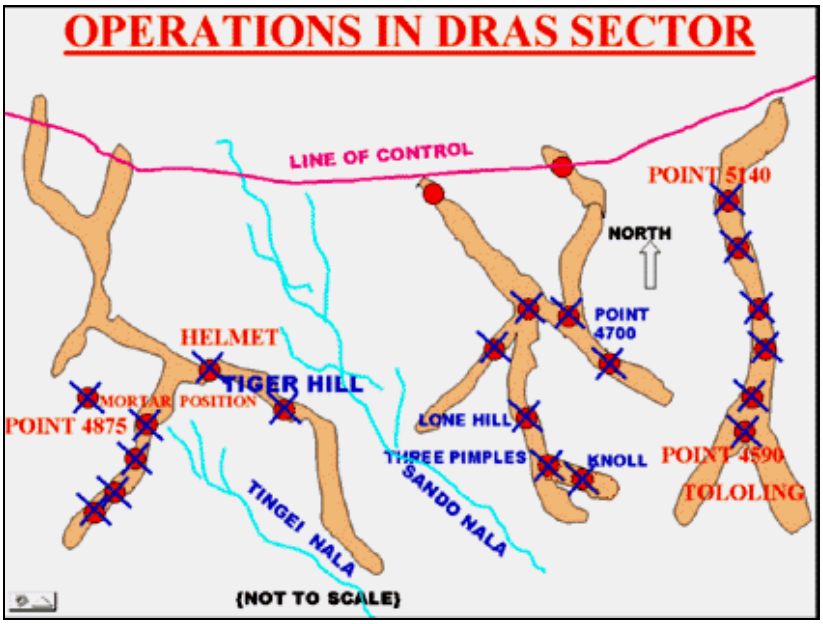

Figure 7. Tiger Hill and the Tololing Complex in the Drass Sector
Source: Vayu Sena, Indian Army, (http://vayu-sena-aux.tripod.com/kargil-maps1.html).

Politically, the G8 nations supported India and condemned the Pakistani violation of the pre-war Line of Control at the Cologne Summit in June 1999. The European Union also condemned the Pakistani invasion. China, an ally of Pakistan, did not intervene in Pakistan's

[31] Global Security Organization, http://www.globalsecurity.org/military/world/war/kargil-99.htm (accessed 17 September 2009).

favor. The Chinese also insisted on a withdrawal of forces to the Line of Control. [32] As the Indian counter attacks picked up momentum, Pakistani Prime Minister Nawaz Sharif met with U.S. President Bill Clinton on 4 July 1999 to obtain support from the United States. Clinton declined to support Sharif. President Clinton asked Sharif to withdraw Pakistani soldiers from Indian territory. Politically as well as militarily, Pakistan lost credibility internally and internationally for its incursion into Kargil.

Subsequently, each Pakistani strongpoint became an isolated outpost waiting in turn for the Indians to attack and reduce it. During the tactical engagements, the Indian army recaptured all of their positions and forced the Pakistani troops back across the line of control, regaining 160 kilometers of territory accorded by the 1972 Shimla Accord. Clearing operations by the Indian army continued until 26 July 1999. Internally Pakistan civil-military relations remained strained. On 12 October 1999, Army Chief of Staff, Pervez Musharraf led a bloodless *coup d'état* and seized power from Prime Minister Nawaz Sharif.

Summary

Casualty estimates range from a few hundred to more than 3,000 killed-in-action. No official tally exists. One thousand deaths appears credible to most sources given the duration and type of fighting.[33] Prime Minister Sharif managed to pull back the remaining Pakistani soldiers from Indian territory. A joint statement issued by President Clinton and Prime Minister Sharif

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[32] The Pakistani military designed and revised plans for an attack on Kargil for several years. The timing of the Pakistani attack on Kargil is interesting because the Indian Prime Minister, prior to the attacks, traveled to Lahore to discuss the issues of Kashmir with Pakistani officials. Arvind Adityaraj, *In the Shadow of Gunfire: Dynamics of Ideology and Power Politics in Indo Pakistan Relations, 1980-1991,* (Ann Arbor: University of Michigan, 2001) 72-77.

[33] This brief conflict marked the heaviest fighting between India and Pakistan since the War of 1971. Pakistan initially declined to recognize the bodies of its dead soldiers. This action coupled with high casualties, low national morale, and a weakened economy set the conditions for Musharraf's coup. Center for Strategic and International Studies, "Kargil: What Does It Mean?" *South Asia Monitor*, July 19, 1999. No. 12.

conveyed the need to respect the line of control and to resume bilateral talks between India and Pakistan.

The ongoing struggle for control of the Kashmir Region indicates that the limited geographical space significantly reduced the number of infantry units either side could deploy and subsequently maneuver. Artillery was not only a vital supporting element, but also the *de facto* leading component of each combatant. The disproportionate number of artillery systems present in the region meant that the infantry to artillery ratio was skewed. Typically, artillery follows the infantry in linear warfare moving forward to support the advance.

Pakistani infantry supported the protection and movement of artillery systems up the peaks. From these positions, they could shell and interdict the main supply route and disrupt the Indian counter offensive. Indian infantry supported the emplacement and protection of artillery sections and batteries until their fires weakened the Pakistani positions enough for a final infantry assault.

Mindful of the United States and others' support, of the Indian political position regarding Kargil, Indian assaults did not extend beyond the recapture of their original outposts. India desired control of Kashmir (as did Pakistan), but it could not afford to alienate its international supporters. Nor did the Indian government desire to escalate the fighting to a full-scale war with Pakistan. India's advance remained limited because it could not deploy its guns further forward in the rugged, high-altitude terrain.

Beyond the political and geographic costs, the Siachen and Kargil experiences yielded significant insights for combat at extreme altitudes and provides points for consideration for the U.S. Field Artillery. These areas generally align with the five requirements for accurate and predicted fire.

Targeting: High-altitude fighting required a large number of observers dispersed among hideouts and strong points to relay fire missions to gun units. Due to the use of reverse slopes,

target acquisition remained difficult and unmanned aerial vehicles and radar systems became central to the targeting process.

Weapons Systems: The Indian army, though streamlining its arsenal, retained the 75mm pack howitzer, the 122mm howitzer in battery level numbers, and it deployed 5.5-inch guns as single pieces. This variety facilitated a tailored approach to employ the correct weapon system to the appropriate task at the corresponding altitude.

Survey: A lack of accurate maps and common survey points degraded the precision of battery locations and their ability to reduce probable error both vertically and laterally. Lacking common survey was less significant in the direct fire mode since guns were firing from their own respective positions to a target. However, India and Pakistan recognized that the artillery needed improved survey and better maps to create accurate declination stations for aiming devices and improved techniques to pinpoint the center of battery locations from which they could reduce the error in location to other guns.

Meteorological Procedures: Both Pakistan and India continue to refine and expand their methods of collecting and disseminating accurate meteorological data for improved targeting accuracy. For India, new high-altitude tables base their data on airborne instrumentation. The strong winds and difficult terrain makes establishing optimal meteorological stations difficult. Using standard meteorological data does not adequately compensate for all the atmospheric conditions of wind speed, temperature, and air pressure at elevations well above 10,000 feet.

Munitions: The lack of maneuver space necessitated improvements in munitions. This included basic firing applications such as direct fire capabilities for shooting from peak to peak, directly into a mountainside position, or troops advancing upslope. Other advances included fielding unjammable proximity fuses, remotely delivered mines to block and isolate key targets, and ramjet (rocket assisted) shells with ranges of 70 kilometers.

Other factors from these conflicts deserve consideration for their overall implications. Troops cannot acclimate at altitudes of 18,000 feet or higher. This increases the rate of troop

rotations to positions at these altitudes. Again, the environmental effects on the infantry create a corresponding demand and increase on the reliance of artillery. Under these conditions, the weapons experience problems due to exposure to freezing temperatures. Continuous freezing and thawing affects dials, gauges, bushings, and springs of artillery systems. The maintenance requirements for each gun as it sits in fixed position grows exponentially with the length of time that it remains there.[34]

In both instances of combat in the Kashmir, artillery became the cornerstone of the Pakistani and Indian Army combat operations. Of the two conflicts, Kargil provides the clearest example of the necessity and utility of artillery in this type of fighting. The Indian army employed approximately 250-300 artillery pieces to dislodge the Pakistanis from the mountain outposts around Kargil. They employed the Bofors 155mm howitzer in direct fire wherever possible.[35] This type of firing allowed the Indian infantry attacks to progress slowly and methodically. India enjoyed a 2.5:1 ratio advantage in howitzers over the Pakistanis during this conflict.[36] For Pakistan, despite the benefit of position, initial surprise, and interlocking direct and indirect fires from defensible positions, they lacked the forces to advance farther and failed to reinforce their advantageous position after 6 June 1999.[37]

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[34] Pravin. Sawhney, "Himalayan Conflict Forges Artillery Doctrine," *Jane's International Defense Review*, (March 1999) 56-59.

[35] The Indian Air Force did not enjoy the success that it anticipated. The Pakistanis shot down two Indian MiG fighters on 26 and 27 May 1999 and an Indian army helicopter. The IAF continued to support operations in the area, but preferred to do so at greater ranges to avoid potential rocket fire. The Indian artillery increased their fire support efforts to compensate for the lack of close air support. Ashok Kalyan Verma, Kargil, *Blood on the Snow: Tactical Victory, Strategic Failure: a Critical Analysis of the War* (University of Michigan: Manohar Press, 2002) 99-100.

[36] The Indian army chose to assault each of the outposts with infantry, supported when possible by artillery and air power. The other option available to Indian forces included crossing the national highway, and encircling the posts. However, this necessitated sending troops into Pakistani territory. The Indian government did not desire to escalate the war and limited its means to a direct approach of each remaining position. These direct assaults often occurred at elevations above 18,000 feet. Ibid., 109-126.

[37] Initially unaware of the scale of the Pakistani and insurgent infiltration, the Indian response was slow to develop. The troops required acclimatization, acquisition of mountain climbing gear and a comprehensive plan for counter attack. Ibid., 109.

SECTION FOUR
THE UNITED STATES FIELD ARTILLERY: INSIGHTS FROM AFGAHNISTAN

Afghanistan remains an example of how the timid and hesitant application of combat power can embolden an adversary. Despite the technological advances made in armaments and munitions in the past decade, misapplication of combat power, or its complete absence, enabled the Afghan insurgency to maintain a weapons parity that should not exist. Considering the combined strength of the United States and its coalition partners, the defeat of the Taliban and remnants of Al Qaida would appear all too certain. However, because lethal combat power, specifically artillery, arrived to Afghanistan in piece-meal fashion and remains deployed in small numbers, Al Qaida, and subsequently the Taliban, exploited the self-limiting tendencies of American and coalition forces. Aggressive insurgent activities keep large sections of the country in turmoil and beyond the control of ISAF and Afghan National Security Forces (See Figures 8).

The heavy fighting in August 2009 in the Helmand Province brings this struggle into sharp focus. The insurgents began to fight with similar conventional techniques used during Operation Anaconda in 2002 and displayed increasing resolve. U.S. Marines battled the Taliban for control of the strategic southern town of Dahaneh. The Marine mission was to cut militant supply lines and allow local Afghans to vote in the 2009 presidential election. With limited troops and still fewer fire support systems available, the mission met with indecisive and limited progress. For the Taliban, simply disrupting and preventing voter participation equaled success.[38] The escalation in fighting and the slow realization that more combat power is vital in rugged terrain sets the conditions for the current dilemma.

[38] Alfred de Montesquiou, "Marines launch new Afghan assault against Taliban," *Associated Press*, http://news.yahoo.com/s/ap/20090812/ap_on_re_as/as_afghanistan (accessed 12 August 2009).

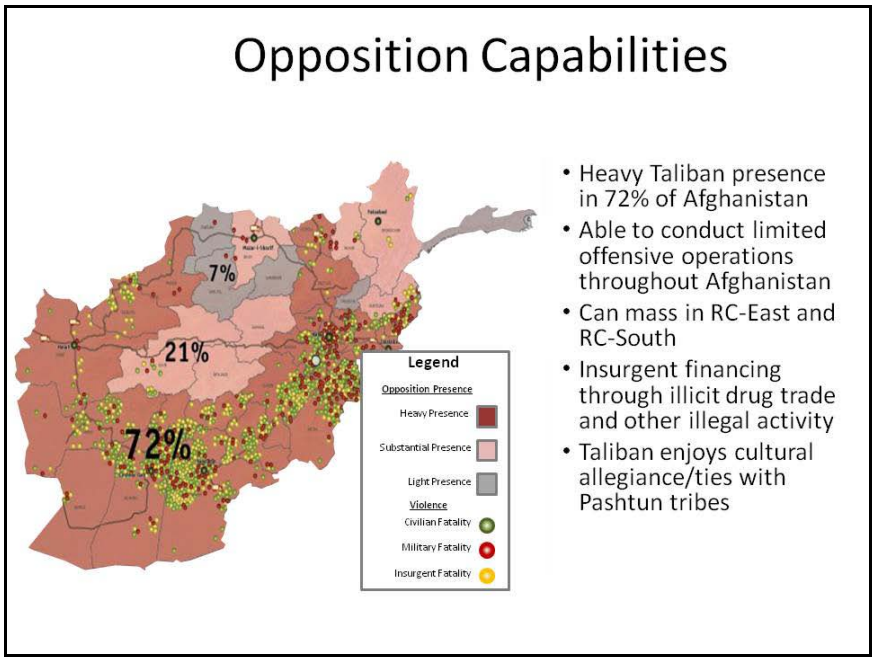

Figure 8. Insurgent Attacks in Afghanistan.
Source: School of Advanced Military Studies, Exercise One. Data Extracted from Open Source Information on ISAF Operations in Afghanistan, 28 September 2009.

The Current Dilemma

Afghanistan is a long-range fight. The restrictive practices of U.S. and ISAF forces coupled with creative Taliban tactics create an operational dilemma. Direct insurgent attacks against fortified positions pit enemy rockets, rocket-propelled grenades, and machine guns against mortars, and heavy and light crew-served weapons. The distance created by the insurgents using these weapons ensures that rifleman cannot effectively range them with their small arms. These tactics enable a small group of insurgents to attack and pin down a much larger force in a fixed position. The result is that two divergent tactical fights emerge. The first fight belongs to the infantry, fighting in platoon or squad-sized actions at ranges of one kilometer or less. The second fight is in the purview of the artillery as it attempts to fight a much deeper battle against selected small targets out to 30 kilometers (See Figure 9).

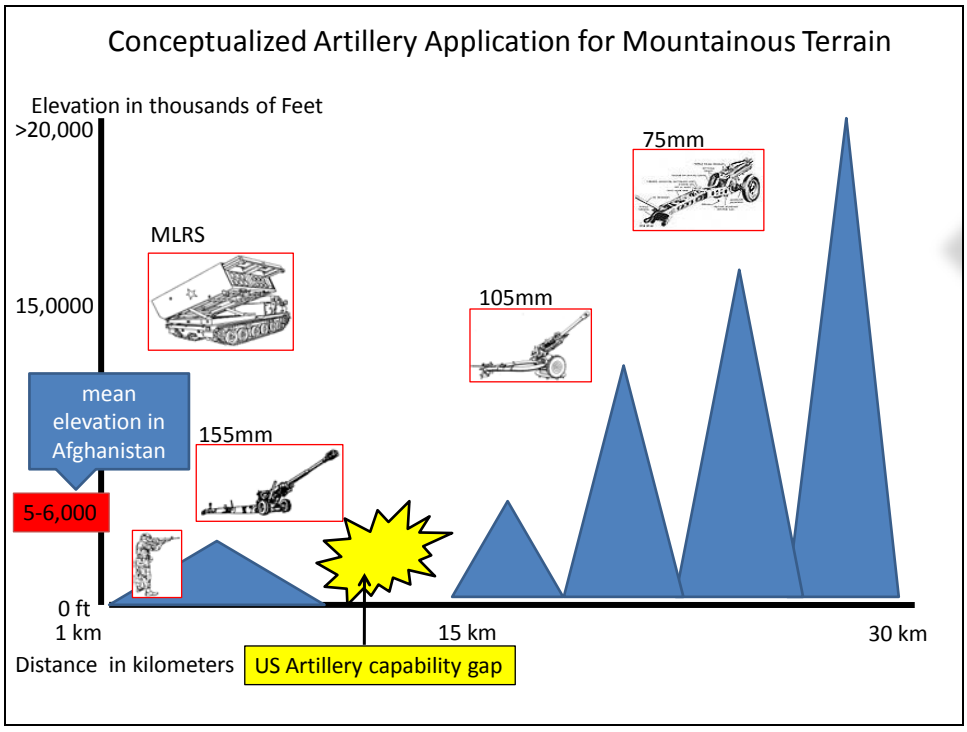

Figure 9. Field Artillery Application and Capability Gap in Afghanistan.[39]
Source: Major Joseph A. Jackson, U.S. Army, September 2009.

Taliban groups study and comprehend the US tactics. They observe that artillery remains fixed on bases and lacks mobility to follow the infantry into the deep defiles and higher elevations. After eight years of conflict, insurgent fighters further understand the limitations of shell fuse combinations and the restrictions that the environment places on rotary and fixed wing aircraft. By moving under cover of the mountains and along remote paths, they can avoid U.S. radar and the limited number of forward observers who can engage them.

[39] This diagram represents more than just the present mobility gap hindering combined infantry and artillery missions. It also represents how artillery might be echeloned by caliber according to altitude to fight in increasingly higher altitudes. The weapons systems displayed, with the exception of the 75mm pack howitzer, are currently in use by the U.S. Army. The Multiple Launch Rocket System typically engages targets beyond 20kilometers and serves to fight the "deep fight" in American doctrine. Joseph A. Jackson, U.S. Army, Field Artillery Application and Capability Gap in Afghanistan, *Conceptualized Slide*, (SAMS, September 2009).

Insurgent fighters use the natural shape, strength, and remoteness of mountains to retain their freedom of maneuver and create the conditions for a long-range fight. Once again, they are utilizing the man-made caves that served them well during the Soviet conflict twenty years ago. Cave utilization forces heavily encumbered American soldiers to pursue the enemy into forbidding regions often beyond the range of direct support artillery. While mortars may provide a quick response, they still lack the punch, mass, and range to support the fight in Afghanistan for the long term. The inadequate application of combat power over the past six years facilitated the increase in hostilities by the Taliban (See Figure10).

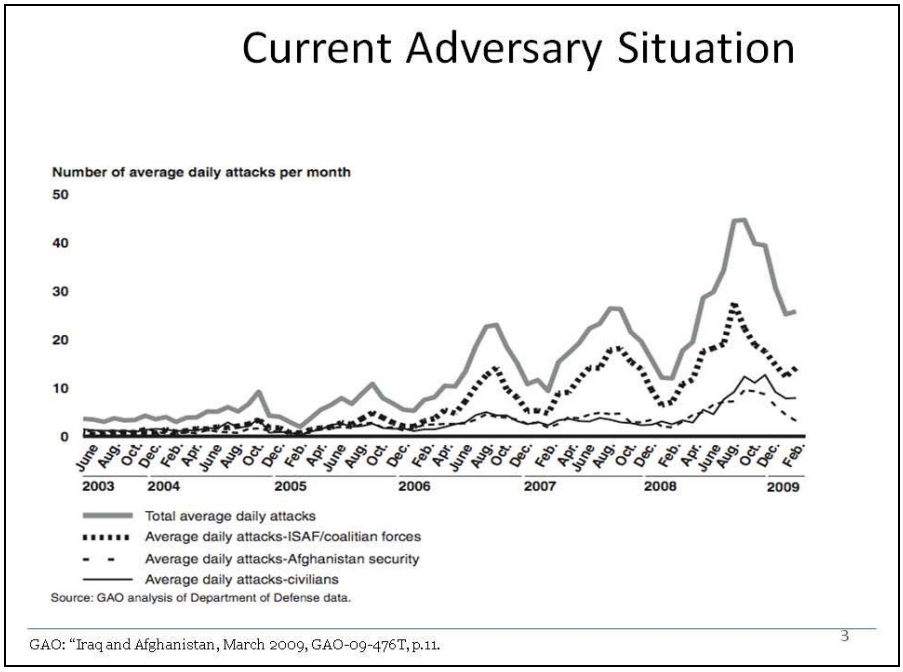

Figure 10. Location and Percentage of Taliban Attacks by Region in Afghanistan. *Source*: School of Advanced Military Studies, Exercise One. Data Extracted from U.S. Government Accounting Office, March 2009.

The improved insurgent tactics now include firing volleys of rocket-propelled grenades, mortar rounds, and missiles from the back of trucks. The lack of coalition troops in any given area and a corresponding lack of artillery to mitigate that deficiency in troop density has allowed the insurgency to fight along increasingly conventional lines not witnessed since Operation Anaconda in 2002.[40] The tactical dilemma that presented itself then emerges again now. The weapon system designed to engage in the long-range fight (cannons, howitzers, and rockets) remains noticeably absent from the majority of the fighting.

The Warnings of Operation Anaconda

A brief review of Operation Anaconda reveals three warnings that should guide the present planning and operations. First, American and coalition forces underestimated Al Qaida's ability to fight a significant conventional combined-arms battle with direct and indirect weapons systems. Second, American forces were limited by the terrain. Third, after several days of fighting and sustaining significant losses, the remnants of Al Qaida proved able to adapt to guerrilla style warfare. Synthesizing these observations underscores the need for a significant artillery presence in Afghanistan.

The fighting in the Shah-i-Kot valley in 2002 rested on two assumptions. First, that Al Qaida would not stand and fight and second, that those weapons systems at hand (mortars, fixed and rotary-wing aircraft) would be sufficient to handle any fighting that did occur. In the months prior to Operation Anaconda, the U.S. military, coalition special operations troops and local Afghan militias banded together and defeated Al Qaida and elements of the Taliban in their attempt to control of the city of Kandahar and a few weeks later at Tora Bora. [41]

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[40] Alfred de Montesquiou, "Marines launch new Afghan assault against Taliban," *Associated Press*, http://news.yahoo.com/s/ap/20090812/ap_on_re_as/as_afghanistan (accessed 12 August 2009).

[41] The US Special Forces groups to included elements of forces from USSOCOM, JSOC and CIA's Special Activities Division. Other units and coalition partners consisted of TF 11, TF Bowie, and TF Dagger, British Royal Marines, and Canada's 3rd Battalion, Princess Patricia's Canadian Light Infantry, and

The United States Army did not recognize the importance of this lesson until after fighting in the Shah-i-Kot Valley commenced. During Operation Anaconda, 1-18 March 2002, no artillery was present for the coalition and American troops. This absence of artillery created a noticeable capability gap that placed an increased burden on other weapons platforms such as mortars, helicopters, and an array of fixed-wing aircraft. Eventually, the application of mortars combined with air power destroyed large stores of enemy munitions, sealed off caves, spoiled a would-be counterattack, and scattered the survivors.[42]

Unfortunately, the notable achievements made by the use of coordinated close air support did not occur before significant delays occurred in the original plan for the operation. Initially, the enemy retained the advantage in weapons and used them to disrupt the sweep through the valley. They not only possessed mortars of equal and greater caliber than the Americans, but also employed D30, 122mm howitzers that could range the length of the valley floor.[43] In response, the U.S. employed a number of aircraft including Apache AH-64 helicopters and fixed-wing aircraft that included A-10s, F-15Es, F-18s, and AC 130 gunships. These bridged the gap between the limited mortar range and total lack of friendly artillery.

It is doubtful that the use of the current U.S. artillery arsenal in support of Operation Anaconda would have produced a decisive change in the immediate engagement. The overall

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Joint Task Force 2. The German KSK, the Norwegian FSK and elements of the Australian Special Air Service Regiment, the New Zealand Special Air Service and Danish Special Forces from Jaegerkorpset and the Danish Frogman Corps and the Dutch Special Forces (Korps Commando Troepen) took part in Operation Anaconda. Steve Call, *Danger Close: Tactical Air Controllers in Afghanistan and Iraq*, (College Station: Texas A&M University Press, 2007) 59.

[42] Ibid., 78.

[43] The decision not to deploy even light artillery – 105mm cannons – was deliberate. General Tommy Franks concluded that there was too little airlift capability to haul the pieces into the high altitudes. Instead, artillerymen of the 10th Mountain Division trained to operate the 120mm mortar. This battle in the Shah-i-Kot Valley fueled the discussion on the use of mortars and airpower to fill the void where artillery pieces could provide a sufficient bridge in the tactical weapons system gap. The D30 122mm howitzer possesses an effective range of 15.4 kilometers, with a rocket assisted projectile, this increases to 21.9 kilometers. In contrast, the 120mm mortar's maximum range is 7.6 kilometers. *OP 4: Field Artillery in Military Operations Other Than War: An Overview of the US Experience*, (Combat Studies Institute. CSI Press. Fort Leavenworth, Kansas) 37.

inability of the artillery to support the mission due to a lack of expeditionary systems is the real point of significance. Of the two American systems that are air transportable (the M198 and the M119), only the M119, 105mm howitzer might have provided some measure of equal range and impact to offset the enemy D30s.

The real value of Operation Anaconda to the artillery is that it marked how unprepared the U.S. artillery arsenal was to fight an expeditionary war in Afghanistan's rugged landscape. Eight years of continued struggle marks the need for a system that can adapt and deploy as fast as the insurgents can melt into the rugged and formidable terrain.

The Artillery Response After Anaconda

Operation Anaconda marked the last conventional fight executed by Al Qaida in Afghanistan. With their forces scattered and weapons caches seized or destroyed, Al Qaida resorted to guerrilla warfare. The Shah-i-Kot Valley offered little space for the deployment of artillery. The long narrow valley and the steep jagged walls offered little room for its use. However, this same terrain offered safe passage for the Al Qaida fighters assembling to attack and escaping from coalition air strikes (See Figure 11). It also marked the pivotal engagement that spurred the deployment of U.S. field artillery to Afghanistan. That response remained incremental and fragmented.

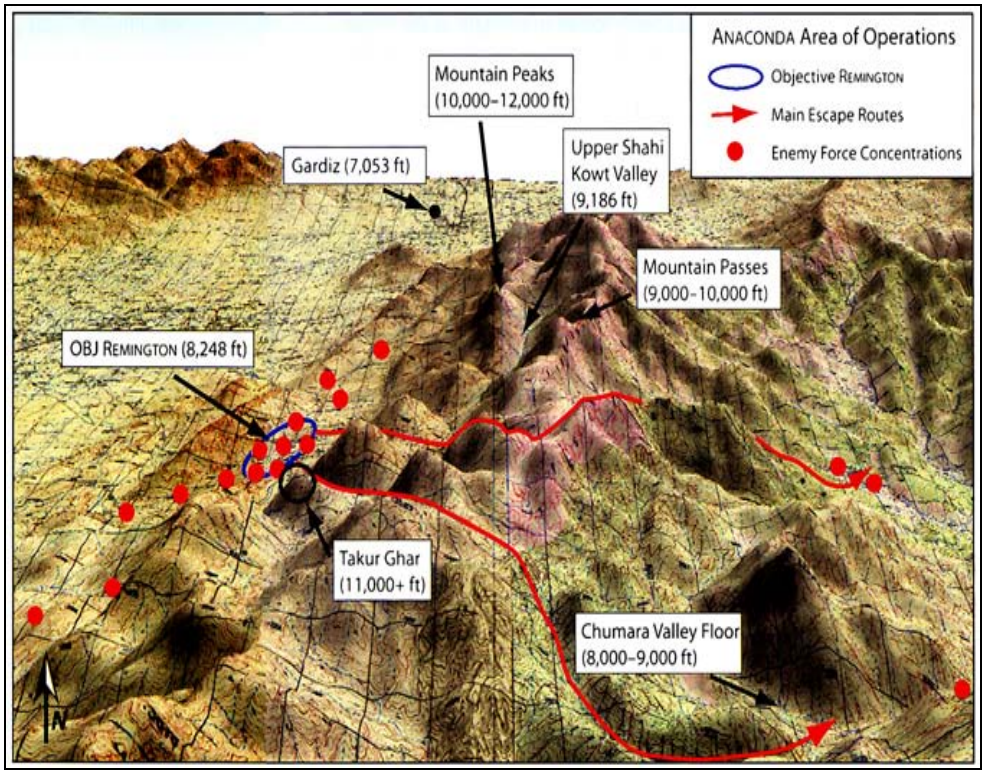

Figure 11. Map Displaying Altitude and General Disposition of Enemy Forces in the Shah-i-Kot Valley.

Source: http://www.army.mil/cmh/brochures/Afghanistan/Operation%20Enduring%20Freedom.html.

Late in 2002, the 82nd Airborne Division deployed with a single M119, 105mm battery. Despite committing artillery to the campaign, it did not necessarily clarify the role of artillery. Instead, artillery units found themselves multi-tasked outside of their normal functional areas. Beyond providing limited fire support missions from firebases, artillerymen took part in major combat operations as provisional infantry and provided augmentation to logistics units. The six guns deployed in direct support in the vastness of Afghanistan did little to alter the tactical fighting.

The fire missions that the units did execute did not reflect the lethality of the weapon system. Instead, illumination missions to demonstrate “presence” and “resolve” to local populations and potential insurgents was the norm. This technique was designed to deter and

reduce the insurgent's effectiveness in operating and recruiting within a given area. No clear evidence exists as to the effectiveness of this technique.

The 2003 deployment of A and B batteries of the 1/319th Field Artillery Regiment to Operation Enduring Freedom reinforced the need for more and effective artillery fires in Afghanistan. This organization proved that the artillery community, while versatile and flexible, still lacked the significant number of tubes necessary to change the tactical level fighting. The guns, unless transported by helicopters, remained immobile on the bases.

Though air mobility was helpful and necessary to move the guns to new positions, this method does not address the fundamental issue that howitzers remain tied to fixed positions. Chinook helicopters transported 105mm guns loaded internally into the aircraft and not sling-loaded beneath. This method intended to create some level of surprise, but with many Afghans in close proximity to the bases, it is doubtful that it achieved the desire effect. Once moved to a new location, the guns remained limited to the confines of the new firebases. Even more troubling, the gunners who employed the M119, 105mm howitzer, adapted to learn the skills of mortar crews to employ and fire the 120mm mortar.[44]

By 2008, the continued deterioration of the tactical situation required that the 173rd Airborne Brigade Combat Team's 4-319 Field Artillery Regiment employ concepts that the Soviets, Indians, and Pakistanis utilized fighting in Southwest Asia. During their deployment, the 4-319 AFAR fired more than 15,000 rounds. Sixty percent of these missions were in support of troops in contact with the enemy. The regiment recognized that artillery provides a central coordinating communications link in integrating all indirect fires systems among mortars, Apache

[44] Mortars are effective and responsive when properly employed. However if their employment is inconsistent with their purpose then their effectiveness degrades. Some units placed their mortars in the same convoys that moved the artillery. By grouping items by functionality, indirect firing systems, it placed the mortars at a disadvantage. In contrast to a howitzer, mortars positioned at the same location cannot range all the targets available to the artillery. Additionally, mortars require that the crew "dig-in" or "settle" the base plate before firing accurately or at maximum ranges become achievable. Mitchell, Joshua D. "A Case for Howitzers in Afghanistan." *Field Artillery* (November-December 2003) 6-9.

and Kiowa helicopters, and close air support. The 4-319th further posited the following relevant considerations for artillery in mountain warfare:

- Successful sequencing for the coordination of fires among different platforms results from controlling the altitude, range, and spread of targeting assets – not sequencing by time alone.
- Howitzers should be positioned with overlapping coverage to ensure that enemy on reverse slopes can be reached.
- Firing high-angle missions at long ranges increases the probable error in range (PE). Example: Low angle fire at 6,000 meters equals PE of 21 meters. High-angle fire at 25,000 meters PE range is 106 meters.
- Direct fire skills remain valuable particularly in constrictive terrain. The enemy can approach to within small arms range of fighting positions by using the masking effects of terrain. During 2008, two platoons defended themselves and their bases against insurgent forces by use of direct fire missions.
- M777 weapon support is a challenge. Despite the fielding of this new gun, it still lacks mobility beyond the Forward Operating Bases and the fire control system requires a power generator to keep the electronics functioning. A two-kilowatt generator is required using the wheeled vehicle to run the generators. While the M777 proved reliable and accurate, its support requirements and lack of mobility make the technological advantages a hindrance in austere terrain such as Afghanistan.[45]

Additionally, target acquisition using radar is a key component to fighting in Afghanistan's mountains. The integration and employment of Q-36 radar must deal with the same environmental issues that affect the howitzers. Typically, radar deploys with a standard of 25,000

[45] Stephen J. Maranian, "Field Artillery: Fires in the Mountains of Afghanistan." *Fires* (July-September 2008) 34-36.

pounds of equipment. This is reduced to between 5-10,000 pounds when employed at altitudes of 10-12,000 feet. This reduction in gross weight more easily enables radar insertion by Chinook helicopter (CH-47D)

The terrain and the masking effect of the mountains limit the effectiveness of radar. The steepness of the mountains often exceeds seven degrees of slope on the mountainsides. This restricts the locations where radars can set up. Severe contour intervals between mountains also hamper the emplacement of radar systems. Radars occupy the tops of hills instead of the military crest, just beneath the peaks. This exposure leaves the radar system vulnerable to hostile fire and difficult to reach for maintenance and service.[46]

Lessons from American fire supporters provide additional substantiation for the necessity of aligning resources and munitions with mission types. The use of precision munitions does not fit every scenario. Precision-guided munitions are not always the ideal choice. They can require a long process to arm and deliver against small and highly mobile targets. Precision munitions do not suit terrain where the target sets are enemy combatants on foot, enemy mortar and heavy machine gun positions, or enemy behind terrain features.[47] In these instances, achieving a critical mass of impacts in a given target area may prove equally as effective, less expensive, and psychologically more powerful.

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[46] The Q-36 radar proved useful in determining the location of 107mm rocket attacks but still had limitations. The Q-36 Radar can locate the origin grid of the attack. However, it cannot discern if the area contains civilians or locations restricted from attack by the Rules of Engagement (ROE). Additional limiting factors included the enemy's ability to conduct a 360-degree fight. By moving through the valleys, along ridgelines and masked by the mountain faces, the Taliban and Al Qaida fighters used the terrain and the position of the radar to shoot under the radar's search fence. Scott E. Prochniak, Dennis W. Yates. "Counterfire in Afghanistan," *Field Artillery Journal*, (September-October, 2002) 15-18.

[47] Precision fires are greatly desirable against larger fixed positions and targets such as a cave and trench complex or in populated areas where the goal is to engage a specific structure utilized by insurgents. In these instances, precision munitions provide a means to limit collateral damage to people and infrastructure. Christopher F. Bentley, Afghanistan: "Joint and Coalition Fire Support in Operation Anaconda." Ibid., 10-14.

Finally, forward observers face similar problems that confronted the Indian and Pakistani observers. The combination of distance and altitude necessitates that more observers accompany or watch over units maneuvering in rugged terrain. The observers must be able to relay information from one or several potential observers to the firing unit. The masking effect of the terrain limits the ability for the normal compliment of observers to observe all of the potential targets in a given area.

Summary

The early decisions during the execution of Operation Enduring Freedom (OEF) did not permit the deployment of artillery to the battlefield.[48] Since its initial and inauspicious participation in OEF, the field artillery's role in fighting the insurgency continues to evolve incrementally in both quantity and quality of guns deployed and in the types of munitions fired. Only after the events of Operation Anaconda did the U.S. artillery begin to assert its utility and presence on the battlefield. That endeavor netted disjointed improvements focused on technology, not on increasing the aggregate number of weapons in the theater. The field artillery's pursuit of technological advancements in precision munitions and pinpoint targeting, though useful, has not alleviated the need for executing basic and traditional fire support missions with massed fires and forward-moving artillery in support of the infantry well beyond the confines of operating bases and outposts.

For the artillery, the union of man, machine, and munitions should facilitate closing with the enemy while aggressively exploiting conditions that allow a limited number of infantry to destroy insurgent groups. While extended-range munitions and pinpoint targeting are impressive,

[48] The decision not to deploy artillery to Afghanistan prior to Operation Anaconda rested with General Tommy Franks. He believed the fighting would not last long and that a lack of airlift capability would hinder the movement of artillery into positions and reduce the number of infantry that could better utilize the helicopters. OP 4: *Field Artillery in Military Operations Other Than War: An Overview of the US Experience,* (Combat Studies Institute. CSI Press, Fort Leavenworth, Kansas) 37.

they often focus fires well beyond the view or immediate reach of infantry forces. In a counterinsurgency conflict, this methodology achieves only temporary effects if there is no immediate occupation of the distant terrain.

SECTION FIVE
CONCLUSIONS AND RECOMMENDATIONS

> It is not what men know that calls forth their energies and determines their actions, but what they realize.
>
> Jean de Bloch
>
> The Contemporary Review, September 1901

Conclusions

Future threats to The United States of America may represent a hybrid array of adversaries. They may be the disciplined armies of emerging state powers and near-peer competitors, groups of transnational terrorist in temporary alliance, or a combination of these entities. This ambiguous compilation of future adversaries does not negate the military responsibility to prepare to fight them in the worst possible conditions. Regardless of the enemy, a common denominator exists. Combat in the future will occur in terrain suited to enemy forces. The United States military should acknowledge that adversaries would seek and maintain a positional advantage to offset American technological superiority. The experiences of the Soviet Union, Indian and Pakistani armies, and recent U.S. observations in Southwest Asia validate these facts.

The importance of artillery in fighting in these areas is undeniable. Shortsighted views focused singularly upon the hearts-and-minds campaign miss the broader fact of the efficacy of artillery. The arguments against significant artillery, whether budgetary or parochial in nature, center on three areas: the lack of mobility, lack of accuracy, and redundancy of weapon systems. However, the continuing U.S. struggle in Afghanistan and the never-ending rivalry between India and Pakistan points to the difficulties, effects, and cost that the terrain of Southwest Asia can exact from combatants who commit forces too lightly equipped.

The example of the Soviet Union's forces in Afghanistan points to the utility of using the full spectrum of indirect weapons systems from mortars to rockets, towed cannon, and self-propelled howitzers. They further reveal that field artillery can provide a useful and leading role in shaping operations and can directly defeat known insurgent defenses. The legacy of artillery use in Southwest Asia is even more telling. The guns employed by India and Pakistan have for more than a quarter century provided the basic combat platform that prosecutes an enduring conflict along contested borders and control for the Kashmir Region.

The United States Army's institutional memory remains short and neglects the fact that the field artillery proved effective in massing fires for decades in full-spectrum operations. Whether for offense, defense, or in deterring enemy forces, the artillery facilitated operational success in numerous contingency operations.[49] Fundamentally, deployed maneuver commanders rely upon the presence of artillery to provide "firepower insurance" – having organic or assigned artillery capabilities present for any eventuality.

With the formulation of a brigade-centric army, the United States attempted to create a more agile and expeditionary focused institution. However, by increasing the number of deployable units, it sacrificed what the divisional organization successfully ascertained long ago. Wars require the projecting of power abroad. That unit of power must arrive with a significantly lethal array of weapon systems and the infrastructure to command and control them. The brigade force removes both the punch and the coordinating command structure to do much more than protect itself relative to it combat systems.

The U.S. invasion of Afghanistan revealed that American artillery lacked a suitable expeditionary arsenal for mountain fighting. A review of the current systems shows that self-propelled howitzers such as the M109A6 Paladin proved too heavy, costly, and impractical to

[49] Ibid., 36-41.

deploy. The M198, 155mm towed Howitzer, proved more deployable. This system still required a crew of ten, a five or seven-ton truck for towing, and a CH 46 or CH47 helicopter to move it onto the forward operating bases. Neither of these ideally fits the need for use in the narrow and steep valleys of Afghanistan. Light howitzers such as the M119, 105mm only incrementally improved the situation. Arguably, less labor intensive than the M198, it still requires a crew of seven and the smaller caliber sacrifices the range of the larger M198. Faced with these limitations, howitzers only deploy as far forward as the location of the forward most operating bases in a Vietnam-style methodology. This method sacrifices mobility for the ability to interlock fires from multiple bases to cover patrolling infantry units and convoys in the spaces in between. The fixing of artillery platoons to positions within a base or combat outpost emboldens the insurgent fighters to probe and attempt to circumvent our installations and capabilities.

Insurgents exploit the porous mountain regions and international border between Afghanistan and Pakistan. To the insurgent, exploiting borders is a matter of survival, continuance of the war, and a fundamental element of insurgent doctrine rests upon this ability to move in uncontrolled and remote spaces.[50] Likewise, the ability to deter insurgent activities with lethal fires centers on overcoming the reluctance to deploy sufficient numbers of artillery consisting of a smaller and more mobile platform. This platform should enable artillery to move into higher and more remote positions.

Certainly fighting in formidable terrain with artillery presents difficulties, but the case studies reveal that it is possible to use all types of artillery effectively and well beyond the confines of forward operating bases in Afghanistan and Southwest Asia. Each scenario also provides helpful insights worthy of review. The Soviets deduced four main factors that limited the effectiveness of artillery during their fight for Afghanistan. First, sudden changes in

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[50] David Galula, *Counterinsurgency Warfare: Theory and Practice*, (St. Petersburg, FL: Hailer Publishing, 2005) 35-38.

atmospheric pressures and temperatures complicate the adjustment of fires. Second, dead space and the masking effects of terrain limit observation and fields of fire. Third, tactical situations may not allow for the incorporation of timely meteorological data. This means that "hip shoots"-- unexpected missions -- may require use of standard meteorological data rather than an accurate set of information to engage mobile and easily dispersed targets. Fourth, mountainsides and steep valleys limit the effectiveness of radar and sound ranging due to sound reflection and echoes.[51]

For the Indian and Pakistani armies, their conflicts at extreme elevations validate the Soviet assessments. These two armies recognized other dimensions to consider when employing artillery for extended periods in harsh climates. The masking effects of the mountain slopes and the drastic changes in elevation require that large numbers of forward observers maintain the ability to see the enemy, accompany friendly troops, and accurately relay calls for fire. At altitudes between 10,000 and 18,000 feet, acclimatization time greatly influences the training plan for units.[52]

In practical terms, the ongoing artillery duel along the Siachen Glacier buttresses the need for sufficient logistical support and spare parts. Prolonged exposure to extremely low temperatures results in the cracking of artillery base plates and recoil springs. Additionally, bearings freeze and rubber bushings crack and fail to properly seal introducing more room for error during firing and endangering the howitzer crews.

The Indo-Pakistani conflicts underscore the complex situations that occur along ill-defined borders. Siachen Glacier and Kargil reveal the difficulties of attaining fundamental

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[51] FM 100-2-2, *The Soviet Army: Specialized Warfare and Rear Area Support,* (Washington: Department of the Army, 1991) 7-2.

[52] For India and Pakistan, maintaining fixed gun emplacements and troop efficiencies is essential along the line of control. To ensure troops are prepared, requires weeks of and acclimatization to high altitudes may require two or three weeks. Complicating the glacier positions is that above 18,000 feet it is not possible to acclimate to the thin air. Therefore, platoons rotate to lower elevations every two weeks. Entire companies transition every three to four months. Lester Grau and Lieutenant Colonel Hernán Vázquez, Argentine Army. "Ground Combat at High Altitude," *Foreign Military Studies Office*, Fort Leavenworth, KS. http://fmso.leavenworth.army.mil/products.htm#casia. (accessed March 20, 2009) 3-5.

surprise at extreme altitudes and maintaining momentum. In both instances, each army attained limited initial success, followed by fighting that deteriorated into local small-unit level actions. These actions, though small in relative scale to a set-piece maneuver battle, required three times the normal allocation of artillery and the expenditure of large amounts of munitions to pummel and reduce isolated strong points.

The enduring low-level conflict between India and Pakistan proves that where infantry lacks numbers, and aviation lacks consistency, artillery, augmented by mortars, is the primary weapons system of choice. Fortified artillery positions crewed by troops enduring altitude sickness and frostbite remain the anchor points in the Kashmir for both the Pakistani and Indian armies.

Each side recognized the need for tailoring and organizing their artillery systems to the difficult terrain. This included the introduction of new and more lethal munitions and the fielding of large numbers of 122mm and 155mm howitzers. For higher altitudes both sides retained the use of smaller, lighter, portable howitzers such as the 75mm pack howitzer. This arrangement of artillery pieces and their corresponding munitions enabled units to optimize the limited space suitable for gun emplacements. It also allowed fire support that contained a wider number of shell and fuse combinations and greater angles of fire than mortars alone.

Synthesizing these experiences yields several salient points relevant to fighting with artillery in mountains and at high-altitudes. These should shape future training designs and fielding plans for the United States Army. As elevation increases, the relationship between infantry and artillery become disproportionate. When infantry units climb higher into remote areas, limited road networks and aircraft cannot deliver sufficient numbers of units into higher elevations. Therefore, the infantry has a greater dependence on artillery to augment insufficient numbers of troops with fires. The combination of altitude and weather limit the effectiveness of all types of aircraft for fire support Artillery in the mountains requires a decentralized command and control structure. At extreme altitudes and in remote locations, units operate in semi-isolation

due to the jagged mountaintops and must coordinate and synchronize their efforts directly with adjacent, supported, and attached units.

Developments in current overseas contingency operations places great strain on the tactics used to facilitate the desired operational outcomes. Nowhere is this more visible than in the Field Artillery. Incremental changes have resulted in improved munitions for both howitzer and MLRS systems. Howitzer and rocket systems possess range and precision capabilities never before imagined, but those new capabilities – though impressive and needed – do not go far enough. They neglect, the operational requirement for massing fires in both the number of tubes and the volume of standard munitions needed by infantry troops fighting the insurgents in rugged and remotes areas. Essentially, artillery systems provide the only long-term viable solution to execute missions in all weather conditions in remote, rugged terrain.

Recommendations

Fighting in Afghanistan reinforces the point that the fundamentals of artillery gunnery remain relevant regardless of the nature of the conflict and terrain. These recommendations serve as a basis of consideration and warning that while digital advancements in weaponry and precision munitions serve an important role, fighting in extremely mountainous terrain also requires the ability to move and to mass fire support at close ranges. During these engagements, aggregate rounds, not surgical precision establish a decisive advantage.

Therefore, fundamental changes should match the demands of the operational environment. Artillery remains tied to precision and technology. These factors do not allow artillery to move along with the infantry to close and destroy the enemy. Reforms must align people with devices, and that combination with the geography. To accomplish this, the U.S. Army should consider expanding its arsenal of weapons systems, revising its doctrine, and applying the insights from history to optimize its role in Afghanistan.

- The reliance upon only two calibers of howitzers, 105mm and 155mm, on dated platforms and with limited air capacity to move them diminished the field artillery's initial involvement in the conduct of Operation Enduring Freedom. The M777A1/A2 though 7,000 pounds lighter than the M198, howitzer remains hooked to a truck or must be lashed to helicopter for movement.[53]
- The Italian-made OTOBREDA 105mm howitzer, manufactured by GIAT industries – disassembles into 11 components (a section can assemble it in three minutes) and is transportable by pack animals. It weighs 1,310 kilograms, or 2,880 pounds. This is a favorable savings in weight even when compared to the 4,690 pounds for the M119. The OTOBREDA fires nine different charges with a maximum range of 18.1 kilometers. Thirty countries presently field more than 3,000 of these systems worldwide. Tests and actual employment of this system in demanding environments such as Sweden, India, and Malaysia proved successful.
- India's Ordnance Factory Board currently produces the India Field Gun (IFG), a 105mm howitzer specifically designed for mountain deployment. It weighs 2350 Kg (5,170 pounds) with a maximum range of 17.5 kilometers and deploys by either truck or helicopter.
- The 75mm pack howitzer (still in use by Pakistan and India) allows the artillery to move with the infantry into narrow defiles and up steep escarpments while remaining close to destroy targets nested in formidable terrain.

[53] The M777's improved weight and digital fire control system does facilitate more decentralized control and increased emplacement options over its predecessor, the M198. However, it remains confined to fire in support of troops from firebases in Afghanistan and cannot readily move with the infantry. Scott R. Gourley, "Soldier Armed: M777A1/A2 Lightweight 155mm Howitzer," *Army* (August 2007) 74-76.

- GIAT Industries also produces the Caesar 155mm self-propelled howitzer. This system integrates the prime mover and gun. The gun rests on the truck bed. The design specifically addresses the inability of towed 155mm howitzers to deploy into mountainous areas.[54]

Munitions play a vital role in the effectiveness of artillery. As an example, the Soviets displayed great skill at organizing and detailing artillery to support small unit actions. They recognized that in mountain warfare, even small units achieve decisive effects in an engagement.[55] The Soviet method of obliterating hectares of land by artillery is no longer necessary. Precision munitions such as the Excalibur round (XM982,) and the M-31 unitary rocket for the MLRS provide extended range and much improved accuracy for pinpoint targets such as caves.

A need still exists to mass fire to destroy, neutralize, and suppress the enemy to create maneuver space. These remain valid missions for artillery in Afghanistan. Missions and munitions need to match the anticipated fighting. If the Taliban continue to move higher into the mountainous border regions between Pakistan and Afghanistan, then increased importance and an equal demand for an increase in guns and munitions will necessitate the following missions:

Artillery battalions should consider employing rolling barrages to clear enemy concentrations from mountain fortresses and enclaves not ideally suited for direct infantry assault.[56]

- The artillery batteries should provide a sustained linear sheaf of fire to protect dismounted infantry advancing toward or disengaging from enemy units. These

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[54] Sengupta, Prasun K.105mm Guns for Rapid Deployment Force and Mountain Warfare. *Asian Defence Journal*, no. 3 (March 1999) 24.

[55] John Sray, Mountain Warfare: The Russian Perspective. *Foreign Military Studies Office*, Fort Leavenworth, KS (1994). http://fmso.leavenworth.army.mil/products.htm#casia. (accessed March 20, 2009) 2.

[56] Ibid., 16.

fires would clear ridges, valley walls, and seal off enemy avenues of advance or retreat.

- Dedicating a portion of training or retraining so that artillerymen possess the skill of using their guns in direct fire mode to exploit immediate opportunities or eliminate close threats.
- To meet these mission types a significant increase in the munitions supply rate supporting artillery in the theater would require reexamination. However, the time spent increasing and reorganizing would produce an artillery arm that could greatly affect the overall outcome of tactical engagements to achieve operational objectives.

Recommendations do not limit themselves to weapons systems. Training doctrine provides the link among the soldier, weapon, and the environment. Soldiers and leaders require access to core documents from which to draw relevant and expedient tactics and methods. A review of U.S. doctrinal history reveals that the army previously experienced fighting in mountainous terrain. The following points regarding texts and training deserve consideration:

- The army should revise and publish Field Manual 70-10 *Mountain Operations*, Field Manual 70-15 *Operations in Snow and Extreme Cold*, and Field Manual 25-7 *Pack Operations*, all published in 1944.[57] These manuals explain in detail methods of mountain warfare. The lessons and methods still apply to the mountain ranges of Afghanistan and Southwest Asia.

[57] Some reprinted field manuals do exist. Nevertheless, they remain in the prevue of Special Operations forces. A significant amount of the army experienced fighting in rugged terrain well beyond the units comprising the traditional Special Forces community in Afghanistan since 2002. Previous army experience from World War Two captured practical information of mountain troops in manuals such as, FM 25-7 *Pack Operations*, published in 1944. Presently published as *FM 3-05 Special Forces Use of Pack Animals*, Department of the Army, (Washington D.C., June 2004).

- Environmental understanding comes from experience as well as from written sources that describe the conditions within a given area. In Southwest Asia, it is important for leaders to remember that acclimatization to elements and altitude is not the same as proficiency in mountain warfare.[58]
- Training areas should match the environment. Two-thirds of Afghanistan stands at 5,000 feet or above. Currently, only the Pinon Canyon, Colorado, a training area with an average elevation of 6,000 feet closely replicates the austerity and altitude of Afghanistan.

Historical case studies and eight years of recent experience validate the need and utility of a significant artillery arsenal in Afghanistan. The rugged landscape there provides a natural fortress for insurgents that make locating and destroying them difficult.[59] Transnational insurgencies such as Al Qaida and the Taliban exploit the network of mountain ranges between Afghanistan and Pakistan to their advantage.[60] Insurgents use the mountains and the protection they offer to maintain weapons parity with U.S. forces.

American forces must adjust to the limits imparted by geographical and environmental conditions. Mountain warfare dictates that combatants redefine their tactics and operational approaches to isolate and destroy these natural makeshift forts. Creating that isolation requires artillery. However, to fill that requirement the artillery must become mobile and directly support a limited number of infantry with a significant volume of fire to reduce and destroy these positions.

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[58] The experiences of the Indian army suggest that it requires two to three weeks for soldiers to acclimate to altitudes greater than 10,000 feet. This acclimatization does not include training to become a competent mountaineer. Indian sources suggest that 18 months training in mountaineering provides a minimum foundation. The Italian mountain troop's claim 10 years is the requirement to become a proficient mountain warrior. Lester Grau and Lieutenant Colonel Hernán Vázquez, Argentine Army, "Ground Combat at High Altitude," *Foreign Military Studies Office*, Fort Leavenworth, KS. http://fmso.leavenworth.army.mil/products.htm#casia, (accessed March 20, 2009) 1-2.

[59] Ibid., 1-2.

[60] Bard E. O'Neill, *Insurgency and Terrorism: From Revolution to Apocalypse*, 2nd ed. (Washington D.C.: Potomac Books, Inc., 2005) 65-66.

Without a significant increase in firepower delivered by a correspondingly lightweight and maneuverable howitzer, the long-range fight in Afghanistan will devolve into an even deadlier and more protracted conflict. Artillery alone cannot produce victory in Afghanistan. However, without its optimal employment in sufficient strength this war can be lost.

APPENDIX A

Overview of Soviet Military Theory

The interwar period for the Soviet Union and the post World War II era marked significant advancements in conventional Soviet military theory. These theories in turn logically shaped the Soviet perception of how major armed conflict would develop. In Vladimir F. Triandafillov's work, *The Nature of Operations of Modern Armies*, he provided the pivot point in linking the State's Grand Strategy. Through exposure to his theories, the Soviet Army developed the operational level of warfare that connected battlefield tactics to the overall strategic goals.

Extending the concept of the operational level of warfare, Georgii S. Isserson concluded in his treatise, *The Evolution of the Operational Art* that future wars would consist of a single extended front comprising a series of an inter-related chain of main battles. Troop formations several echelons deep would determine the nature of the offense. These formations would deliver frontal blows by shock armies and then penetrate and exploit the enemy's interior lines. The desired goal was to avoid stagnation and devolvement to a positional fight. Equally, decisive victory and retention of momentum and initiative drove this concept.

APPENDIX B

Soviet Artillery Fires

The nomograph is a table that dictated the intensity of artillery fires on specific target sets in normative terms. Normative fires are the number of expended rounds required to guarantee mission accomplishment. These are mathematically and field-tested, and expressed as the numbers of rounds fired by a type of artillery system within a specified period to produce a guaranteed percentage of destruction.

Generally, Soviet artillery missions comprised four types of fires: annihilation, destruction, neutralization and harassment. The first three missions fell within the normative fire terms. Annihilation *[unichtozheniye]* consists of inflicting such losses or damage on a target that it completely loses its combat effectiveness. In the annihilation of unobserved targets, fire is conducted until a designated number of shells is expended which assures a 70-90% kill probability of individual targets or the mathematical expectation of 50-60% of targets destroyed in a group target. The desired end state is that the target is so damaged that it cannot reconstitute and is incapable of even token resistance).

Destruction/demolition fire *[razrusheniye]* consists of putting a target in an "unfit" condition. The target, without a significant expenditure of time and resources, is capable only of sporadic and uncoordinated resistance.

Neutralization/suppression fires *[podavleniye]* involves inflicting such losses on a target and creating such conditions by fire that it is temporarily deprived of its combat effectiveness, its maneuver is restricted or prohibited, or control is disrupted. In neutralizing an unobserved group target, the expenditure of rounds assures the mathematical expectation that 30% of the target is destroyed. The target would receive severe damage, but would be capable of eventual coordinated resistance after the suppression fire lifts.

As an example of the rounds required to annihilate a target, the normative artillery fire against a single artillery piece is 300 rounds of 122mm howitzer ammunition, 200 rounds of 152mm howitzer ammunition or 360 rounds of 122mm multiple rocket launcher ammunition. Neutralization normative fire against an enemy strongpoint occupying one hectare of ground is 200 rounds of 122mm howitzer ammunition, 150 rounds of 152mm howitzer ammunition or 240 rounds of 122mm multiple rocket launcher ammunition.

Information for nomograph and Soviet Fires extracted from the following works: Grau, Lester W. *Artillery and Counterinsurgency: The Soviet Experience in Afghanistan.* Foreign Military Studies Office, Fort Leavenworth, Kansas, June 1997. For primary source data see also, G. E. Peredel'skiy & M. P. Kankov, *Artilleriyskiy divizion v boyu* [Artillery Battalion in Combat], Moscow: Voyenizdat, 1989.

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