Mountain Combat: Hard to move, hard to shoot, even harder to communicate

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Communicating in mountains is a challenge since there are few ideal spots for communication. FM radios, which are line of sight systems, frequently cannot communicate because their signals are absorbed by terrain folds and features. If all the force is on the same side of the mountain and the mountain forms a bowl, FM communications are usually possible. However, radios located on the same side of the mountain at different altitudes have difficulty communicating because of intervening terrain and communications dead space. If the force is deployed on the same side of a mountain which curves out, communications are especially difficult. Even FM radios located on the summit of the mountain have difficulty communicating with radios located further down the mountain slope due to dead space. Communications sites must be carefully selected–and often become key terrain. When line-of-sight communications in mountains are possible, communications are excellent, but there are few sites where line-of sight is possible to all other elements in the net. There are often only three solutions–either move the radio to where it can communicate, set up a radio retransmission site or relay messages across the net.

Radio retransmission sites are expensive in terms of personnel and equipment. TO&Es normally do not provide adequate personnel and equipment to provide several retransmission sites. Further, since the retransmission team must work away from the main body, it must have enough personnel to protect itself and haul all its gear to the retransmission location. Batteries, antennas, guy wires, rations, water, weapons, ammunition and personnel gear are heavy. Moving a site is labor intense. Maintaining a site is also a chore. Fresh batteries, chow and water have to be carried to the site and personnel rotated. If the mission is not static defense, the retransmission site has to constantly shift–to yet another site where it can adequately support its unit. Such sites are not easy to find-or reach, yet the communications teams must keep up with the advancing force which is usually moving along easier terrain.

The Soviets in the mountains of Afghanistan.

During the Soviet-Afghan War, Soviet forces often entered the massive Hindu Kush mountain chain or the imposing Sulieman range. Radio retransmission sites were essential. The Soviets often used Mi-9 VZPU command and control helicopters or other helicopters to conduct retransmission support during movement.[1] Often, the Soviets lacked sufficient personnel and equipment to establish enough ground-based retransmission stations. Then, the Soviets had to resort to radio relay–a long, tedious process involving relaying the message to various stations until it eventually reaches the intended recipients. At first, communications troops made errors during radio relays. The Soviets solved this problem by requiring their communicators to physically record all messages prior to relaying them. Then they trained their communicators to write clearly and quickly on standard forms using capital letters while never lifting the pencil from the paper. The communicators would repeatedly listen to various transmissions and record

them to gain proficiency . Over time, these simple drills improved their accuracy and relay time significantly.[2]

UHF radios also present problems in the mountains. Like FM, UHF signals are absorbed by intervening terrain, yet UHF are not restricted to line-of-sight and can bend somewhat over mountain tops. The Soviet tactical UHF radios were normally able to communicate out to 100 kilometers over open ground. They could also communicate out to 100 kilometers with an intervening mountain as long as the transmitting and receiving stations were on high ground and the intervening mountain was midway and no higher than 200 meters above the stations. Taller mountains and multiple peaks interfered with UHF communications. A single, closer, yet lower peak cut transmissions to 20-22 kilometers and that was only if the mountain crest was narrow and both stations were aimed at the sharp peak. UHF communications distance was cut to 10-12 kilometers if the intervening peak rose up to 100 meters higher than the stations. If there were a series of 200 to 400 meter peaks between stations, transmission distance was cut to 9-10 kilometers–and only if both stations were far enough away from the mountain bases and used whip antennae. Large, domed mountains cut UHF transmissions to 5-6 kilometers, while cut-up rugged mountain terrain further limited transmissions to 4-5 kilometers. UHF communications were frequently lost while moving along mountain roads or in the "silent zone" on the far side of mountains.[3]

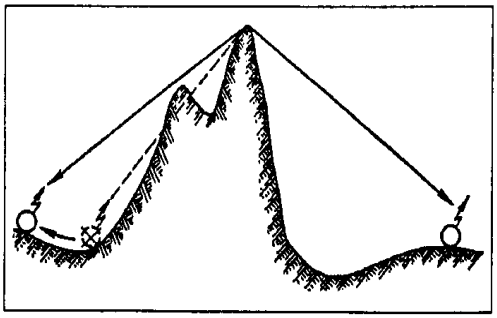

Figure 1: Deploying radios to direct the transmission over a narrow mountain peak (both radio operators must be able to see the mountain peak).

The Soviets took various measures to support UHF communications in the mountains. These measures included:

1. Select communications sites that have a narrow single mountain crest between them. Aim the transmissions at the highest peak. Keep the sites away from the mountain base. (Figure 1)
2. Deploy radios away from the mountain base to a distance at least equal to the distance of the slope between the base and mountain crest. (Figure 2)
3. Deploy radios to commanding heights to improve their line-of-sight to the top of the intervening mountain.
4. Deploy the radios where they can communicate over a single mountain rather than a series of peaks and defiles.
5. When confronted with a large, domed mountain, deploy the radios away from the base of the mountain and on high ground. (Figure 3)[4]

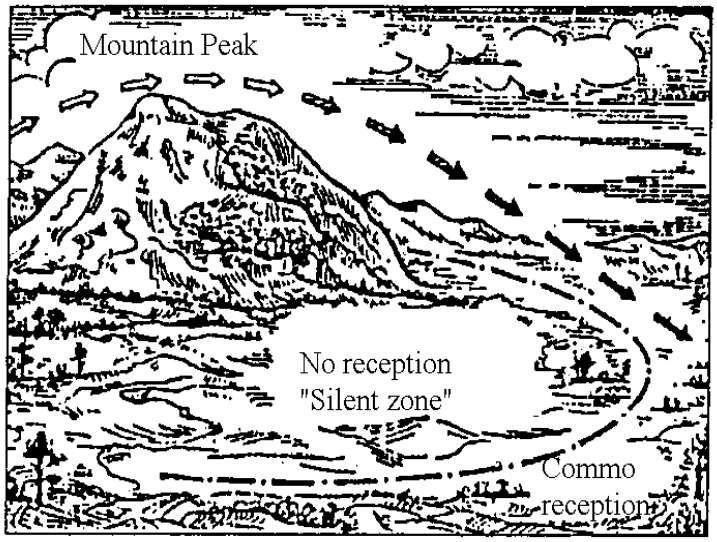

Figure 2:

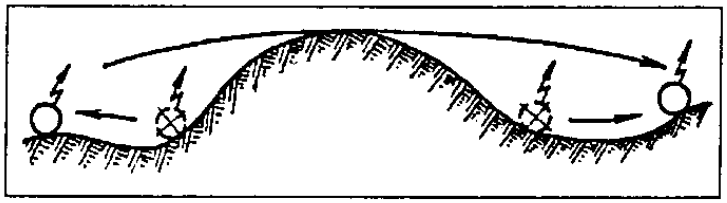

Figure 3: Deploying radios to direct the transmission over a domed mountain (most of the transmission is lost in the air)

There are other problems in establishing radio communications in the mountains. Erecting antennae is one of them. The hard stony ground makes it difficult to pound in stakes for ground wires and guy wires. Winds and slope make it hard to aim and tune antennae. Winds frequently tear down antennae. Another problem is that the optimum communications site may not be the optimum tactical location. Signal sites are often deployed separately from their main body. These sites are attractive targets that do not have a lot of combat power. Weather is another problem. Mountains get more than their fair share of thunderstorms, ice storms and snow. Antennae attract lightning. Antennae ice over rapidly and the ice decreases the transmission power significantly. Ice has to be removed, but this is not easy to do on a long antenna on a mountain during a snowstorm. Diesel engines do not run very well at high altitude, yet most communications generators are diesel-fueled. Standard radio batteries do not handle cold well and therefore the more-expensive lithium batteries are necessary in the high mountains. Finally, communications personnel need to be relieved, rotated and rested regularly in order to maintain good communications.

The U.S. Army in the mountains of Afghanistan

The U.S. Army experienced the difficulties of communicating in the mountains of Afghanistan. Although the U.S. Army has far more satellite communications radios (SATCOM) than the Soviets did during the Soviet-Afghan War, the U.S. Army experienced many of the same difficulties. During operation Anaconda, 101st Air Assault and 10th Mountain Division units formed a single brigade–Task Force RAKKASANS. TF RAKKASANS found communications a challenge, but they were able to make them work.[5]

The base radio for the ground forces was the SINCGARS family of FM radios. Since the force landed inside a mountain bowl and the range of the battlefield was not too great, the FM radios worked surprisingly well, however, terrain folds frequently absorbed signals. "If you can't talk, move" was the working solution, although some wags observed that "communications drives maneuver". The fire direction net, brigade command net and battalion internal nets were all on FM radio. The task force did not use the frequency hopping option on the SINGARS since they also talked to neighboring special operations forces (SOF) on FM on a single frequency. During the two-week operation, the task force changed its frequency only once–and this was due to constant interference and bleed over from another net. A major advantage of FM radio was that ground forces could communicate with helicopter aviation once they were flying in the bowl. However, once the helicopter cleared the crest of the bowl, FM communication was lost.

The helicopters talked to each other on UHF radio. The ground forces had little luck with UHF radio. Unlike SINCGARS, UHF traffic was plain text. The pilots could talk to the main headquarters at Bagram (over 100 miles away) on UHF. TF RAKKASANS had little confidence or success using UHF on the battlefield, nor did they use HF radio. Canadian forces and SOF used HF radio to send scheduled reports, but not for combat. The ground forces did not bother taking VHF radios since they considered VHF as "unreliable and too complicated", and "big and bulky and useless". Indeed the 60-pound weight of the issue VHF radio is prohibitive on any terrain.

The AN/PSC-5 TACSAT radio was the primary means of communications beyond the mountain bowl during Operation ANACONDA. Encrypted satellite communications were reliable, but the narrow-band width assigned to ground forces by the DAMA (demand assigned multiple access) system made communications very slow and hard to understand. Three battalions and the brigade had to share one 25 kilohertz channel! Further, the brigade's TACSATs were not data capable which frustrated speed of communications and accuracy. The USAF and SOF, on the other hand had broadband TACSAT and enjoyed good communications. If no helicopters were in the bowl, TF RAKKASANS had to contact the AWACs aircraft by TACSAT. Since AWACS lacks TACSAT retransmission capability to helicopters, AWACs would manually relay messages to the helicopters.

Other means of communication were Iridium satellite telephones. Although they are difficult to encrypt, they provided excellent emergency communications and allowed the brigade to enter SIPERNET through laptop computers. Much necessary communication was done on the Internet through the SIPERNET-Iridium connection. Further, the Iridium net transmitted and received at normal speed while the TACSAT net was very slow and hard to understand. No wire

communications were used, since wire is heavy and the brigade had limited lift capability. Radio batteries lasted about a day and fresh batteries were a key logistics concern.

Task Force RAKKASANS had two TACSAT narrow-band nets (one each from the 101st and 10th divisions), a USAF broad-band TACSAT net used by the Air Liaison Officer (ALO) to talk to supporting high-performance aircraft, an FM fire direction net and a FM command net. There were no brigade administrative and logistics or intelligence nets due to the limited number of TACSAT nets available. In order to save time and insure accuracy, when the brigade commander spoke, he spoke only to his commanders and everyone else stayed off the net. Due to the heavy fighting, there was no command and control helicopter over-flying the battlefield. The brigade staff worked out of Bagram where they had access to the Predator UAV feed coming into the 10th Mountain Division Headquarters. Each battalion had two TACSAT radios and the normal compliment of FM radios. Battalions were on the brigade TACSAT command net, the brigade FM command net, the brigade fire direction net and internal command net.

Special Operations Forces had quality FM, UHF and wide-band TACSAT radios which provided good communications throughout the operation. Air Liaison Officers had good communications with their wide-band TACSAT radios throughout the operation.

Operation ANACONDA highlighted the problems with DAMA and demonstrated the need to issue broad-band TACSAT radios to conventional forces. It further demonstrated the need for data-capable TACSAT radios and more satellite coverage. It also showed the need for TACSAT radios in helicopters.

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Despite dramatic advances in communications technology, communicating in mountains remains a problem. Satellite communications systems provide greater capability, but they have problems operating around terrain folds as well. Bandwidth and lack of data capability are further serious drawbacks. There is a role for FM and UHF. Iridium phones with computer data link are particularly valuable. Much of the staff work and battle management was accomplished in secure chat rooms. The problem with chat rooms, however, is that anyone with access can join in. The siren call to participate in an operation, even remotely, brought a lot of strap-hangers and time-wasters into the chat room.

Operation Anaconda demonstrated the need to have over-the-horizon communications with aircraft and the main headquarters. Further, the operation demonstrated the need for a survivable command and control aircraft. Data burst technology was not available.

Communications in the mountains is possible but requires planning, training and experience. It also requires better equipment and improved bandwidth.

ENDNOTES:

[1] The Russian General Staff (translated and edited by Lester W. Grau and Michael A. Gress), The Soviet-Afghan War: How a Superpower Fought and Lost, Kansas University Press, 2001, 210 &221.

[2] Yu. Kuzimichev and S. Ponomarev, "Perepriem i retranslyatsiya v gorakh" [Relay and retransmission in mountains], Voyenniyy vestnik [Military journal], December 1986, 74.

[3] "Radiosvyaz' na YKB-stantsiyakh v gorakh" [UHF radio communications in mountains], Armeyskiy sbornik [Army digest], February 1997, 44-45.

[4] Ibid, 45.

[5] This section based on an interview with Captain James Riley, Signal Officer, 3rd Brigade, 101st Air Assault Division at Kandahar, Afghanistan on 13 May 2002 and an interview with Captain Francisco Ranero, Signal Officer of 1-87th Infantry Battalion, 10th Mountain Division at Fort Drum, New York on 11 June 2002.