

Ground Surveillance Radar Operations in Heavy Units

by Captain Frank Sobchak

The Ground Surveillance Radar (GSR) team is perhaps the least understood, if not most underutilized asset that the heavy battalion task force has in its bag of tricks. However, with proper education, leadership, and coordination, this asset can greatly assist units for both their reconnaissance and surveillance missions and their counterreconnaissance battles. Although this article focuses entirely on GSR assets, some of the principles addressed here apply universally to using slice or support elements.

How the System Works

This type of radar works similarly to those used to guide civilian aircraft safely into airports, although the Army system, the PPS-5B (Figure 1) is older, more spartan, and only tracks targets in two dimensions. The radar has two major components, the radar transmitter (RT) and the controller indicator (CI). The RT puts out the electronic waves, and the CI (Figure 2) is used to interpret them. Basically, the radar puts out electronic bursts of energy at a constant rate. These pulses reflect off targets and cause an echo, which is then transformed back into an electronic signature by the controller indicator. The system determines range by the length of time that the echo takes to return to the radar. Targets must be moving, or have moving parts, like an engine idling, in order for the detection to be accurate.

The system can detect targets by three methods:

- **Through an audio return on headphones.** Once the range gate marker is set at the desired range of detection, the radar cycles through its scanning sector. The operator will hear the signature of the target located at the range he has dialed in on the range gate marker. An operator can hear footsteps, engine noises, wind or rain.
- **Through a bright spot on the B scope.** The B scope on the controller indicator shows a vertical trace line that oscillates back and forth across the screen as the radar sweeps through its sector of scan. Targets and "clutter" show up as brighter areas. Reflections

from the ground show up as less bright areas, and areas not covered by the radar appear dark.

Because the trace creates a map-like image over the distance the radar covers, it can be used to visualize dead space.

- **Through a spike on the A scope.** The A scope gives a temporary picture of activity along a particular bearing, and constantly changes as the radar sweeps through its sector. Targets appear as spikes on the one horizontal bar.

After detecting a target, the operator has to stop the radar from scanning and dial the range gate marker (visible on both the A and B scopes) onto the target. Once the range gate marker is on the target, the operator will hear the loudest signature, and from this, can get a range, down to 1m distance, and an azimuth. The azimuth and distance are then transposed onto a plotting board or a surveil-

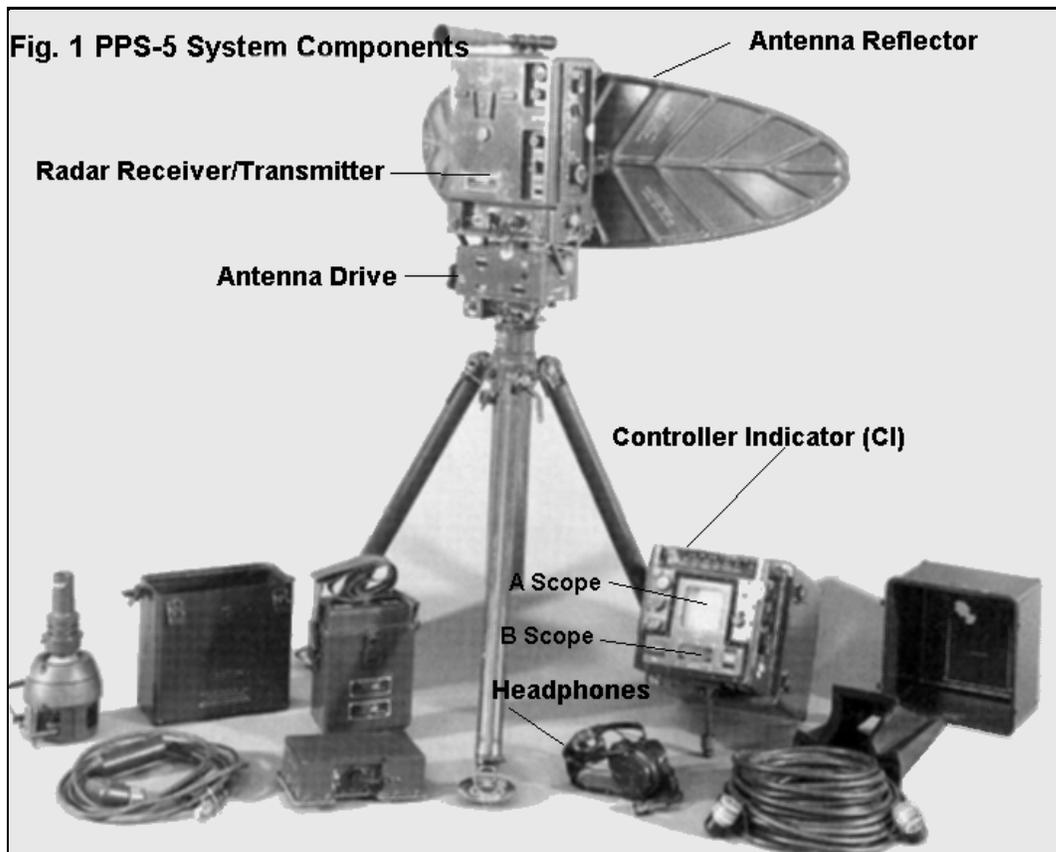


Fig. 2.
Controller Indicator

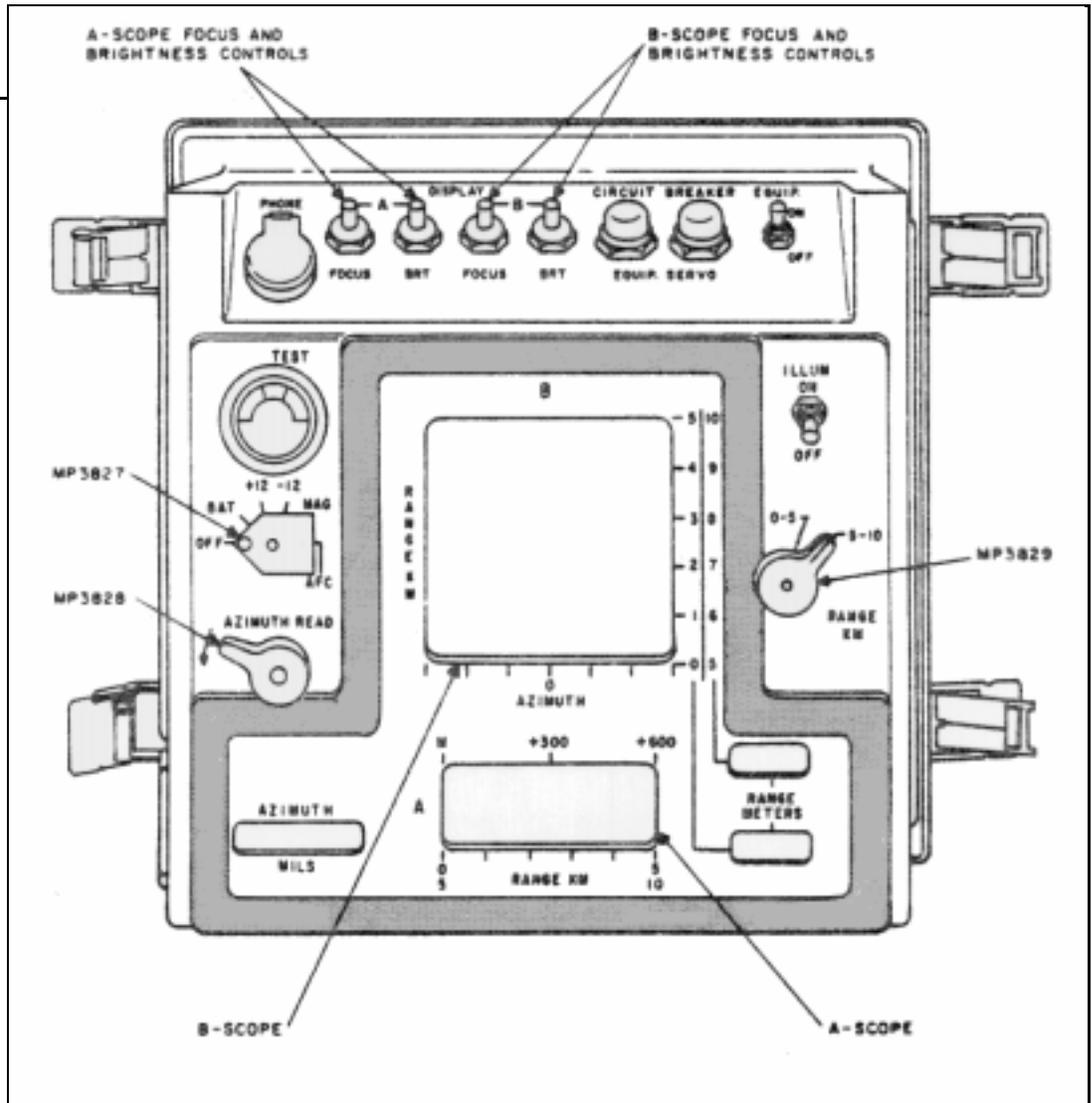
lance card and plotter (SCAP) to get an 8-digit grid, much the same way that a polar call for fire is computed.

Capabilities

The radar team can produce an 8-digit grid, accurate to 10m and based on the quality of the operator, for vehicular targets out to 10km, and out to 6km for personnel. Operators have detected targets beyond these distances, but getting an accurate grid past 10km is nearly impossible. Operators can track multiple targets and can identify the type of target, either wheeled or tracked, from the audio signature. Skilled operators can tell exactly what type of vehicle the system is tracking from its telltale audio signature (e.g., the whine of turbine engines in an M1-series tank). Many NCOs who served on the Inter-German Border before the decline of communism state that it was extremely easy to distinguish the bouncing of track on older Warsaw Pact vehicles equipped with their Christie-derived suspensions.

During the counterreconnaissance battle, GSR teams are effective hunters in a hunter-killer team. Once the GSR detects enemy movement, operators can vector the killers toward the enemy (Figure 3). By tracking enemy movement and friendly movement on their plotting boards, the operators can calculate an intercept course for friendly forces, and talk the friendly force into position to kill the threat.

For reconnaissance, GSR teams can offer great night capabilities and decent daytime capabilities. The GSR soldier (96R, an all-male, combat-exclusion MOS) should be skilled in scout techniques of infiltration, intelligence gathering, and reporting. Furthermore, they are available for cross-FLOT operations (with security support or detailed planning), and for use as standard scouts, even if their radar is inoperative or ineffective due to terrain. They should also be masters of the scout's primary weapon: the call for fire.



The system slaves off vehicle batteries, and can be remoted 50 feet from the prime mover. However, an operator must still be present at the CI (only 12 feet maximum from the RT). While the entire radar can be dismantled and manpacked to an OP, weight and special battery needs makes this impractical.

Limitations

The radar has a 10-15 minute setup time and a 5-10 minute tear-down time and cannot be operated on the move. Consequently, offensive operations in continuous operations or a movement to contact are extremely difficult.

Because the radar is a line-of-sight system, terrain will create dead space like that of any direct fire weapon system (Figure 4). The radar cannot look through or over hills, mountains, or intervisibility (IV) lines. Additionally, the radar waves are broken up by trees, particle smoke, rain, or fog. This leads to two main conclusions:

- Radar effectiveness is based upon the terrain you will be operating in (part of METT-T); if you have thick woods with few sparse areas, the radar is limited to open areas and straight roads. This is the radar's weakness in LIC operations in either woods or urban areas.

- Because most people with binoculars can see 10km line-of-sight during the daytime, the radars make their money at night.

Like any other weapons system, the GSR is only as effective as the operator using it. If the system is not leveled, doesn't have a correct center scan, or the operator is not proficient in detecting or pinpointing targets, the system will be as ineffective as a non-boresighted tank.

Enemy forces can easily use direction-finding (DF) to locate and kill the GSR, which was a high-priority target for the Soviet forces stationed in East Germany. Although the soldiers sardonically joke that their job is seven seconds to Hell (the time necessary to DF a GSR), real-

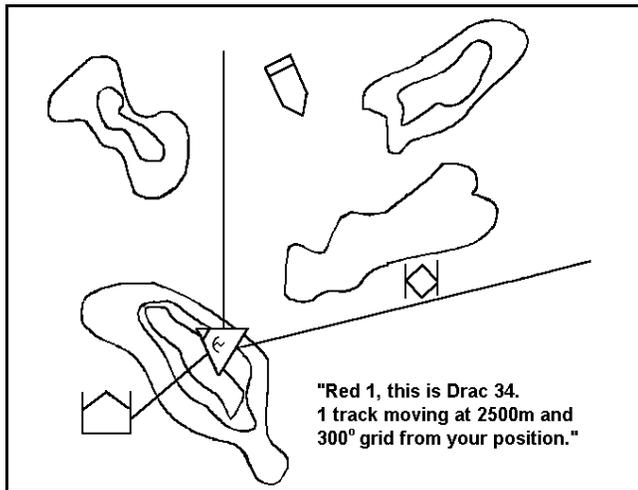


Fig. 3. Vectoring

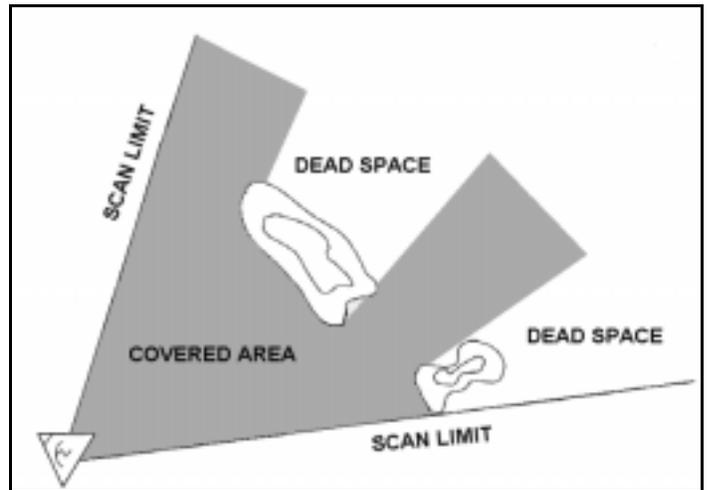


Fig. 4. Dead Space

istically there are almost no countries left that have this capability. Furthermore, if a threat exists, the operators can scan intermittently and displace to avoid fire.

Tactical Considerations

The MTOE personnel authorization (Figure 5) has a significant effect on GSR operations. The current DS company operations platoon contains one HUMINT (Human Intelligence) squad and one GSR squad made up of four teams. Each team is composed of an M113 and three personnel (one track has four personnel with the squad leader), and a headquarters with a platoon leader, platoon sergeant, and an HMMWV. This causes problems in two areas, coordination and sleep plans.

Usually the GSR/operations platoon leader is the brigade LNO for the direct support military intelligence company and can do little or no coordination for his teams. If he does get a chance to get out of the brigade TOC, he may only see one of the two task forces being supported or might only visit his HUMINT squad. This leaves task forces and teams coordinating directly with an E6 (by MTOE, which would not be a major problem), or more likely an E5 or E4. Although some of these junior team leaders conduct great coordination, many do not understand the intricacies of reconnaissance and surveillance to effect proper coordination. The fact that the squad leader still has to run his own team adds to coordination problems. The S2 should take a vested interest in the coordination of the GSRs attached to his brigade or battalion, but many do not.

Fig. 5. MTOE Strength

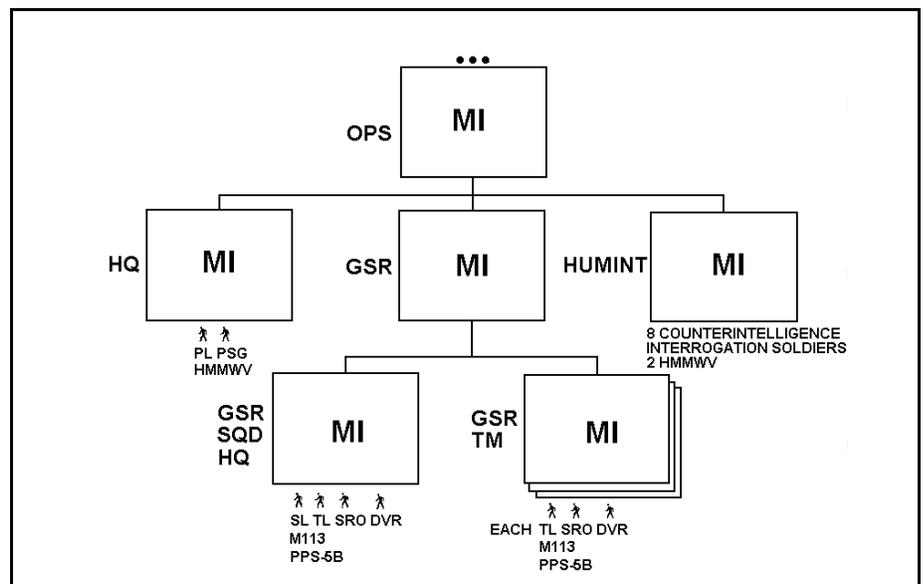
This lack of leadership available for coordination causes problems in fratricide, logistics, and employment.

Failure to coordinate for near and far recognition signals, call signs, COMSEC, and locations cause instances where GSR teams get killed by the units they support. Another problem is that the PPS-5's radar signature, sometimes and at certain frequencies, will cause the radar warning receiver of an AH64 Apache to go off, indicating to the helicopter crew that it has detected a ZSU-23-4 radar (Gun Dish). This unfortunate electronic problem, along with a failure to coordinate, caused a fratricide incident which destroyed a GSR team and killed two crew members during Desert Storm. Simple coordination directly or by FM can prevent the wasting of this asset.

Without logistical coordination, GSR teams support units, but frequently don't have individual, crew-served, or antitank

weapons (AT4s) to defend themselves. This problem is further accented when the GSR teams move from supporting one team (or the scout platoon) to supporting another. Head count for meals (or forgetting to tell the GSR team that LOGPAC has arrived) is also too often a problem. Mistakes in employment occur when leaders do not want to, or forget to, coordinate with the subject matter expert, the GSR team leader or squad leader, and employ the team in an unsound tactical method.

Second, the MTOE causes further problems. Even if teams have all three crew members, usually all three crew members are awake while they are conducting operations. The team leader mans the M2 machine gun, provides security, and monitors the radio. The senior radar operator (SRO) mans the radar and listens on the earphones. The third soldier provides dismounted security and plots targets picked up by the SRO



(based on METT-T, he could be in the driver's compartment or resting). Due to personnel shortages and the standard losses from nondeployables and chapter actions, etc., some teams have only two members, with the SRO taking up the slack, which further constrains operations and slows reporting. Additionally, monitoring duties must be rotated at least every hour to keep the operator fresh because viewing the radar screen and hearing the earphone noises tend to lull some operators into unconsciousness. Some task forces and companies do not take this into consideration and have the GSRs scanning all night, and moving during the day, and then repeat the cycle, never allowing for rest, which other members of the company usually take at night. One suggestion to solve this problem is to keep your GSR teams working reverse cycle, taking their rest during the day when the radar is less effective.

Since each GSR team has only one .50 caliber M2 for protection, they should either have some sort of security provided for them, or be infiltrated to a position (hide site) where they can be concealed and enemy contact is highly unlikely. Providing security through some sort of command relationship benefits both the attached and supported unit. It prevents the GSR from becoming a "loose cannon," wandering around the battlefield, and provides security for the team.

Employment Principles

Generally, maneuver commanders should rely on the subject matter expert (the GSR team leader or platoon leader) to position his unit. However, everyone needs to know some of the general rules for effective GSR employment. Higher terrain is usually better because it allows you to look over small bumps in the terrain and presents less dead space. Finding a location that has a hard background (trees, hills, mountain) makes for clearer radar returns. Having a good concealed position is critical to survival. Orient your sector of scan to cover the designated named area of interest (NAI) so that it maximizes the system's range and minimizes dead space (avoid close hills and mountains). The system has an average sector scan of 90 degrees, so position the radar where you can take advantage of this large sector. Do not waste it covering point NAIs. Having high terrain to the flanks and rear, beyond the sector being covered, is a bonus. These features can absorb the rear and side-lobe radar signature, making it harder for the enemy to find the radar.

Offense

GSR employment is more difficult in the offense. It is most difficult in the movement to contact, but several options are still available. One is to attach two or more GSR teams to a company/team on the flank to protect that flank from an enemy counterattack. The teams would subsequently bound forward in a leap-frog fashion to ensure constant coverage. This method requires detailed planning and rehearsal, to synchronize the set-up and tear-down of the two systems to ensure seamless coverage.

During a stationary counterrecon battle prior to the offense, the GSRs could be used in hunter-killer operations.

Finally, they could be attached to the TF scouts to establish a stationary OP with a scout far across the FLOT looking at enemy reserves or repositioning.

Defense

GSR teams can be attached to the scout platoon to establish an OP past the FLOT with a scout vehicle and either monitor the same or different NAIs. One variation of this is to establish the OP with just the GSR team, although it is risky and not recommended.

Teams could be attached to the battalion's forward or flank to provide night security, and cover an NAI to observe where the enemy main attack is coming from.

Teams also work well attached to a company as the hunters in a hunter-killer concept. The GSR can even talk the killer toward the prey with azimuths using the vectoring technique.

Common Problems

- **Poor use in the offense.** Many task forces either expect too much of the GSR, thinking it can operate on the move, or giving it multiple missions to perform in too short a time. Or they throw up their arms and under-utilize the GSR (providing security for the CTCP) because they do not coordinate for bounding coverage.

- **Coordination.** This causes several problems: First, lack of understanding can cause underutilization and nonparticipation in the R/S plan (the GSR may be attached to a CO/TM without an NAI to cover, or SIRs to answer, or any sort of plan). This can be fixed with coordination with the subject matter expert, either the GSR platoon leader, platoon sergeant, squad leader, or team leader. Second, lack of coordination can cause fratricide — the unidentified vehicle ap-

proaching your rear or flank that you shot may have been the GSR sent to establish an OP on the flank of your company. Third, without logistical coordination, teams may not have ammunition or food to carry out their mission.

- **Inefficiency.** This stems from three major areas: Lack of a rest plan because of multiple missions burns out crews and makes them combat ineffective. Lack of security or a good plan/hide site makes them an easy kill for the enemy. Use of GSRs as a scout (mobile as opposed to OP) degrades their ability. If you can use the 10km range of the radar, you should. I have seen task forces attach GSRs (with functioning radars) to scout platoons to plus up the strength of a scout platoon, and not plan to use the radar at all, even though the radar had a good mission available to work with the counterrecon screen. If possible, use the radar properly.

Future

Plans are for the PPS-5B to be phased out of the Army inventory without replacement. Originally, they were slated to disappear in FY95, current plans are for FY99, but that may change again. Most likely, soldiers in the 96R MOS will be retrained to 96U (UAV operator) or reclassified, although evaluation of a British radar (MSTAR) and an American imagery system (Nightstalker) might indicate that American GSRs are not dead yet.

Conclusion

Although GSR assets are frequently misunderstood and underutilized, a task force which uses the combat multiplier of the GSR properly can greatly assist their reconnaissance and surveillance missions and their counterreconnaissance battles.

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