



Artillery in urban combat

military-Earth thinking notebook

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Combat in urban areas is demanding in terms of support. Colonel Olivier Fort shows how to use the urban environment, but also the advantage of permanent artillery fire in urban clashes, with particular emphasis on the need for precision ammunition.

Le The urban environment is an increasingly necessary refuge from the ever-increasing lethality of indirect support.

- Lethality of the modern conventional arsenal is constantly increasing Artillery ammunition, first of all, always strikes farther and harder. Added to this is the power of surface ammunition, which was banned by the Oslo agreements in 2008, but to which some countries are not signatories. The Ukrainian conflict made it possible to discover Russia's new arsenal. A BM 30 rocket launcher, for example, can destroy anything within an area of 650 m by 650 m with 12 rockets. The air arsenal is also becoming more lethal through the combination of the mass of explosives and the precision of the ammunition [1].
- This modern arsenal makes the protection offered by the urban environment increasingly necessary.

When faced with surface ammunition, it is preferable to move around or choose static positions in town. The city provides immediate protection against observation and hits, unlike open terrain where UAVs see everything and any position has to be developed and camouflaged.

During the recent conflict in Donbass, Ukrainian forces were sometimes confronted with Russian artillery fire from inside the town. In some cases, these shots came from Russian neighbourhoods, the intention of the Russians being to rally these neighbourhoods,

which, according to them, did not sufficiently support the separatists, by provoking Ukrainian artillery fire. The Ukrainian artillery refused to fire from the settlements, even though it sometimes hid in them, so it moved a few kilometres to fire.

This strategy of concealment within built-up areas is now a classic strategy. Palestinians in the Gaza Strip stretch sheets between buildings in the alleyways of the medinas to prevent IDF drones from following their movements after a rocket or mortar attack. This strategy has obviously been followed by Daesh in Syria and Iraq [2] to resist Russian and Western firepower and to try to turn it against world public opinion.

Locating the enemy in an urban environment remains a challenge, only drones allow permanent observation.

While technology is making it increasingly easy to locate targets in open areas, locating the enemy in urban areas remains complex. In Mosul, Daesh has dug many tunnels so that he can move from one building to another without being seen or hit.

The work of the observers is more difficult than in an open environment. Observers have to look for well-concealed positions, but these often offer limited viewing angles. The permanence of observation may be hampered by frequent movement from one floor to another or from one building to another. Reduced viewing angles can make it difficult to estimate the height of floors when the street is cluttered with rubble. The conflict in Iraq again showed that artillery observers were particularly exposed, being the primary targets of Daesh snipers. Only airborne means, and in particular UAVs, provide in-depth and continuous observation, provided that the absence of ground-to-air threats allows it. Close to the population, only UAVs give an idea of the "patterns of life" [3] and of whether or not people have arrived in the area of the target to be treated. All this is invisible to the ground observer.

In the face of indirect enemy fire, the action of UAVs is complemented by that of trajectography radars. In Mosul, the American artillery deployed radars on the roofs of buildings in order to shield them from the mask represented by the buildings for any radar on the ground. For the artillery, urban combat must be accompanied by a density of tactical UAVs that allows for as permanent and extensive observation as possible. The density is justified by the need to observe very small sectors, such as sometimes the facade of a building from which shots are fired regularly.

In such a context, and in the face of enemy artillery operating from the city, it is essential to further refine the observation by targeting it on probable locations and times. This is the task of operational analysis. During the Battle of Mosul, the American artillery set up artillery intelligence cells. Their mission was to forecast the likely areas and times of mortar and rocket fire from Daesh. For example, the cells found that although the mortar fire was from different positions each time, the positions were very close together. They were able to deduce from this that a stockpile of shells was located in a central position and that the mortar tubes were only a short distance away. Thus, it was possible to use an intelligence asset to monitor the area and be ready to fire as quickly as possible at the most likely times. ROZ[4] were opened for this purpose and tubes ready to fire with guided ammunition on the position. It is desirable that the operational analysis return to the artillery. It is a matter of software (such as the American JADOCS [5], software developed in South Korea initially for the counter-battery), and manpower. The benefit will be measured in lives saved for the troops on the ground.

Fugacity of objectives imposes precision ammunition

Daesh often used mortars from inside buildings, on the ground or intermediate floors, to make counter-battery strikes difficult (difficulty to determine altitude, difficulty in reaching the lower floors without capping on nearby buildings).

During the Battle of Mosul, the coalition only used guided, air-to-ground and artillery ammunition in the city, with the exception of open spaces such as parks, riverbanks and activity zones. Anything that had guided ammunition was allowed to fire. The French artillery was strongly penalized by the absence of 155mm guided ammunition in its arsenal. The American Excalibur guided shell is not yet qualified on the Caesar, and the LRU [6] was not deployed. The American artillery was able to fire a large quantity of Excalibur shells, shells with PGK fuzes [7] and unitary rockets, the stocks of which must now be replenished nationwide.

The reason for this primacy of guided ammunition, even more than to avoid collateral damage, is to have a better chance of destroying the enemy. Indeed, Daesh had very elusive targets, barely visible for a minute or two.

In addition, there is a need for trajectories of the shortest possible duration in relation to the short time in which the target is visible. The problem is similar for direct fire weapons, what Colonels Pierre Santoni and Frédéric Chamaud call the intervisibility segment, defined as "the ratio between the time of appearance of a target and the distance of engagement of the weapon". During this short window of opportunity, if we add the dispersal of an unguided munition, even if it is only about ten metres for a target firing a mortar from a doorway, the target is not hit "and lives to fight another day", as our British friends say. Guided 155mm ammunition is indispensable for French artillery and it is urgent to acquire it.

One way of compensating for the constraint caused by the stealth of the objectives was to set up ambushes against Daesh's indirect fire support means. It was found that the latter, wishing to show the population that they dominated the fighting, systematically reacted to artillery fire. French and American artillery therefore combined their effects to trap the enemy. The French artillery fired warning shells [9] to provoke; all sensors, drones, trajectography, were ready, and when enemy mortars were revealed, American guided shells destroyed them. . Frequently, this allowed the destruction of enemy mortars or rockets in built-up areas.

Another reason makes guided ammunition even more necessary in the city. Building heights add to the unevenness of the terrain and enemies can be found at any height. It is therefore necessary to estimate the real altitude of the objective with the greatest accuracy. The dispersal of an unguided munition can cause an impact several tens of meters higher or lower. Guided munitions do not disperse, as their final trajectory close to the vertical makes them largely immune to planimetric errors.

Moreover, during Operation Chammal, French artillery supported the Iraqi infantry. Few shots were fired in the vicinity of friendly troops because the communications systems were different, and because the Iraqis did not have Blue Force Tracking. The difficult location of front-line units therefore necessitated firing beyond coordination lines. When we have to engage the French infantry in urban combat, the artillery will be asked to fire

in the vicinity of friendly troops. Guided ammunition will then be indispensable. Indeed, a dispersal, even if it is only ten metres, will cause the shell to fall into the nearby street while you are aiming at someone on a roof, or vice versa. In this fight, there will be no question of depriving our troops of indirect support due to lack of proper equipment. It should be added that in a compartmentalized environment, in many areas, some direct infantry support weapons will not be able to be used, such as the MMP [11] missile, thus increasing the relative importance of indirect support. Finally, in an urban environment, hitting the enemy with precision can only be achieved by taking maximum precautions to avoid hitting civilians. It is therefore necessary to maintain observation and be aware of the "patterns of life" in each neighbourhood.

But can guided munitions alone win the battle in an urban environment?

The need for more guided munitions was clearly demonstrated by the battle of Mosul. Increasing the proportion of this type of ammunition in the arsenal of the armed forces will be extremely costly, depending on the volume, but also because of their shorter lifespan. It is therefore necessary to carefully analyse the RETEX in Mosul.

The coalition has chosen to prohibit the use of unguided explosive ordnance, shells, bombs, in Mosul. To conclude that urban combat means the exclusive use of guided munitions would, however, be wrong, especially since we cannot measure the relative share of each component of the coalition in the victory. How much of the victory is attributable to the air force, the western artillery, the Iraqi infantry, the special forces? One actor is systematically forgotten, the Iraqi artillery. The coalition was unable to impose rules on the armed forces of the sovereign state, that is to say... Admittedly, little is known about the missions it carried out, but its contribution to victory cannot be overlooked. Could a coalition adopt these same rules without the contribution of the artillery of the country it supports? Could Mosul have been liberated with all the units complying with the strict Western rules of engagement? The self-imposed restriction on the coalition to use only guided munitions when it could count on an ally that was not subject to them clearly meets a strategic communications objective. The ability to sustain urban combat with guided munitions alone is questionable. Guided ammunition stockpiles were nearly depleted during some phases of the battle, requiring the urgent use of industrial companies from several countries. [12] These rules of engagement could not prevent the destruction of a large part of the city. This was inevitable, because when Daesh turned a building into a fort, it had to be destroyed. This restriction of use could not apply in all contexts. There was an exception for counter-battery fire. Since indirect enemy fire against Iraqi forces was considered a significant threat, more permissive rules of engagement were established. In order to permit counter-battery fire, a location by two counter-battery radars was sufficient for a period of 10 minutes. Accuracy was then 20 to 30 m, which is very accurate, but this can still be seen as a certain contradiction [13] with the rule of using only guided ammunition. This need to protect troops - but also civilians in friendly areas - from the indirect threat would be even greater in the face of an adversary with more powerful and numerous artillery, thus placing additional strain on the stocks of guided ammunition.

The comparative advantages of CAS[14] and artillery in urban areas

Artillery and SAC are also complementary in urban areas. They are two means for the benefit of the joint commander who retains the freedom to choose the best possible

"tool" according to contingencies. What are the relative advantages and disadvantages between CAS and artillery in urban areas? Mosul has once again demonstrated that buildings are easy to fortify and that underground tunnels exist or can be dug. The firepower of the air weapon is essential in this respect. Artillery today does not have ammunition with the same destructive power. The guided rocket cannot deal with all objectives, depending on the strength of the surface, and some objectives must be achieved by several rounds of ammunition. The destructive power of a munition is often decried and current events are used as arguments. The incident in Mosul in March 2017, where some 100 civilians were killed by a bomb when the target was a sniper on a rooftop, may have been exploited by commentators not versed in defence matters, but in our view in a partisan manner. It is impossible to advance in a defended city like Mosul without high-powered guided munitions. The use of these munitions allowed a much quicker liberation of the city, removing many civilians from Daesh's control. The sole use of 155mm guided ammunition, for example, would have been a logistical and economic gulf, leaving many terrorist hideouts unreached[15]. These guided bombs were also used in a mode of action rediscovered [16] in Iraq, cratering. The aim was to prevent Daesh's IED vehicles[17] from moving to destroy coalition units.

Finally, long before the city was defeated by artillery fire, CAS could finally begin to destroy the enemy, hit him in his morale, and force him. Finally, a CAS patrol is better able to deal with a fugitive direct sight objective in an urban environment when it has the appropriate ammunition, than indirect fire when it requires the opening of a ROZ. Unless artillery is available at many points around the city, it will not always be possible for an indirect trajectory to reach the target [18], as the aircraft can reposition itself and, more often than not, find a trajectory.

Artillery, on the other hand, brings the following advantages: the most important of them in an urban environment is the permanence of fire. The meteorological aspects are of course another advantage, the artillery being less constrained by climatic hazards, its availability being better guaranteed. However, in an urban environment, this advantage is to be put into perspective. A high proportion of targets being designated by drones, they are as much constrained as CAS by the weather. The permanence of the artillery is then limited to the support of the troops in contact, who have their observers, and to the counter-battery fire on data provided by the trajectory radars. But above all, once the city is invested by the land forces, it is the return of the siege artillery. The artillery is there, permanently capable of beating all parts of the city. The CAS, depending on the airfields where the aircraft are based, may take several hours to reach the city. It is limited by the type of bombs it carries (unless it is an aircraft such as a B1 or B52 [19]), which are not always suited to the type of target being revealed. If they do, the effort cannot be sustained for very long, not because of fuel range, but because of ammo range. This aspect can only be overcome by a high number of in-flight patrols, which is the only way to have a greater range of ammunition. The number of CAS patrols present at the same time over Mosul was sometimes considerable.

The presence of aircraft flying over a combat zone always carries risks to the lives of the pilots [20]. 20] In Mosul, the coalition had no option but to put the pilots at risk, as Western artillery did not have ammunition of the same strength. 21] Only the acquisition by the Western artillery of high-powered guided ammunition would make it possible to reduce this risk. Armed UAVs, for their part, would only be able to carry an even smaller quantity of ammunition than multi-role aircraft. It is the importance of the mission that justifies the risks, but to take the example of cratering, is it worth risking the lives of pilots to make holes in the roads? Some of these missions could have been carried out by American M31

rockets, but the craters made were always smaller than those dug by CAS.

In a logic of capability[22], to extend the example of cratering, but without limiting itself to it, is it really necessary to fly several hours at 20,000 euros per hour[23] when the artillery on the spot could carry out this mission without risk over the entire surface of the city? Why add the cost of moving the aircraft to that of the ammunition? For operations in urban areas, only doctrinal and capability thinking can allow armies to absorb the cost of acquiring a larger arsenal of guided munitions. This investment involves the acquisition of guided rockets with high destructive power for artillery. These munitions are indispensable in urban combat. They will replace neither air munitions nor CAS, which is absolutely essential not only upstream, but also during certain phases of urban warfare, both in the city and in the depth of operations. When the arsenals of Western artilleries allow it, they will be able to take a greater part in urban combat, thus reducing the number of CAS missions, which are today only necessary because of the absence of this land-based ammunition. The capability requirement appears to be a guided rocket with a range of about 50 kilometres and containing about 250 kg of explosives. This range limits it to the area of interest of the head of land operations, and limits its cost.

Beyond Mosul, and if one accepts that it is essential to have guided munitions with a high destructive power in urban combat [24], as the air force has demonstrated, it makes sense to[24], it is logical to assume that without such rockets for ground forces, Western forces would be powerless to conquer a city of the same size in the face of an enemy with powerful ground-to-air capabilities. 25] The only recourse would then be a considerable consumption of lower-caliber ammunition and a massive engagement of melee troops, with the foreseeable consequences in terms of casualties.

1] The Russian arsenal, including air munitions, includes cluster munitions.

2] In the case of Mosul, the Iraqi government's instruction to the population not to flee and to stay in their apartments increased the risk of collateral damage.

3] Lifestyles

4] Restricted Operation Zones.

5] Joint Automated Deep Operations Coordination System.

[6] Unitary Rocket Launcher.

[7] Precision Guided Kit.

^[8] «The Ultimate Battlefield-Combat and Win in the City», by Frédéric Chamaud and Pierre Santoni, éditions Pierre de Taillac, 2016, p 18.

9] Warning shots reduce the risk of collateral damage to a minimum. Concepts lovers may call this "the right sufficiency in provocation".

^[10] Testimony of TF Wagram 2 (11th^{RAMa}).

^[11] Medium-range missile

12] "Ammunition stockpile management, which has affected many countries in a context of intensive firing, was also an issue raised....e during this battle", in Lettre du CiCDE, December 2017, article "Focus RETEX - main lessons learned from the battle of Mosul", Col (A) Le

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Centre de doctrine et d'enseignement du commandement

Mouël, p 8.

13] In the city, the presence of civilians is possible and will not be detected by trajectography radars; ten minutes later, the population can move.

14] Close Air Support.

15] Even if a fair proportion is to be sought in the joint arsenal.

16] This use already existed during the First World War to thwart enemy offensives which were based on very heavy logistics. The British even had a habit of destroying roads behind German lines in an area where enemy artillery seemed to be preparing an offensive. If the roads were repaired, this confirmed the offensive intentions. If not, it was a diversionary attack. In "L'artillerie des stratagèmes", Colonel Olivier Fort, Economica 2016, p 37.

17] Improvised Explosive Device.

18] And this despite the vertical terminal trajectories provided by most guided ammunition.

19] The B 52 can carry 31 tons of ammunition.

20] Even if no technical incident was noted on the Rafale during the campaign.

21] Not all air force ammunition is of high destructive power, some of which has been designed to minimize collateral damage.

22] And not an operational logic because, in Mosul, the coalition had to make the best use of the various means, and in particular the ammunition it had at its disposal during the battle.

23] According to the CBSA study "Estimating the cost of operations against ISIL", of September 2014, the marginal cost per flight hour of an F-15 was then 20,000 dollars.

24] However, we must not lose sight of the need to have 155mm guided ammunition to limit collateral damage.

25] The proliferation in the world of ground-to-air systems such as the S 400 makes it possible to envisage that a State neighbouring the territory where we are engaged could prohibit from its border any air presence.

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