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Towed Artillery in the Modern Battlespace

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On 24 March 2022, Captain Wiebe concluded his essay on digitally dispersed positions by saying "the CAF and RCA must re-shift its focus on and prepare for a potential return to large scale conflicts with a near-peer or peer-to-peer adversary". While this essay may have been completed just as the Russian invasion of Ukraine began, one year later, we are able to see how the conventional doctrine on towed artillery has played out. Any seasoned artillerist has heard the worried discussions over this decade on whether MLRS with Counter Battery (CB) radar or small UAVs will render towed artillery obsolete (Turks 2016 p.11). The advantages of lower cost, movement range, ease of training and maintenance have always been touted as the excuses to keep towed artillery around; after all, it was perfect for COIN operations (Wiebe 2022 p.4). This paper explores how effective use of dispersion and economics has proven towed artillery still has effective use on the modern battlefield.

Towed artillery requires troops to be always out in the open on a gun position to operate the howitzer. If they are in a static position for extended periods, they can dig trench and foxholes for extra protection. However, in the modern battlefield the effect of CB allows for hostile artillery to engage a battery in as little as 3 minutes (WARDEV p.2), although often taking up to 10 minutes (Wiebe p.3). This requires batteries to shoot and scoot, limiting the time available to pragmatically dig in. This limited time leaves troops in the open for the duration of the firing, as well as the duration of the cease firing process, leaving troops fully exposed to indiscriminate CB until they are in the truck moving, which is typically a soft skinned vehicle. While CB fire is effective at inflicting casualties on these open gun positions, what is

more effective are MLRS CB because of the wide area of affect they have and their ability to fire without recourse from opposing CB due to their range and post firing mobility.

This threat of CB because of modern CB radars has been discussed over the last decade with simulations run which argue for the effectiveness of a battery continuing to fire instead of always withdrawing after an initial volley, as well as discussions on how we can change doctrine to reduce casualties (Turk p.11). Due to the invention of the Digital Fire Control System (DFCS), "current doctrine does not capture the full spectrum of the M777A2A2's capabilities" when concerning the use of dispersion (Turk p.57). If one reads Wiebe's paper, he goes into detail on how doctrine could be altered to begin using hides and what he terms "digitally dispersed gun positions" which have the potential to span a battery to nearly 10 km across, albeit that is in the most extreme cases; half of that would do fine. In Turk's simulations, M777A2's set up as a tight battery "suffered substantially more casualties than the distributed force", and Turk's simulations did not disperse nearly as far. Furthermore, in comparing to self propelled guns (SPGs), the speed of deployment was not the end all be all as "Howitzer displacement time [had] a small but measurable impact on survivability" (Turk p.59). In the Ukraine, many of these principals have been put into practice and the M777A2's that have been sent there, while not getting he same praise as the HIMARS, have been hailed as great improvements by the troops using them (Stewart 2022). Captain Wiebe's suggestions are partially being practiced today in Ukraine as "dispersal of individual guns twice and even three times farther apart than specified in NATO doctrine" is the norm (Korshak 2022). Despite this, our doctrine in training favours tight battery formations for convenience and faster deployment speeds with the recce party. While this is hard to avoid with LG1 and C3 training guns, occasionally utilizing large spread-out recce parties to allow for training in dispersion would be an achievable move forward which could also be valuable if GPS systems failed on M777A2's and fixation became difficult to achieve accurately.

By January 27th nine months had passed since M77A2's began to arrive in Ukraine. At that point, only 35 of the 152 M777A2's sent had been damaged or destroyed and in many instances the crews have survived. While shoot and scoots were expected to be the SOP (Turk/Wiebe), often we see dispersed gun positions where the troops shoot a heavy volume of fire and withdraw but leave their howitzer in place, covered in camouflage until they need to come back and shoot again (Stewart). A Ukrainian artillerist explaining "Its easier to camouflage. When we used to work with soviet artillery, it was challenging." highlights the larger size and uniform shape of an SPG making it hard to hide (Radio Free Europe, 2022).

One reason towed artillery may have faired so well in the Ukraine war may be because shortages in munitions, a situation that is being exacerbated by the Ukraine's targeting of ammo depots. If more ammunition was available, perhaps indiscriminate CB firing would have rendered these dispersion strategies less effective. Turk's simulations may show that if a battery fires on "one distributed howitzer then it leaves itself open to IDF from the other five distributed howitzers." (p. 58), but CB MLRS will usually be out of range of opposing CB. If ammo was not a concern, wouldn't these lone howitzers continually suffer from attrition? The issue with this question is that its not that ammo is a concern, but cost is a concern. Artillery economics may answer this for us.

The Russian military stockpiles from the USSR era have been getting drained faster than most analyst predicted (Keating 2022, Parfonov 2022). Ammunition attrition is a classic logistical mistake made before a war when analyst forget that in wartime every empty house or cluster of bushes can suddenly appear as a necessary target for a salvo. MLRS is well known to expend ammunition resources at a much faster rate than guns. When speaking about MLRS here, I am not referring to guided rockets that cost as much as $160, 000 per shot (Puglise 2016) because they are equally as effective on SPGs as they are on towed howitzer and serve a wider strategic purpose. Instead, I am speaking to the dumb munitions such as those fired from a BM-21 battalion that can "fire 712 rockets in one minute" that along with two artillery battalions could cover "an area roughly equivalent to two football fields" with "up to 1000

projectiles or explosives, in the space of one minute" (Korsvold 2020). While that would be overkill on a towed gun battery, it highlights how effective that would still be on SPGs, but also shows that by only using the BM-21's you could confidently destroy a towed gun battery if not dispersed wide enough. Further, it demonstrates that after using CB radar to pick up dispersed howitzers, you could fire on a single howitzer reasonably quick and expect to destroy it should it not be fast enough to pull out.

That however, is also where MLRS's disadvantage lies. While it is hard to get accurate data, Parfonov at The Jamestown Foundation developed estimates that place the lower end of the cost (priced in CAD) per Uragan rocket in 2022 at $4697 and the upper end at $19,438. When compared to a 152mm at the same factory at $740, or a Canadian 155mm shell that averages $2000 (Puglise), not only must the cost per munition be taken into cost consideration, but also the higher volume of fire required. A 712 round rocket barrage would cost $3.34 million. If it is a successful hit, then it makes its worth, but if a digitally dispersed position reduces accuracy and troops are able to scoot, then quickly the cost of these barrages loses their benefit when acting as counter battery. Compare that to the typical barrage from two howitzer batteries that would cost $45,000 for a 5-round fire for effect with an adjustment round which should create the same effect of damage because of accuracy; albeit sacrificing some time for the adjustment. Although, one must also consider the time of flight would be much lower for nearer ranged howitzers.

This volume of fire is threatening and when occasionally used it acts as a deterrence that is hard on morale. If used as standard doctrine though, as it currently is for the Russian military (AWG p.23), it becomes a cost that drains away at military resources and logistics. Some commanders may think the economic engine goes into full force on the war machine, but they would be forgetting that price reflects energy and resources input into production. You cannot assume that ammunition will be in surplus, and that is before you even account for disruption in logistics conducted by nature and the enemy. In the current war in Ukraine, munition stockpiles are dwindling, and that is with 70 years of USSR surplus

being unleashed, although much of it has of course been trafficked for 30 years (Keating). Furthermore, in a total war, you have to account for increased disruption of global supply chains affecting access to the resources that would even allow for increased production. A larger war would make global supply disruption even worse, meanwhile base metal shortages were already being felt hard at ammunition manufacturers before the war (Smith 2021). This is the case in a world where sea lanes are still open and legacy mines are still in operation as well as not being the target of strategic attacks (Anders 2022). The cost of ammunition is a critical representation of its availability in war. This expenditure for MLRS makes indiscriminate firing for CB at the first blip on a radar an exhaustive strategy if the target is digitally dispersed and actively withdrawing. That all said, a $3.4 million cost would be worth the certain destruction of a $5 million M777A2 along with a potential crew, but certainty has not been the case.

CB radars have had unexpected shortfalls in this war. MLRS CB response time has been much slower in this war than expected, taking as long as 30 minutes it some cases to respond (Roblin 2023). One explanation for this could be Wiebe's thoughts that if guns are dispersed enough "sound ranging would not show a consistent report for an engagement, and that radar could either miss the projectiles or be overwhelmed by them engaging from enough different positions". Additionally, when CB radar is active, it becomes easy to detect (Morgan 2019), and Ukrainian forces has been using strategic weapons like HIMARs to destroy CB radars. Along with being slower than expected, Russian forces have only been activating CB radars selectively to preserve their survivability (Roblin 2023). It makes you think that in all the discussions about the threats of CB radar, we forgot that they themselves are obvious targets. Not only does this mean higher towed artillery survivability in the face of CB, but it also means more inaccurate CB will draw on more ammunition which is in short supply. This would make a commander more hesitant to fire without a positive identification beyond just a CB radar.

The other threat is small UAVs. One year into the war, Ukrainian artillerist have decided that small UAVs are their primary threat and have changed their tactics to prioritize them over MLRS (Roblin

2023). Some proof of this is the videos seen of gun positions with ammo stockpiles too large for a shoot and scoot mission, indicating how long guns are static for. Large armed UAVs are a new threat to everything, but I will focus on small UAVs because they pose a unique threat to towed howitzers (and infantry) due to their exposed nature near the frontline. Particularly, I will be referring to Russian Lancet-3's and American Switchblades as examples of large and small kamikaze drones, but Shahed-136 and off the shelf drones outfitted with grenades should be thought of as well. Different variants of Switchblades and Lancet-3's have varying attributes, but generally cover a 10km to 40km range and have between 1.5 kg and 5.5 kg of explosive. These drones are small, cheap, and hard to spot, but do not pack the explosive power of an artillery shell or missile. Shahed-136s are examples of much larger kamikaze drones that aren't quite in the same category of being small.

Self Propelled Guns (SPGs) are not under the same threat of small UAVs because of their armour; while it is thin, it does protect against grenades and small explosives. The Ukraine war has flooded social media with videos of off the shelf drones either dive bombing with explosives or dropping grenades onto exposed infantry in trenches. These retail drones and small UAVs are easily able to do the same on a 7-troop gun detachment waiting around the gun for fire orders. The current doctrine is to stay at your gun while a fire mission is ongoing, regardless of the hostile fire you are receiving. This gives small drones a deadly advantage at inflicting casualties on gun detachments or an entire battery if they come in larger numbers.

This threat is unique and different than MLRS because it can be proactive, not waiting for fires to act in counter to, and it can follow a gun det after is has gotten mobile again, although less effective if the vehicle has any armour. This is a notable disadvantage to towed howitzers because the exposed parts of the gun itself. If the troops are away from the gun, and a switchblade drone detonates on it, components of the gun will be badly damaged such as sight and DFCS, rendering it out of action for a long period. In videos on twitter, you can see artillerist running away from their M777A2 as a lancet-3

approaches and detonates. Afterwards, there appears to be no damage done to the troops, but it is a direct hit on the M777A2. SPGs have less vulnerable points for a small explosive to do mechanical damage. That said, Lancet-3s have been reported as badly damaging an SPG, so they are not immune. As well, other footage has shown a direct hit by a Lancet on a towed gun with a large front plate, the result being no damage to the troops, but just a busted tire. While these attacks appear to be certain death, the results so far have still showed reasonable survivability for the gunners. Unlike MLRS though, these drones are quite inexpensive, so counter measures must be enhanced.

Drones are new and counter measures are even newer. Many of the counter measures we have seen are unique. Instead of waiting for handheld radio jammers and lasers, Ukrainian forces have been utilizing camouflage nets with tank wire overlayed to stop Lancet drones from harming them (Roblin 2023). This causes an early detonation, leading to no gun damage and minimizing troop damage. Other ideas as unique as training eagles to take down drones have existed outside of Ukraine, WWII era flak cannons have been revived (Roblin 2022), and we can imagine other creative methods will emerge that board rooms could not dream up, whether pragmatic or not. Most conventional counter measures that are in design often focus on getting into the hands of the infantry who are seen as most vulnerable to this threat. These appear so far as the Droneshield C-UAS gun, lasers or rifles that fire a net. The development of these will improve survivability for towed howitzers more than SPGs. Unless radar dishes and fixed turrets are developed for every SPG, the versatility of man-portable counter measures benefits towed crews as they have more spotters and a faster reaction time not being in the vehicle like SPG crews. Drones are still a major threat, but SPGs are not immune and counter measures are still in development.

The purpose of this paper was not necessarily to compare towed artillery to SPGs, but simply to put to rest the notion that towed artillery are obsolete outside of training and COIN operations. While towed artillery do have some advantages over SPGs and vice versa, the fears that MLRS and small UAVs

pose a notably larger threat to towed howitzers are not dramatic enough to render them useless. They are cheaper to make, significantly cheaper to maintain, they can travel longer distances with no dependence on a single vehicle, and you can train troops to operate them much more quickly. With new doctrine that creates larger dispersion, CB radar with MLRS has become less effective against them, and threats of small UAVs have not been overwhelming; albeit they are still an evolving problem. The RCA should take another deep look at Captain Wiebe's paper on digitally dispersed positions and consider if we should adapt out TTPs to follow new doctrine.

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