Signal tactics and shoreline profiling

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by Maj. George E. Sherman

Relying on area communications

Is it prudent to rely as much as we do on tactical satellite (TACSAT) relays for AirLand Battle (ALB) communications? Space architecture reports indicate that satellites are vulnerable to attack and have a limited capacity to relay communications. Furthermore, the current constellation of satellites is all we have, and short-term relief is not in sight because of delayed launch schedules. Improvements that will make our satellites more resistant to jamming and nuclear attacks are slow in coming. "Satellite piracy," whereby a hostile force takes over our satellites for their own transmissions, is still a reality. And satellites have fixed life-spans, some "falling" from their orbits. Fortunately, TACSAT is not the only radio that can perform valley-to-valley links. Improved high frequency radio (IHFR) and troposcatter systems, as well as the Single Channel Ground and Airborne Radio System (SINCGARS), are also able to do so.

However, I propose that a strong area communications system—which for the U.S. Army means Mobile Subscriber Equipment (MSE)—is yet another way to make these valley-to-valley links. Though critics of MSE contend that some new transmission system will be necessary to supplement MSE in making valley-to-valley links, such critics are unimaginatively adhering to yesterday's Signal tactics. If we are smart enough to modify our tactics to take advantage of the new-found capabilities of MSE, we will be able to rely on area communications more than ever. Let's look into the tactics of deploying MSE in the 3-dimensional AirLand Battle.

Zone of tactical operation

To develop Signal tactics that work, we will need to find our "space" within the 3-dimensional ALB, a location that will allow us to provide area communications and insure survival from artillery and nuclear, biological, and chemical (NBC) attacks, as well as from radio-electronic combat (REC). And to determine our options in choosing a zone of tactical Signal operation, we need to understand what our military intelligence people tell us about the Threat's (or the Soviet Union's) various capabilities.

The Threat's REC capability combines Signal intelligence, direction finding (DF), intensive jamming, broadcast deception, and destructive fires. Their overall goal would be to disrupt our command and control (C2) and weapon systems communications. REC target priorities include command posts, observation posts, communications centers, radar stations, and logistic centers — *targets traditionally found on hilltops or in valleys*. Ground-based electronic warfare (EW) involves radio jamming, probably within the division and more accentuated near the forward edge of the battle area. Airborne EW units would also conduct electronic reconnaissance and electronic countermeasure (ECM) missions against our communications systems. (It is important to note that airborne EW elements have to be high enough in the air for proper results and consequently must be exposed at some time during the battle.) The effective zones of jamming are depicted in Figure 1.

Although Threat forces have interception capability, their DF capability is also dangerous to our Signal operations. The Threat's DF capability, used in conjunction with SIGINT and terrain analysis, is capable of developing target areas for artillery fire. DF is also used to develop a "picture" of the battlefield, revealing the disposition and possible

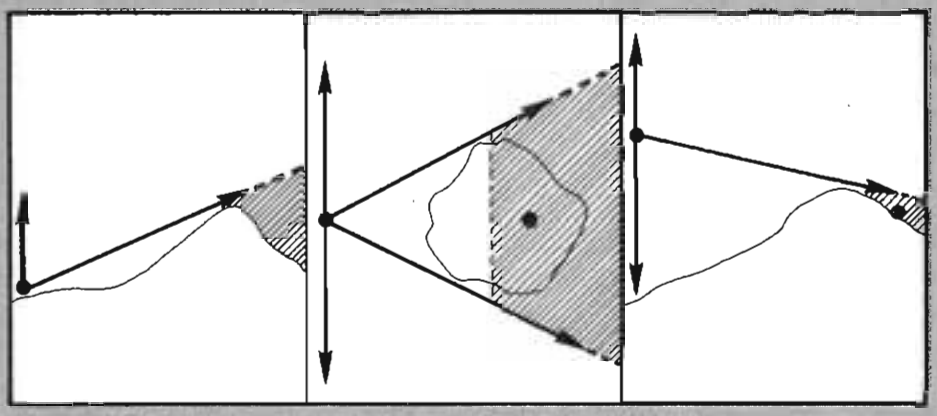

Figure 1. Defilade from jamming (ground, ground, airborne)

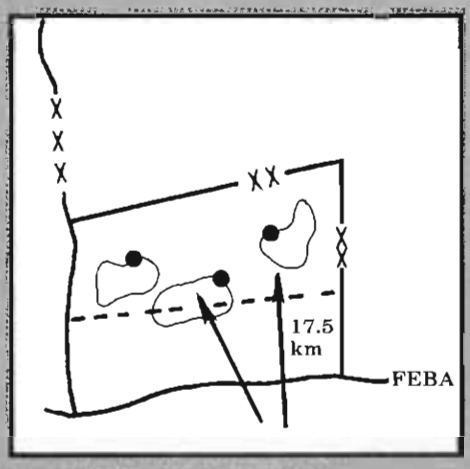

Figure 2. Regimental artillery (long flight)

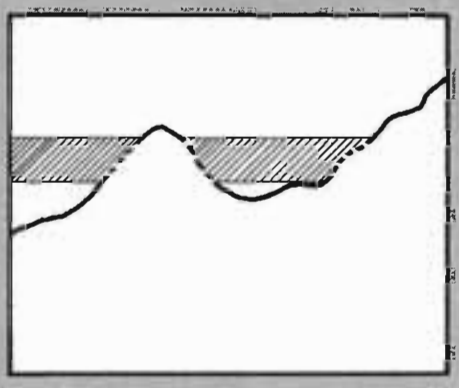

Figure 3. Zone of operation

intentions of our units. It should be noted that about 25 seconds after transmission begins, the Threat targeting sequence can continue even if our transmission ceases. REC doctrine then dictates the use of indirect fire to destroy electronic targets. (See Figure 2.) The Threat regimental artillery supports this mission, but long range exposure of projectiles may allow our target radars time to target their artillery. The bottom line is that we must use terrain defilade to mask our electronic signature.

The Threat classifies both nuclear and chemical weapons as "weapons of mass destruction" relative to troop protective measures, but considers chemical munitions to be "conventional" weapons when discussing employment doctrine. Suitable targets for tactical nuclear strikes include headquarters of divisions and higher echelons, troop concentrations, and communications centers. The key objective of the Threat would be to destroy main combat formations and the command and control system. Their defensive strategy calls for using nuclear weapons primarily to deny areas to us by using surface bursts. They may also use radiologically contaminated barriers produced by surface or subsurface bursts to prohibit or slow movement and "canalize" our forces, (in other words, force our people into certain narrow areas or "canals" where they are easier to attack). On offense, the Threat might employ chemical weapons against our unprotected troops and equipment, as well as use them to deny us the use of certain terrain. In a limited nuclear war, they might use chemical weapons to complement nuclear munitions—again to deny us our use of certain terrain and to canalize our forces.

What is interesting about all this is that although the Threat could deny our use of a great deal of terrain, there is a zone of operation in the ALB that permits us to operate and survive. This zone, shown in Figure 3, is just below the hilltop and just above the valley. Hilltops invite artillery and rocket attacks, whether non-nuclear or nuclear. Valleys invite attacks using persistent agents that linger in low areas with limited air flow. (See Figures 4 and 5.) We have to operate between these target areas. The zone of operation we are looking for is shown as lighter areas on the 1:50,000 scale map in Figure 6.

Fitting to terrain

Our single most important tactical challenge is to deploy communications capable of surviving, given a limited portion of ALB terrain. This challenge becomes especially difficult in our deployment of line-of-sight (LOS) radios, which traditionally have needed to operate from hilltop to hilltop in order to communicate effectively. But as discussed above, this hilltop to hilltop communication invites enemy REC and artillery and rocket attacks. As a result, we need to develop a technique for profiling from the sides of hills, shooting through valleys and between hills. "Shoreline profiling" is a method of LOS radio link planning that allows us to do just that.

Shoreline profiling

What is "shoreline profiling"? In order to develop a "shoreline profile" of LOS links within the defined zone of operation, the S-3 planner must consider two aspects of the terrain: elevation and contour. With a contour map before him or her, the planner, operating from the corps Signal brigade operations section, will actually "slice" the terrain horizontally at specified elevations

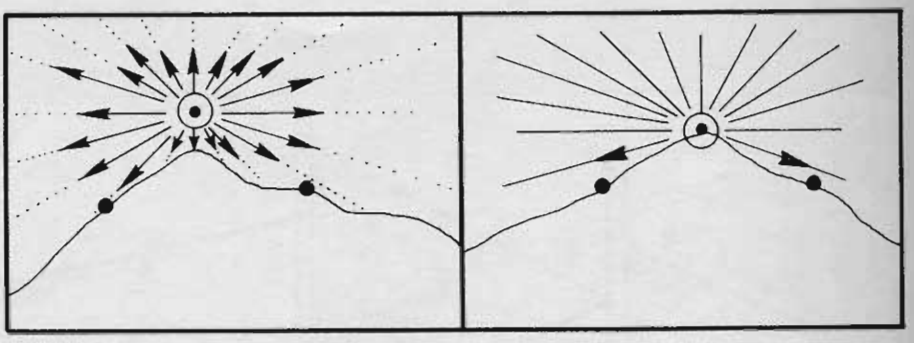

Figure 4. Artillery bursts (air surface)

and momentarily ignore whatever is below the imaginary "waterline" thus created. The result of this slicing is a reduced image of terrain that depends on contour. As you can see in Figure 6, the land above the slicing resembles islands, and isolated ridge lines look like jetties. The coast-like edges, which are actually the contour lines from the terrain data, are what we call "shorelines." By referring to this shoreline profile, the planner can now profile LOS links from a point on the "shoreline" to the distant "shore" across the imaginary water, thus avoiding obstacles. The result is a hillside to hillside shot masked by higher terrain. An example of terrain masking applied to mobile access radio planning, especially in areas close to the forward edge of the battle area, is shown in Figure 7. The MSE radio access unit (RAU) can provide mobile access via a "footprint"—or zone of communication—that rests primarily behind hilltops. We can use MSE's UHF or SHF assets to provide links up and over hilltops only when absolutely necessary. In this way we gain more control over our electronic signature and improve our chances of survival. Remember, the optimal placement of nodes and relays still depends on terrain analysis and the locations of supported forces.

The elevation for slicing is the planner's choice, and factors such as earth curvature and accessibility should be included in a planner's analysis. The elevation chosen should represent a planner's attempt to stay off the hilltop, leaving a sufficient margin to avoid the effects of artillery (nuclear or non-nuclear), air attacks, and Threat ECM. The planner should also consider staying out of low areas to avoid the chemical threat. Figure 8 summarizes the slicing and shoreline profiling techniques.

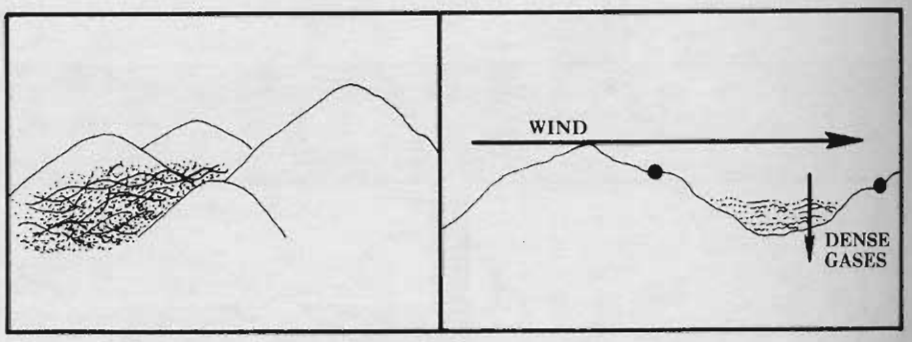

Figure 5. Persistent chemical agent in low areas

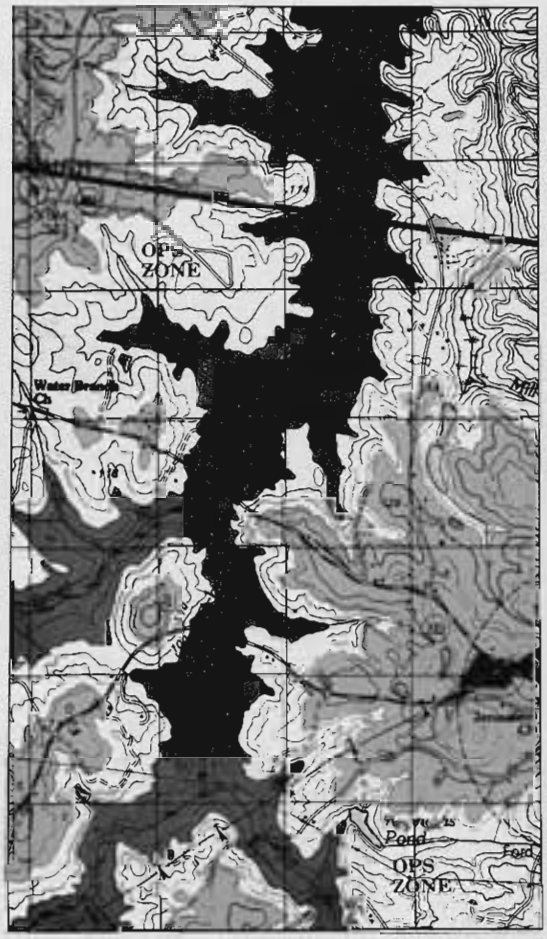

Figure 6. Zone of operation (aerial view)

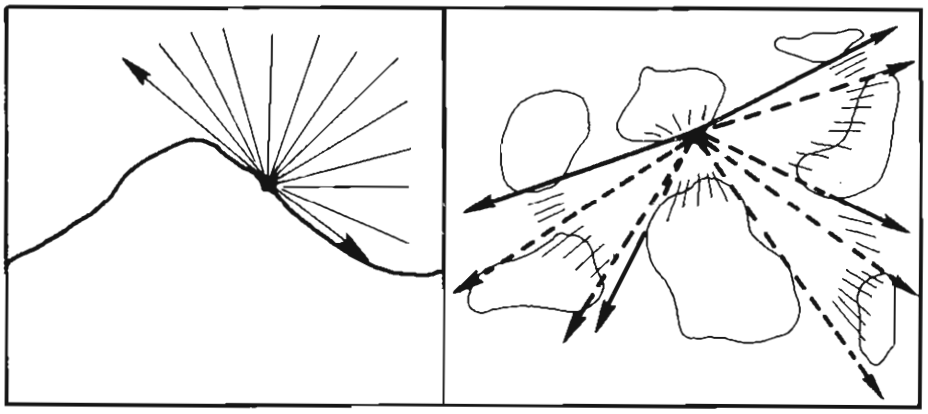

Figure 7. RAU footprint below hilltops

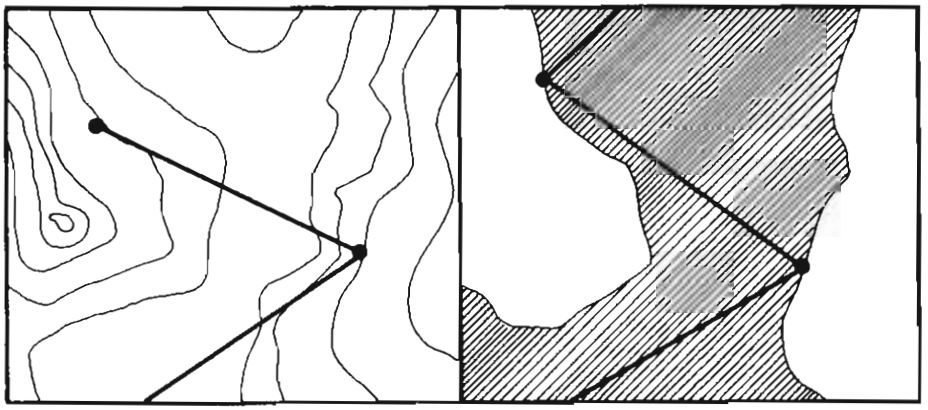

Figure 8. Hillside radio (LOS) links (slice and shoreline profile)

Special benefits

What are the benefits of not having Signal tactics dependent upon the use of hilltops? MSE finally gives us the ability to follow terrain to make use of terrain defilade and to mask our electronic signature. We can directly manage and design our signature by hiding or deliberately showing signatures as we choose—in other words to practice deception. This suggests that we can create a misleading ALB electronic image contrary to the actual disposition of headquarters and ground forces. The ability to disguise the corps commander's intent directly affects the success of the ALB. Although not a direct weapon, electronic subterfuge provides battlefield commanders with an important tool for misinforming Threat intelligence supporting the Threat commander.

One of our new roles might be to alter the Threat's disposition of firepower on the battlefield. We can hide ourselves or selectively help draw long-range regimental artillery and airborne fire as active role players in the ALB. This is probably not a popular idea with Signaleers, but at least our combat arms comrades will know we are a gutsy folk with a long, courageous heritage and are committed to winning the AirLand Battle. For those still unenthusiastic . . . remember that the MSE contract contains many references to "unmanned" assemblages!

Maj. Sherman is chief of the MSE Training and Doctrine Branch in the Signal Leadership Department at Fort Gordon, Ga. He has a B.S. from the U.S. Military Academy, an M.S. in artificial intelligence from Kansas State University, and has completed Ph.D. course work in artificial intelligence at KSU. He has presented public lectures on computer vision and is the author of several articles, including two previously published in ARMY COMMUNICATOR. He has also done remote sensing and computer mapping work in artificial intelligence.