Protecting the Q-37 Firefinder

by Captain Steven M. Carroll, Chief Warrant Officer Two (Retired) Kenneth J. Roberts and Warrant Officer Two David R. Utter

The 25th Infantry Division (Light), Schofield Barracks, Hawaii, designed aggressive force protection measures for its Q-37 Firefinder radars with great success during its corps Battle Command Training Program (BCTP) Warfighter Exercise. Marine infantry, Engineers, Air Defense Artillery (ADA) and Military Police (MP) assets worked together to safeguard this valuable corps asset. The computer simulation proved how effective the radars could be for counterfire if allowed to operate unimpeded by enemy forces.

As a result, we wrote a force protection standing operating procedure (SOP) that incorporated the combined arms forces and reconnaissance and surveillance (R&S) plans we used in the exercise. We then set out to refine and validate our SOP force-on-force at the Pohakuloa Training Area on the Big Island of Hawaii.

This article discusses the tactical and logistical requirements for deploying, emplacing and hardening a radar section in coordination with joint and combined arms units at a site subject to aggressive enemy reconnaissance and infiltration. We developed a checklist for coordinating with combined arms assets and a time line to serve as a template for division artillery (Div Arty) tactical operations center (TOC) planning. We also identified additional maintenance required to sustain extended radar operations in the unusual conditions.

Force Protection FTX

In April 1996, the 25th Field Artillery Detachment (Target Acquisition) conducted a field training exercise (FTX) to validate our force protection annex of our SOP. Our protection package included a platoon of Marines from the 3/3 Marine Regiment, a platoon of Avengers from the 1-62 ADA, excavation assets from the 65th Engineers and a platoon from the 58th MP Company. The opposing force (OPFOR) was a four-man team from the 25th Division's long-range surveillance detachment (LRSD).

The scenario began with the radar in a tactical assembly area (TAA) with the radar technician's receiving a radar de-

Day*	Night*	Event
0 - 10.5	0 - 12.5	Radar section receives Green 3 and RDO instructing it to send an advance party to a new location. The Radar Tech begins troop leading procedures.
0 - 10	0 - 12	Support element reps arrive at current radar site. Radar Tech conducts initial coordination IAW the TACSOP.
0 - 9.5	0 - 11.5	Radar Tech issues movement and OPORD to key leaders and slice elements IAW TACSOP.
0 - 9	0 - 11	Radar advance party leaves the SP and consists of Radar Tech, Section Chief, SRO and Driver; EN LNO/Rep (in radar recon vehicle); 1/2 the attached IN slice in a 5-ton truck; and 1 Avenger fire unit, if available.
0 - 8.5	0 - 10.5	Advance party arrives in the vicinity of the new site. All efforts are made to observe the site from standoff distance using binoculars, FLIR, etc. IN slice sweeps the area and establishes initial security. Avenger displaces to the site while remaining vehicles begin closing on it. Radar advance party marks the site positions and briefs the EN LNO.
0 - 7	0 - 9	Excavation party arrives and consists of 2 SEEs, 2 dozers and FAD survey.
0 - 6.5	0 - 8.5	EN excavate; IN slice begins implementing R&S plans (METT-T).
0 - Travel Time		Radar Tech calls main body forward, which consists of 3 radar 5-tons with trailers, 1 IN 5-ton and 3 each MP/ADA vehicles, if available.
0 - .5	0 - .5	EN complete tasks to TACSOP standards. Survey completes mission prior to the radar's closing on the site. Radar arrives and starts emplacing. Survey departs for the TOC.
0 - Hour		Radar IPRTO, Green 1 and 2 reports sent to Targeting Cell via digital net.
0 + .5		Radar equipment is 100 percent camouflaged. IN slice sends R&S plans to radar to forward to the Targeting Cell. All begin deploying Class IV supplies to construct a defense/ obstacles.
0 + 2		Overhead cover for crew-served weapons complete. IN OIC forwards perimeter sketch to radar. Commo land line emplaced between Radar Tech and IN OIC.
0 + 3		Radar Tech establishes/marks Casualty Collection Point and MEDEVAC sites and disseminates the info to the IN slice and Targeting Cell.
0 + 4		Overhead cover for remaining fighting positions complete. All positions "hot-looped" for communications.
0 + 12		Radar changes shifts and implements rest plan.

*Times are indicated in minutes and considered "not later than" times.

Legend:

ADA = Air Defense Artillery
EN = Engineer
FAD = Field Artillery Detachment
FLIR = Forward-Looking Infrared
IAW = In Accordance With
IN = Infantry
IPRTO = In-Place-Ready-to-Observe
LNO = Liaison Officer
MEDEVAC = Medical Evacuation
METT-T = Mission, Enemy, Terrain, Troops and Time Available
MP = Military Police
OIC = Officer-in-Charge
OPORD = Operations Order
RDO = *Radar Deployment Order*
R&S = Reconnaissance and Surveillance
SEEs = Small Emplacement Excavators
SP = Start Point
SRO = Senior Radar Operator
TACSOP = Tactical Standing Operational Procedures
TOC = Tactical Operations Center

Figure 1: Time Line for Protecting Q-37

ployment order (RDO) to link up with our protection assets and move to a position of approximately one grid square. We tested the technician's ability to use the site selection criteria and employ mission, enemy, terrain, troops and time available (METT-T) and observation, cover and concealment, obstacles, key terrain and avenues of approach (OCOKA) for site selection. This began the time line sequence we were validating (see Figure 1). After conducting troop leading procedures and initial coordination with the joint/combined arms unit leaders, the advance party departed to reconnoiter the new position.

Organization for Combat. The original organization broke the force into two parts: the advance party and the main body. The advance party consisted of radar advance party personnel, all engineer assets, half the Marine platoon and one Avenger team. The main body consisted of the Q-37 and its two support vehicles, the other half of the Marines, the remaining ADA assets and three MP vehicles for convoy security.

The advance party had 10 vehicles in a convoy that stretched for three-quarters of a kilometer. When the convoy stopped to sweep and secure the position area, the convoy was exposed on the road for nearly two hours. Moreover, the convoy was devoid of leadership during this time. The intent was to secure and harden a site hidden from enemy attack, but before we could even establish the site, we were giving away our position with the cumbersome advance party convoy.

Our solution was to divide the force into three moving pieces instead of two. First, the advance party consisted of the radar advance party personnel (radar technician, senior radar operator and driver) and a representative from the engineers in one high-mobility multipurpose wheeled vehicle (HMMWV) and the Marine sweep/security team following in a 5-ton truck. The advance party visually reconnoitered the proposed site from a standoff distance and then swept and secured the area. During the sweep, the radar technician conferred with the engineer rep on the site layout and last-minute changes. This way the engineers could begin digging as soon as the excavation team, the second moving part of the force, arrived.

The excavation team consisted of the engineer assets, radar survey team and MP escort, if available. The excavation team departed the TAA two hours after the advance party (or when called forward). Breaking the advance party into two parts reduced the force's exposure to enemy detection and fire and simplified command and control.

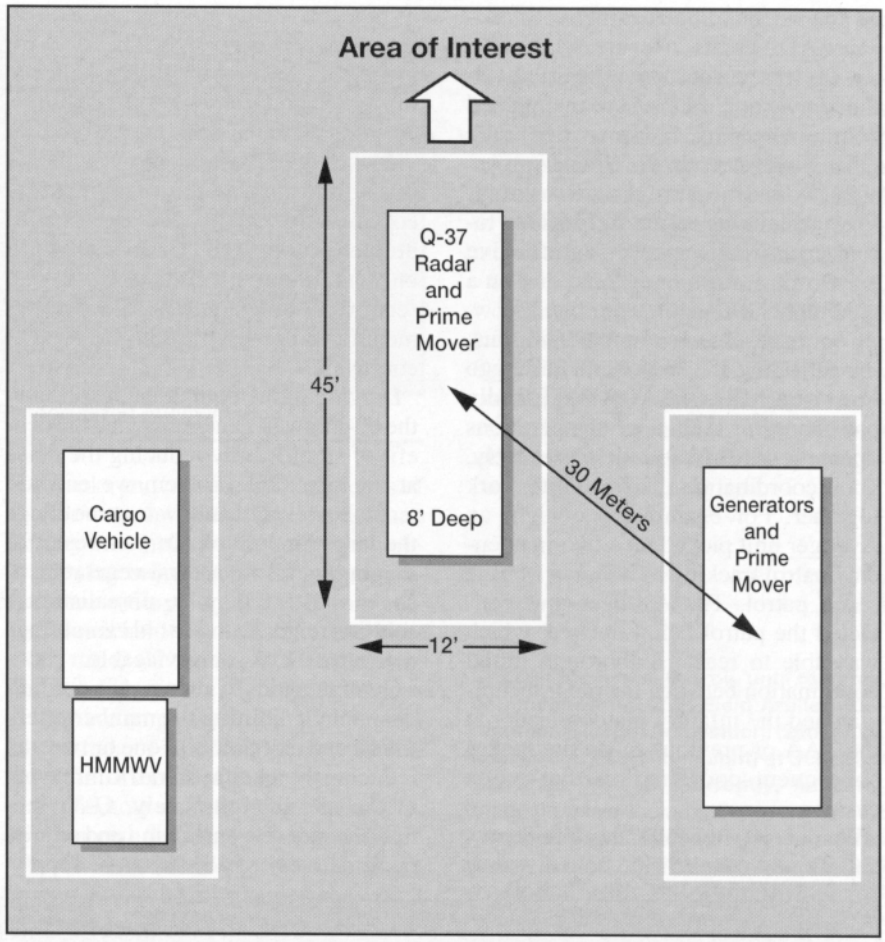

Figure 2: Radar Section Position. The radar's entry-exit slope must be no more than five percent. Once the radar is in place, the front is bermed to the bottom of the antenna. Crew-served weapons positions are dug by the small emplacement excavators (SEEs) with their positioning determined by the radar warrant and infantry officer. This operation requires four hours in normal conditions. Individual fighting positions are dug, as time permits and as determined by the engineer section leader.

Of course, the final part of the force was the main body, which arrived at the site just as the trenches were complete.

Site Excavation. The engineers took four hours to dig three trenches for the Q-37 and its equipment (Figure 2) and two more hours to dig crew-served and individual fighting positions. The engineers would have needed a total of eight hours in limited visibility or rough terrain.

We learned several lessons about how to dig the Q-37 trenches. First, the exit point glide slopes for the three trenches have to be no greater than five degrees. Second, the connecting trenches dug by the small emplacement excavators (SEEs) between the three larger trenches must be dug first or the last 10 feet or so will have to be done manually. This is because the walls of the large trenches are not strong enough to support the weight of the SEE within 10 feet. Last, although the excavated dirt must be spread out somewhat to preclude a large pile, it should be localized enough so that it's easily camouflaged.

During the excavation, the noise and dust clouds made us susceptible to enemy detection. So we began counter-reconnaissance patrols as soon as possible. Because manpower to build the perimeter is decreased by patrolling, we had to extend the time to complete the defense.

Site Defense. The Marines began executing counterrecon patrols based on the platoon leader's METT-T analysis and the reconnaissance and surveillance (R&S) plan sent from the counterfire headquarters. The MPs conducted R&S

on the surrounding road network. Because ADA assets cover areas, not units, we did not co-occupy a position (although we could have) but maintained communications and provided each other situation updates. Whenever possible, we had the Avenger units use their forward-looking infrared (FLIR) to locate enemy movements—an effective way to find warm bodies moving on a cold night.

Coordination and communication during patrolling are paramount. Failing to inform the MP or the ADA that friendly patrols are in their area of operations opens the door to fratricide. Conversely, good coordination ensures units work together. For example, one night an Avenger unit picked up a two-man enemy patrol tracking a five-man Marine recon patrol. The Avenger unit contacted the patrol being tracked, which was able to react. A thorough initial coordination between the radar technician and the infantry platoon leader at the TAA or previous radar site makes subsequent coordination that much easier.

We developed a joint/combined arms coordination checklist to help the radar technician identify the other units' readiness status (see Figure 3). The checklist is a part of the force protection annex in the SOP and, among other things, prompts the radar section chief to provide the slice leaders a current situation update and meld security activities into cohesive operations. We once had a problem during an extended halt when only half the units dismounted to pull security. Coordination and a good movement briefing will prevent this type of confusion.

Digging in the equipment, especially the 60-kilowatt generators, had the benefit of significantly reducing the noise at the site. One problem we encountered, however, was how to camouflage the large amount of dirt as a result of digging in. Using natural vegetation to cover the dirt may be unrealistic. A solution might be to use old camouflage nets turned in as unserviceable.

Other methods of keeping the site hidden include limiting the number of entrance and exit points to one or two and reducing the amount of traffic in and out of the site. Unfortunately, Q-37 sections are not self-sustaining and require point delivery of all classes of supply. The only solution seems to be to restrict resupply efforts to times of limited visibility.

Despite our efforts to hide the radar site, the enemy LRSD located and observed us. During the FTX after-action review (AAR), we discovered that our movement to and from the site gave away our location. The LRSD was able to hide and observe us because they used gilly suits and restricted their own movement to a minimum. It wasn't until they began probing that we detected them. (The LRSD had an unrealistic advantage of knowing the approximate location and size of the site.)

In the next exercise, we'll move more to see if our reorganization for movement hinders the enemies ability to find the unit when it relocates. Last, we will stress the importance of hiding the site in conjunction with hardening efforts, emphasizing map and ground reconnaissance as part of site selection.

Enemy special forces were a primary threat to Q-37s during the Warfighter exercise, and, therefore, we set up to defend against a dismounted ground attack. This included crew-served and individual fighting positions, triple-strand

1. Personnel
- Unit OIC and NCOIC
- Number of Personnel (Get an Alpha Roster)
- Attachments (Medics, FOs, etc.)

2. Weapons and Ammunition
- Type Weapons–M2 (.50 Cal), M60 Machinegun, M249 (SAW), M203, M16A2, AT/4 Antitank, M18A1 Claymore and/or M67 Grenade
- Number of Weapons
- Type and Amount of Ammunition

3. Vehicles and Class III Status
- Vehicle Type
- Fuel Status
- Maintenance Status

4. Class I Status
- Water
- MREs

5. Other
- Maps
- Current Situation

6. Communications
- Commo Equipment Type
- Number of Each
- Battery Status/Requirement
- Call Sign(s)
- Briefing Topics: Pyro Signals, Running Password, Challenge Password, CEOI in Effect, Methods of Communication in Priority

7. Special Unit Coordination
- *Engineers:* (Brief TACSOP Excavation Requirements)
  - Proposed Digging Terrain
  - Slope of Land
  - Time Requirements
  - Advance Party LNO
  - Route Constraints
- *Infantry:*
  - Concept of the Defense
  - R&S Worksheet(s): Distribute and Explain
  - Det. Weapon Systems, Ammo, Pyro, Class IV Available
- *Military Police:*
  - Proposed Route of March
  - Order of March and Composition of Columns
  - Key Assets
- *Brief All:*
  - TACSOP Priorities of Work (Defense)
  - De-Conflict Immediate Reaction Drills
  - Radiation Hazards and Precautionary Measures

8. Time and Place for the Movement Order

Legend:

CEOI = Communications-Electronics Operations Instructions
FOs = Forward Observers
MREs = Meals Ready to Eat
NCOIC = NCO-in-Charge
OIC = Officer-in-Charge
TACSOP = Tactical Standing Operating Procedures

Figure 3: Combined Arms Coordination Checklist

Class IV Item	Basis Load Quantity	Additional Required	Total
Sandbags	300 Bundles	1,000 Bundles	1,300 Bundles
Concertina Wire	45 Rolls	270 Rolls	315 Rolls
Large Pickets	100 Each	500 Each	600 Each
Small Pickets	24 Each	100 Each	145 Each
Tangle-Foot Wire	N/A	10 Rolls	10 Rolls
4'x 8' Plywood	6 Sheets	24 Sheets	32 Sheets

Figure 4: Class IV for a Radar Section with a Platoon-Sized Augmentation Force

concertina wire, antipersonnel mines and preplanned indirect fires.

In the process, we realized we did not have enough concertina wire for the extended perimeter when a platoon of infantry co-occupied with us. Figure 4 lists the Class IV needed to construct an adequate perimeter defense with a platoon-sized augmentation force. The key is to keep the enemy special forces teams from encroaching any closer than small arms range, given that several rounds through the antenna transceiver group (ATG) or antenna will seriously degrade operations. The radar technician must carefully weigh the benefits and risks of a well-hidden and well-hardened site.

The radio frequency (RF) radiation hazard zone will affect the construct of the defense perimeter. This area is defined as extending to 40 meters out from the radar and between the search azimuth limits in a narrow sector scan and seven meters out from the radar and between the search azimuth limits in a broad sector scan. (In 1997, the US Center for Health Promotion and Preventive Medicine, Aberdeen Proving Ground, Maryland, changed the danger zone for human exposure to RF for the Q-37 from 141 meters to 40 meters in a narrow sector scan and seven meters in a broad sector scan.) The danger zone cannot be occupied by soldiers for any extended period and may, in some cases, preclude directly covering likely enemy avenues of approach. If METT-T does not support a defensive perimeter with a frontal radius from the radar of greater than 40 meters, you may not be able to place fighting positions in this area. Therefore, the radar technician and infantry platoon leader have to be creative in defending this area.

One of the best solutions is to use concertina wire to channel the enemy to the flanks and into the primary zones of the crew-served weapons. The unit can deploy channeling wire and other obstacles in conjunction with antipersonnel mines (Claymores) and 40-mm grenade launchers to defend this area. However, the Q-37 radar can inadvertently detonate electronically armed devices if they are emplaced within 268 meters of the radar's antenna face for the full 1,600 mils sector of scan.

A final note on defending a radar site. We learned that a position in defilade with close-in screening crests that don't impair the radar's coverage may be a good opportunity to employ a reverse-slope defense. Moreover, against superior odds, the reverse slope defense gives the defender an advantage.

Additional Maintenance. Maintenance on the radars and support generators is more intensive when the equipment is dug in. For example, the filters on the radar had to be cleaned every 12 hours rather than the 24 hours as recommended in the technical manual (TM). Moreover, we decided it would be better to bring an extra set of filters to switch them out and clean the old set with soap and water. The compartments in the shelter and the ATG also needed to be cleaned with alcohol and lint-free cloth every 12 hours.

Our most important maintenance discovery was that for every 12 hours of operation, the radar had to be shut down one hour for maintenance. Though this would seem to impede our accomplishing the mission, the alternative was to lose the radar to catastrophic failure. For example, the collection of dust in the high-voltage compartment combined with the condensation created by cooling temperatures underground at night could cause arcing of the traveling wave tube (TWT) or other critical components in the compartment. Such a situation could deadline the radar for days.

Additionally, we suggest that the signal processor be cleaned out as much as possible–the compartment blown out using an air line from the 5-ton–and that the circuit cards are inspected. We had to execute an analog-to-digital alignment because of degraded performance.

In this joint/combined arms exercise, we refined and validated our SOP while learning how to make the most of our Q-37s forward on the battlefield. As a combat multiplier for the corps commander, the Firefinder must be protected from an enemy who sees the radar as a high-payoff target. And he's right.

Captain Steven M. Carroll, until recently, commanded the 25th Field Artillery Detachment (Target Acquisition) (25th FAD), 25th Infantry Division (Light) at Schofield Barracks, Hawaii. Currently, he commands a Basic Training Company at Fort Leonard Wood, Missouri. He began his career as an 11B Infantryman in 1986 stationed with the 25th Division at Schofield Barracks, receiving his commission in 1992. Also with the 25th Division, he served in the 1st Battalion, 8th Field Artillery as a Fire Direction Officer and Firing Battery Platoon Leader.

Chief Warrant Officer Two (Retired) Kenneth J. Roberts was the Radar Technician and Detachment Executive Officer for Section 2 of the 25th FAD for three years until his retirement in October 1997. Entering the Army in 1977, he was a 17C Target Acquisition Specialist for eight years until he changed to 13R FA Firefinder Radar Operator. In 1989, he became a Warrant Officer 131A Targeting Technician. Among other assignments, Chief Roberts has served with the 6th Battalion, 8th Field Artillery, 7th Infantry Division (Light) at Fort Ord, California, where he participated in Operation Just Cause as a Radar Technician, and the 26th FAD, 2d Infantry Division, Korea.

Warrant Officer Two David R. Utter is the Section 1 Radar Technician in the 25th FAD. His prior service was as a Radar Technician in the US Navy on the *USS Nimitz, USS Constellation, USS Forrestal, USS Eisenhower*, and at Naval Air Station, Whidbey Island, Washington. He received his commission as a US Army Warrant Officer 131 Targeting Technician in 1995. He is serving his first Army tour at Schofield Barracks.