Photo by SPC Jeremiah Johnson, Combat Camera

Counterfire in Afghanistan

By Warrant Officer One Scott E. Prochniak and Major Dennis W. Yates

On 2 March 2002, Task Force Rakkasan, the 3d Brigade Combat Team (BCT), 101st Airborne Division (Air Assault) with elements from both the 101st Airborne and 10th Mountain Divisions, assaulted into the Shah-e-Kot Valley in the Khowst-Gardez region of Eastern Afghanistan. The task force's units immediately came under intense fire from al Qaeda elements high in the hills surrounding the valley. Small-arms fire, rocket-propelled grenades (RPGs) and, in particular, 82-mm mortar rounds ricocheted and impacted all around task force elements as they advanced on their objectives.

For two days, the 1st Battalion, 87th Infantry (1-87 IN), 10th Mountain Division from Fort Drum, New York, and the 2d Battalion, 187th Infantry (2-187 IN), 101st Airborne Division from Fort Campbell, Kentucky, were shelled continuously by al Qaeda mortar crews hiding in caves, emerging to fire their weapons in direct-lay mode. The technique was simple yet effective. The enemy did not even bother to use bipods, opting to prop their tubes on piles of rocks built to help aim the mortars on pre-registered targets.

Although this tactic was not particularly accurate, it produced several friendly casualties and disrupted the task force's assault during its initial stages.

Air strikes and Apache helicopters destroyed most of the enemy mortars in those first two days. However, one enemy mortar crew proved highly resilient and harassed 2-187 IN for two days as the battalion moved to its objectives in the north of the valley. The enemy crew was perched outside a cave on a dominating ridgeline on the west side of the valley that was dubbed "The Whale." [See the map on Page 6.]

Late on 3 March, the commander of A Company, 2-187 IN finally had all of the shelling he was willing to stand. He devised a strike package to eliminate his harassers. Turning to his fire supporters, the commander said, "Okay, here's what we're going to do: ETAC [enlisted tactical air controller], call in a close air strike on that cave. FSO [fire support officer], work up a mortar fire mission on that position and prepare to fire on my command."

As the F-16 roared away after dropping its ordnance, the company commander gave the order, "Fire!" Several rounds left the tubes; the report of the mortars was masked by the boom of afterburning turbojets echoing through the valley floor. As predicted, the enemy crew (that had come through yet another air strike unscathed) exited the cave once more and began to set up their mortar. Before they could complete their task, the hillside erupted in a series of detonations as the American 60-mm rounds found their target.

As the smoke and dust cleared from the hillside, Alpha Company's forward observers (FOs) looked through their binoculars at the results of the mortarmen's handiwork. The enemy crew lay dead outside the mouth of the cave with their mortar tube smashed. The company began to cheer, finally having silenced their tormentors.

Such is the nature of the counterfire threat in the Afghanistan campaign. The 3d BCT, 101st Division, faced an enemy that uses guerilla tactics and makes the most of improvised and low-tech weapons and devices. Protecting the force against such a threat is hard work. Constant vigilance is a must. Pattern analysis is very difficult.

It is against this backdrop that the Q-36 Firefinder radar section from the 3d Battalion, 320th Field Artillery (*Red Knights*), 101st Division, deployed to Kandahar Airfield to provide counterfire coverage for the 3d BCT. The operational environment in Afghanistan has highlighted the limitations of the Q-36 and illustrated the need for a lightweight, omni-directional counterfire radar system to locate enemy elements.

The Environment. The environmental conditions at Kandahar are similar to those experienced during Operation Desert Storm in the Persian Gulf. The region around the airfield is a dry, dusty and sand-covered flatland with hills and mountain ranges in the far distance. This is an extremely harsh environment for both men and machines.

The *Red Knights* Q-36 crew quickly learned techniques to use to keep the radar operational. These maintenance lessons are listed in Figure 1.

Positioning the radar on the airfield is difficult, given the limited space available. For security, everything at Kandahar must remain inside the perimeter fence. The radar also must be positioned away from other electronic systems that potentially could interfere with its signals.

The radar position we used is comparable to those built at the National Training Center (NTC), Fort Irwin, California, with a platform for the antenna group and survivability holes for the shelter and generators. The antenna group is "bermed" to the bottom of the antenna face. With such a set-up, it almost would take a direct hit to disable the radar.

The Mission: Protecting the Force. A small part of the radar's mission is to locate enemy mortars launched at the airfield. A more important function, however, is for the radar to locate enemy rockets launched using improvised firing platforms and timing devices. Just such weapons attacked the airfield on 23 February. Many such rocket attacks have occurred across the country. The maximum range these rockets achieve is about eight kilometers. The maximum effective range of the 82-mm mortar is about four kilometers.

Using the Q-36 in extended-azimuth mode causes undue wear and tear on the azimuth drive motor because of the sand and strong winds in Afghanistan. Therefore, it is imperative for the brigade's S2 (security) section and fire support element (FSE) to work closely to develop named areas of interest (NAIs) to focus the radar's sector of search.

The sensor-to-shooter link also has to be given serious consideration because the airfield is located in the center of a fairly well-populated region. Indiscriminate use of high-explosive rounds to engage enemy attackers easily could result in the deaths of innocent civilians, causing untold damage to the coalition's efforts in the country. Therefore, we developed a battle drill to redirect a patrol or launch a quick-reaction force (QRF) to deal with a counterfire acquisition. We also developed an Apache helicopter QRF as an option available to the commander.

A better solution to provide effective counterfire coverage to the airfield may be to use an AN/TPQ-37. The Q-37 is designed for locating low-trajectory weapons, such as rockets. To mitigate the potential for rounds fired inside the Q-37's minimum range of 3,000 meters, the airfield's perimeter defense force uses its outstanding optics, perimeter towers with clear fields of fire and an aggressive patrolling schedule.

Doublestack the filters on the roadside air intake.
Blow out filters daily.
Disconnect, clean and reconnect data and power cables daily.
Keep shelter door closed as much as possible to reduce the dirt inside.
Ensure the shelter airflow remains clear of obstructions.
Ensure the top and side of the radar processor remains clear of obstructions so the air can move freely through the system's components.
Ensure the radar processor blower is free of dirt and sand.
Add a 400-Hz vacuum cleaner to basic issue items (NSN 7910-00-530-6260).
Upgrade the hard drives to 1.0 GB or more.
Use digital maps instead of paper maps.
Rotate the generators daily and give each a 24-hour break.
Write the hour/date of each service on the generator oil filter.

Figure 1: Q-36 Maintenance Lessons

Other Mission in the Area of Operations (AO). Another mission routinely given to the task force is to secure small, remote sites in the AO using platoon-sized security forces. As in other operations, the main threat is the enemy mortar or rocket attacks or direct-fire attacks using small arms and RPGs.

The AO does not offer much cover or concealment, and the attacks usually are in open terrain. As such, the terrain allows an enemy good observation. As often happens at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana, when the enemy can see the face of the Q-36's antenna, he knows to wait until it is facing away from him before firing his mortars.

Resupply occurs at random times and as infrequently as possible to avoid falling into a pattern easily identifiable by the enemy gunners and to save undue wear and tear on airframes. Therefore, it is not possible to deliver the fuel required to power the Q-36 for continuous operations at a remote site.

Given the threat, the terrain and the radar's logistical requirements, using the Q-36 with its relatively high profile, directional limitations and fuel consumption is an invitation for disaster. The radar is much more successfully employed at a base, such as Kandahar, where it can be properly maintained, serviced and supported and linked to a delivery asset.

Operation Anaconda. During the fight for the Shah-e-Kot Valley, the question was raised as to whether or not the Q-36 would have helped us locate the enemy mortar positions. The answer was, "Actually, not effectively." This is not to say that the Q-36 is no longer a valuable tool in today's counterfire fight. Terrain and other factors always determine the effectiveness of any system.

Operation Anaconda is an example of how the operational environment, in fact, can be so limiting as to render the radar unemployable. Three specific limitations precluded the use of the Q-36 during this fight: tactical lift capability, the severity of the terrain and the directional nature of the radar's location capability.

Tactical Lift. The primary constraint was lift. The altitude at which the operation took place (9,000 to 10,000 feet) had a limiting effect on aircraft loads. The

Army's CH-47D Chinook helicopter, even under ideal conditions, is the only practical choice of airframe to lift a Q-36 radar section into combat. The allowable combat load (ACL) for the CH-47 under the conditions at the time of the operation was considerably less than the maximum ACL under optimal atmospheric conditions (25,000 pounds). Given this ACL, it was theoretically possible to lift the Q-36 shelter truck, the heaviest component of the system, using slings. Doing so, however, would have been a high risk because external loads greatly reduce an aircraft's maneuverability and speed. Because of this, the task force used internal loads almost exclusively; it only used sling-loads for 5,000- and 10,000-pound cargo nets to resupply the force quickly when bad weather threatened to halt aviation operations.

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The second constraint to lift capability was the number of airframes available for the operation. Inserting the Q-36 system would have used four of the task force's 12 CH-47s on one of the initial lifts, thereby limiting the task force commander's ability to insert additional riflemen into the objective area.

Terrain. Terrain on the objective was the next most important factor affecting radar employment. The terrain was so broken that even movement by high-mobility multipurpose-wheeled vehicles (HMMWVs) would have been impossible. Therefore, once airlifted, the radar would have had to remain where it was inserted for lack of a prime mover and trafficable terrain.

Few places on the battlefield offered an occupation site with less than a seven-degree slope. The only place on the objective flat enough to allow occupation by the radar was the valley floor, which the enemy occupied.

Other possibilities included placing the radar in the mountain passes to the east, collocated with task force blocking positions. Those areas suitable for a radar site had to be used instead for helicopter landing zones (HLZs).

These areas also were surrounded on all sides by high hills. While the hills would have helped the radar's defense, they also would have raised the search fence considerably, reducing the probability of acquiring targets.

The contour interval of the terrain was, perhaps, the most striking feature of the objective area. The radar section leader, brigade targeting officer and the brigade executive officer used computer programs such as Falcon View to try to analyze the terrain, the enemy situation and the capabilities of the radar versus the tactics, techniques and procedures (TTPs) being used by the enemy.

The maps produced for the operation gave almost no indication of the broken terrain and severe slopes in the area. The severity of the terrain was not completely appreciated until the brigade FSO was inserted with the brigade tactical command post (TAC). He then was able to assess the terrain first-hand. Mask angles and site-to-crest were severe, easily

Once its on the ground, how does the radar system resupply?

Aerial resupply, which will cause additional blade time for aircraft.

How much fuel can be carried in on the initial lift, therefore increasing the lift requirement for insertion?

100 gallons of fuel, including fuel tanks on the prime movers and the use of the auxiliary fuel system on the generator set, thus adding 780 pounds to the total package weight.

How long will the radar generator run on a tank of fuel?

The radar set uses approximately 30 gallons of fuel each day when running 24-hour operations, thus allowing the system to operate for 72 hours before requiring resupply.

Who will the radar communicate with if no over-the-horizon communications are available?

The radar would talk to the brigade fire support element (FSE) and establish a quick fire link with mortars on the ground.

What repair parts, if any, should elements bring in with the system?

All small parts that easily could be damaged by direct fire systems, especially on the antenna group.

How long will the radar remain operational before being engaged with direct fire by the enemy?

Depending on the weapon identification skills of the enemy, the radar system might not make it to the fight without small arms fire rendering it inoperable. Enemy guerillas and indirect fire systems were visible from the task force blocking positions, plus aircraft returned from the battlefield with multiple bullet holes in their airframes.

How many infantry soldiers can four CH-47 Chinooks take into the fight instead of the AN/TPQ-36V(8)?

Given the same allowable combat load (ACL) restrictions as on the Firefinder system, the lift brought 172 infrantrymen, a large company, to the fight instead of the radar system.

What's a solution to the "dead space" problem of the Firefinder system?

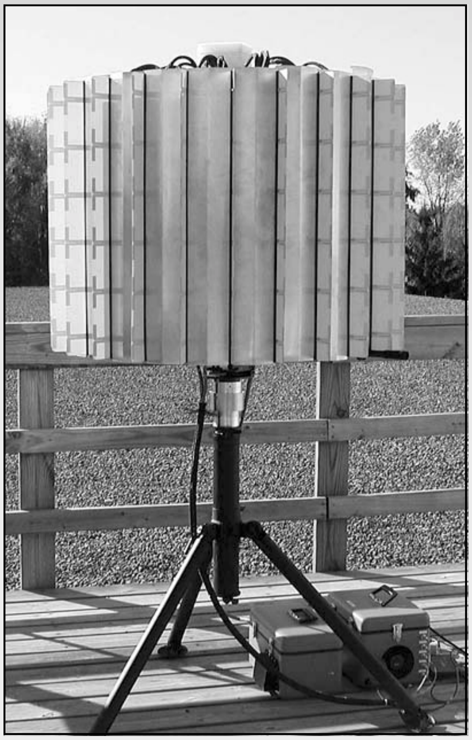
A lightweight countermortar radar (LCMR) to complement the Q-36—not replace it.

Figure 2: Q-36 Employment Considerations

more than 120 mils. The objective area contained multiple wadis and gullies over 100 feet deep. The only practical location for a Q-36 would have been on top of a hill. This would have given the enemy an easy target for their mortars.

360-Degree Fight. The task force was involved in a 360-degree fight. The bulk of the enemy force was located on the south side of the objective area. The only relatively safe location in which to position a radar was on the north side of the objective. From there, the Q-36 only would have been able to acquire a small percentage of enemy rounds—those rounds fired from south to north. The enemy was firing at targets in all directions from firing points ringing the valley, negating the Q-36's ability to track rounds. Also, the low trajectory of rounds fired in direct-lay mode would have put many of the rounds under the radar's search fence. As it turned out, it was relatively easy to spot the enemy's firing positions anyway. Most of them were on mountain slopes above the task force. There was no vegetation to use as concealment, so it was easy to hear the report of the mortars and spot the smoke from the muzzles.

A Look at the Future. A possible means to provide 360-degree coverage would be to supplement the existing AN/TPQ-36 section with the lightweight countermortar radar (LCMR) developed by the Army's Special Operations community. With its range of six kilometers in the omni-directional mode, this may be the system to help fill the gaps currently left by the limitations of the Q-36. When set up in an inconspicuous place, the LCMR can provide 6400 mils of coverage without being easily visible to an enemy. It can be powered by a commercially available 60-Hz generator (as opposed to the 400-Hz generators used by the Firefinder family) or from batteries.



The lightweight countermortar radar (LCMR) developed by the Army's Special Operations community.

The target location error (TLE) of such a system need not be particularly accurate, just good enough to redirect a patrol or an aircraft to the firing point. The Army is likely to find itself in operational environments similar to that in Afghanistan where the rules of engagement (ROE) prevent targeting enemy mortars with more lethal fires.

An LCMR should be added to the Q-36 section and manned by two additional radar operators. The future AN/TPQ-47 Firefinder has a nine-soldier section—a reduction of three soldiers per section as compared to the Q-37 crew. These slots could be given to each light division to supplement their Q-36 sections with an LCMR and its operators.

The addition of this system to each light division's modified table of equipment (MTOE) would give the section new capabilities for the maneuver commander to exploit. The Q-36 would be available to conduct missions within its capabilities, and the LCMR would be able to fill gaps by providing the omni-direction coverage needed by the light forces. By using the systems together, with the smaller system covering the dead-space left by its larger cousin, the commander would be able to achieve 360-degree coverage close in and focus on NAIs at a greater range.

A near-term change to the Q-36 can reduce the lift required to move it. The AN-TPQ-36 can be reconfigured to resemble the future Q-47. Currently the Q-36 requires two C-130 airplanes or four CH-47 helicopters to transport it. By relocating the signal processor from the shelter to the antenna trailer and providing a mounting bracket for the portable operations suite in the generator truck, the Q-36 section would have a two-vehicle early entry configuration similar to its new big brother, the Q-47, cutting the lift requirements in half.

Conclusion. The lessons learned in Afghanistan and at our Combat Training Centers (CTCs) demonstrate the need for both a short-range, omni-directional counterfire capability and a long-range directional capability. Experiences in Afghanistan and at the NTC show that the threat to radar systems by the harsh desert environment is compounded when the terrain hampers transportation and logistics.

The solutions presented in this article would provide the tactical commander a more mobile radar section, one capable of providing 360 degrees of force protection. We acknowledge that there may be other solutions, but we believe these solutions provide the quickest way to ensure that future task force commanders will be able to protect their soldiers adequately from a light counterfire threat.

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