Geoffrey Brooks Memorial Essay Contest
Concours d'essai commémoratif Geoffrey Brooks

Overcoming the Key Barriers to MRR Operability

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Third Place

In combat environments across all spectrums of warfare, the requirement to possess the capability to combat and monitor enemy fires as well as monitor airspace has become increasingly essential. The results of not having this capability complete, or at all are evident most recently in areas such as Ukraine, where the danger of enemy fires and the need for an effective counter battery system are very real and persistent.[1] This capability requirement retains its importance even outside the immediate battlefield.

To meet this requirement, the Canadian Army has procured and currently operates the Medium Range Radar (MRR). The MRR is a towed radar system that provides both weapon-locating and airspace surveillance capabilities out to considerable ranges. [2];[3] The main tasks included in this are as follows: To detect, locate and classify hostile weapons, determine the targets of HB and identify which HB is firing at which target, adjust the fire of friendly guns onto targets that cannot be seen by forward observers.[4] The MRR is also tasked to carry out radar registration for friendly guns, carry out passive listening in the ESM role; and to provide force protection, via warning to deployed operating bases and friendly forces.[5]

Key advantages that allow the system to operate in these functions include a twenty four hour operating capacity with minimal staffing of four soldiers, doing so while operating in minimal visibility. The MRR is capable of producing accurate results and is designed to redeploy within a timely manner[6];[7].

There are in turn a number of disadvantages to the system. The MRR produces a large footprint that can and will be targeted by enemy electronic warfare assets. The radar is also vulnerable to both air and ground attacks and is susceptible to being affected by a number of adverse weather conditions, such as heavy amounts of moisture. This was experienced by a radar detachment when moisture began to affect the most exposed electronic components of the system. The system itself is expensive, with ten radars acquired for $243.3 million and is a prime target for artillery fires.[8]

This paper will highlight some of the weaknesses of the MRR, which I argue are barriers to being able to effectively employ the system to its maximum effectiveness. I will discuss the ways in which 4th Artillery Regiment (General Support) (4 REGT [GS]) has made efforts in curbing the hindering effects of these disadvantages the radar can carry. The scope of this will be directed to the most recent exercise, Ex Forged Gunner (28 Sept 20 – 09 Oct 20). The specific topics that will be addressed are:

a. Overcoming common survivability concerns;
b. Mitigating mobility issues; and

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[1] Briefing Note for Comd JTF-U.Operation Unifier – AFU Surveillance and Target Acquisition (STA) Artillery Reform.
[2] Rheinmetall Defence. Proposal Presented to PWGSC For the Medium Range Radar Part A, Section I –Technical Bid, Pg 20.
[3] Rheinmetall Defence. Proposal Presented to PWGSC For the Medium Range Radar Part A, Section I –Technical Bid, Pg 22.
[4] Surveillance and Target Acquisition (STA) Artillery in Land Operations, 5-5-1.
[5] Ibid.
[6] Rheinmetall Defence. Proposal Presented to PWGSC For the Medium Range Radar Part A, Section I –Technical Bid, Pg 22.
[7] Surveillance and Target Acquisition (STA) Artillery in Land Operations, 5-5-1.
[8] France-Presse, Agence. (2015). Defense News. *Canada to Buy Iron Dome-Like Radar System*.

c. Tackling Tactical Data Link (TDL) capability shortcomings.

Survivability

As mentioned previously the MRR is a valuable asset to friendly forces and an equally valuable target to the enemy. Specific threats towards MRR operations will be “pressure activated mines, small arms fire, mortars and small calibre unguided rockets”.[9] Denying the enemy the ability to target and destroy the MRR is one of the key challenges to its operability. Tactics to reduce the risk of attack from both ground forces and EW/counter battery (CB) assets were enhanced on Ex Forged Gunner. To mitigate the risk presented by ground forces, 129 Bty demonstrated with the help of 4 ESR the ability to provide cover to a radar using a constructed berm, as well as by digging in the radar within a trench system designed specifically for this piece of equipment.

This allowed for the radar to remain concealed in the lower half, with the sensors still able to screen over the berm and accurately report information without degradation. Although the antenna remained vulnerable to small arms fire, the lower portion, as well as the radar detachment, remained concealed. Detachment stores and vehicles were also able to gain concealment behind a separate berm constructed for them. This would also provide protection against indirect fire, a key threat to the system.

The digging in of the radar was a feat, requiring heavy machinery and xxx hours to complete. Being able to manoeuver the system into a tight dugout and retain the ability to operate it proved to be a worthwhile experience. As with the creation of the berm, this was able to demonstrate how the radar can be protected from CB as well as mitigate the damage done by attacks from ground forces. The confidence gained from this experience has proven that the radar can operate in conditions outside its comfort space, allowing it to be more adaptable to adverse conditions.

Another approach to solving the survivability concerns was the utilization of maneuver in the conduct of the radiation plan which lent itself to the maintenance of continuous coverage. This involved using rotating coverage strategies and demonstrated the ability of radar detachments to go through a continuous on-and-off radiating cycle over a prolonged period of several days. This means that one system would radiate while the other was conducting detachment routines or preparing to move to a new location. After a set amount of time the radar would leave its position while the other began to radiate from a new location.

This decreased the likelihood of enemy forces both gaining accurate information from static radiating platforms and increased the difficulty for ground forces to formulate an attack. The aim of this tactical movement was to demonstrate that the radar could be employed in operations where coverage had to be maintained continuously while mitigating the risk of detection from enemy forces. This also confirmed that the radar was able to be quickly moved in and out of use, bringing the radar detachments much closer to meeting the required operating times.[10]

Incorporated into the maneuver of the MRR detachments was confirmation that the local defence and cam and concealment requirements for the detachment and radar were able to be met even on a timeline of rapid deployments. These accomplishments combined with the above mentioned fortifications of the MRR demonstrated that it can be effectively employed in a setting where enemy contact is probable in rear areas.

These achievements are impressive especially for a towed system such as the MRR, which is designed to be a primarily static system working on hard platform[11]. Components being moved separately

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[9] Statement of Operational Requirement – LF ISTAR Medium Range Radar (October 2008), Pg 34.
[10] Ibid.
[11] Statement of Operational Requirement – LF ISTAR Medium Range Radar (October 2008), Pg 16.

such as the radar, power skid and detachment members only present more difficulties, but also highlight some similarities to some of the issues faced by towed artillery guns. This is an entirely important discussion on its own, however by mitigating these concerns with the MRR, we can begin to see similarities to tactics employed by gun lines to remain free of enemy contact and detection. There is no doubt that proving these abilities with the MRR, a piece of equipment far more fragile than an M777 is a milestone and an important achievement.

Mobility

Mobility was also key in the above section, the specifics are important to discuss on their own. There are three principal mobility requirements that were overcome during Ex FORGED GUNNER, all of them essential to effective deployment of the MRR.

The first of these is the ability to conduct rapid deployments, the radar is built to allow for this, however concerns have arisen in the past in regards to continued rapid deployment of the MRR.[12] This is to say that in cases where the radar was in frequent use and relocation, it could become worn down or damaged. This is most commonly related to the delicacy of the equipment and terrain. As discussed in the survivability aspect, the MRR was proven to be able to overcome these concerns during radiating plans requiring frequent movement. This was able to be accomplished due to the dedication of those working on the equipment combined with the increase in knowledge they continue to gain from familiarizing with the MRR is a variety of working conditions. Deliberate reconnaissance of radiating positions was also key in placing them in suitable positions.

These mobility concerns are also a result of the radiating platforms that are required in today's battle space, where a flat, hard radiating surface is not always available or if it is, it is easily predictable. As the towed MRR was constructed to operate primarily on consistently flat or stable surfaces, its performance outside these areas can cause wear on the equipment, especially on unpaved roads with an unusual pattern of elevations. These difficulties are greatly increased during harsh weather conditions.

Despite these terrain challenges the MRR was successfully deployed throughout Ex FORGED GUNNER to a variety of locations that were challenging for the equipment, most notably, the actually towing components and the MRR. This was carried out while incurring minimal damage to the system which allowed them to stay in use and avoid being a victim to terrain conditions. This advancement was accomplished once again by the continued effort of the radar troops and familiarization with the MRR. It was without a doubt demonstrated on Ex Forged Gunner that the towed MRR can be employed well outside its design conditions, once again overcoming a great barrier to the system reaching its full combat deployment potential.

Tactical Data Link (TDL) & Communication

Despite the number of tactical concerns discussed with the MRR, the technology within it is state-of-the-art and some of the best available. The functions that the radar can perform are extremely valuable to the Canadian Armed Forces (CAF) as a whole. However, some of these technical capabilities are being held back, not at the fault of their performance, but by factors limiting how the collected information is disseminated to the demanding HQ.

Currently, information gathered from the MRR regarding either air surveillance or hostile battery reports is passed through combat net radio (CNR). This not only slows down the passage of information,

[12] Rheinmetall Defence. Proposal Presented to PWGSC For the Medium Range Radar Part A, Section I –Technical Bid, Pg 22.

but also allows more room for error and hinders the ability of radar detachments to participate effectively with other friendly forces, using digital methods. These methods are less secure than data links and are more likely to be detected by enemy EW.[13] This is exactly the problem that 4 Regt (GS) with the 129 Bty Airspace Coordination Centre (ASCC) have begun to overcome and is in many regards the most important and influential steps toward increasing MRR operability.

When receiving a tracking from the radar, this information gathered was successfully passed using wave relay up to a significant distance of 25km. The total distance that information could be passed along then only then relied on the amount of CP kits that were available. This allows the data to be passed through command posts, using each one as a station or relay to then get to the next. This mitigates the need to send long distances if there are multiple kits spread out over an area. Similar to flying SUAS over long distances using spoke deployments, if a CP kit was placed every 25 km the distance could be increased even further. Using TDL would allow this information to be transferred without delay to other organizations that require it in order to effect an appropriate response. As the information gathered by the MRR is important to C2 organizations, information sharing in real time is invaluable.

Increasing the use of this capability is actively enhancing the information sharing capabilities of the CA and is also creating greater land-air integration, while enabling the MRR to be active in more operations. It increases situational awareness within CAF structures and contributes to more operational capabilities.

Closing Remarks

Recently, 4 Regt (GS) has made remarkable strides regarding tactical employment of the MRR. This is a direct result of dedication within the Regiment to increase these capabilities and to find methods that allow radar troops, and the Regiment as a whole, to overcome the MRRs physical characteristics. Taking new directions in MRR local defence and refining strategies to conceal radiating platforms while applying deception tactics only increases the effectiveness with which the MRR function on the modern battlefield.

4 Regt (GS) has succeeded in operating a delicate piece of equipment around the battle space, confirming that the radar can be used outside its traditional expectations. These affirmations ensure the MRR will remain active and allow for a reliable method of information gathering, both in regards to air surveillance and CB Finally, the importance of the advances in the use of TDL and wave relay for this data transfer cannot be stressed enough. Continued dedication to increasing this capability will only further the use of the MRR and make it more compatible with friendly forces. This will ensure that the MRR continues to remain a highly effective capability for the CAF.

[13] Northrup Grumman's Guide to Secure Tactical Data Links. Understanding Voice and Data Link Networking. (December 2013).

References

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