Scientific Journal of the Military University of Land Forces
ISSN: 2544-7122 - print, 2545-0719 - online
2018, Volume 50, Number 3(189), Pages 43-56
DOI: 10.5604/01.3001.0012.6226

Original article

DIY (do it yourself) weapons in 2011-2016 conflict in Syria

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INFORMATIONS

Article history:

Submited: 23 February 2018

Accepted: 16 July 2018

Published: 30 September 2018

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ABSTRACT

The article presents a phenomenon accompanying the conflict in Syria, involving the production and use of homemade weapons. Based on publications as well as multimedia materials published on the Internet the authors describe homemade weapons. The advantages and disadvantages of their use in tactical operations were identified in the form of conclusions.

KEYWORDS

homemade weapons, conflict in Syria, civil war

'Necessity is the mother of invention'
[Polish proverb]

Almost five years since its beginning, the popular uprising in Syria has turned into the brutal civil war. Numerous rebel groups fight against the president Bashar al-Assad's forces using all available weapons. Apart from the modern weapon systems, frequently the provisional solutions and construction are applied. Anti-aircraft rifles are installed on pickups' loading platforms in vehicles workshops. Mortar shell cases are manufactured at home garages and explosives are blended in concrete mixers. Production of weapons in makeshift conditions is not a new phenomenon in the world's history. In History of Poland handbooks one can find so-called kosyniers (scythe-bearers) [Bratkowski 1979, p. 340] who due to the scrutiny of other assets transferred agricultural tools into weapons. Further example can be searched in 1942 when Wacław Zawrotny reported to the Home Army HQ and presented a concept of a sub-machine gun adjusted to production under conspiracy (homemade conditions). Wacław Zawrotny together with Sewryn Wielanier developed the construction of weapon which could be manufactured applying technologies available in craft workshops. For that reason in the sub-machine gun called 'Błyskawica' the parts were connected with hydraulic threads and screws [Satora 1985, p. 78].

The present article is the result of the authors' interest in the phenomenon of the use of homemade weapons. The lack of publications which deal with this issue in Polish-language literature is worth underlining. Due to the commonness of usage of homemade weapons

constructions in contemporary armed conflicts, mainly those of asymmetric character, it can be assumed that this tendency will remain unchanged in the future. The authors aim at introducing a reader to the issue of homemade weapons. It will allow for avoiding the so-called *'technical surprise*' [Lorber 2004, p. 253] stemming from usage of weapons of unknown capabilities by an enemy and lack of countermeasures. Such the situation occurred in Iraq when improvised explosive devices were used after the Americans had entered the country. Methods of building and obtaining explosives were copied by anti-coalition forces in Afghanistan and they caused several-thousand losses among NATO soldiers. The purpose of the article is on the one hand to emphasize the significance of the problem through demonstrating capabilities and effects of application of homemade weapons and on the other hand, attract the interest of the issue by a wider range of readers. The comparative analysis of selected subject literature and the Internet publications was used in the paper.

Fig. 1. Warsaw insurgent with Błyskawica sub-machine gun
Source: [9 mm Błyskawica, pistolet maszynowy n.d.].

According to the authors, siege engines are the first type of armament worth mentioning. They met their splendor in the early Middle Ages. Constructions of neouroballistic engines employing the power of a spring and baroballistic using a counterweight constitute a basic method of throwing stones at long distances before the powder had been discovered.

David Harding in his book on the history of armament provides ranges of medieval catapults and slings (Fig. 2).

Neoroballistic weapons experienced its revival during WW I on the western front renowned for conducting fights based on extensive system of trenches (Fig. 3).

Catapults used during WW I were professionally manufactured devices equipped with sights and their range of 300-400 m, depending on the size of a projectile.

Type	Propultion	Source of information	Projectile	Range of fire
Neuroballistic engine 	Restoring force	Experiment with a prototype model. The spring made of ash wood of 76×101×1520 mm size	85 g	150 m
Catapult 	twisted cord	Prototype model: arm 2130 mm, string diameter – 203 mm. Approximate data for larger model:	4.5 kg 22.6 kg	320 m 365 m
Ballista 	two sheaves of cords constituting a string	Prototype model: arms 610 mm, string diameter – 760 mm. Approximate data for larger model:	1.1 kg 4.5 kg	274 m 365-420 m
Trebuchet 	lever (counterweight)	Approximate values: arms of lever 15 m, total mass 9000 kg	136 kg	275 m

Fig. 2. Comparative table of various throwing engines
Source: [Harding 1995, p. 158].

Fig. 3. Usage of neuroballistic weapons during WW I
Source: [The Leach/Gamage catapult… 2014; Grenade Catapult… n.d.].

At present these construction are enjoying their renaissance in Syria when in case of exhausting combat assets, fighting sides search for distinct means of sustaining losses to an opposite side.

Due to low mobility and range, various types of catapults and slings (Figs 4 and 5) can be used only in warfare of positional character. Despite numerous disadvantages, among others low range and accuracy, they have a superiority consisting in lack of associated with other throwing assets, shot reports. It hinders identification of a shooting position. When it comes to shelling executed by traditional artillery, localization of fire positions is significantly easier. During WW II, soldiers were able to distinguish enemy's fire assets by sound of a discharge thus, gaining time required to search for a cover. The lack of a flash and a shock wave which allow for avoiding unmasking dust constitute a further convenience of these machines.

Fig. 4. Large sling used by anti-government forces in Syria in 2012
Source: [McCann 2013].

Fig. 5. Catapult used in Syria in 2013
Source: [Taylor 2013].

Likely due to low efficiency and mobility, using catapults and slings in Syria is not of mass nature, as it was during WW I. It can be observed in video footages that these devices are used to throw homemade grenades made of tins or pipes filled with explosives. Blasting fuses are used to initiate an explosion. The time of the explosion is determined through an appropriate length of a cord, the approximated cord burning time is 1 cm/s. Standard grenades used by various countries 'professional armies are of 3.4-4 s. delay time which due to the long flight time disqualify them from throwing at large distances with catapults.

The usage of grenades is efficient when opposing sides are separated by a relatively short distance e.g. during urban operations. Their efficiency as artillery shells, taking into ac-

count their lethality, is significantly lower. It is complicated to unequivocally determine the range of contemporary catapults used in Syria as their constructions differentiate to a large extent. However, based on the research results presented in *Encyklopedii Broni. 7000 lat historii uzbrojenia* by David Harding it can be assumed that it does not exceed 400-500 m.

Fig. 6. Homemade grenade Syria, 2013 and WW I grenades
Source: [McCann 2013; Harding 1995, p. 82].

The use of Toyota vehicles[1] called 'war chariots of third world countries' constitutes the other example of the homemade weapons. Pickups with open loading platform appeared to be an ideal carrier of numerous types of armament: machine guns, recoilless guns, anti-tank missile launchers, anti-aircraft guns or systems. Adaptation of pickups to carry weapons is commonly widely used on a wide scale in various places in the world (Figs 7 and 8). It mainly refers to less developed countries or to these which as a result of a long-lasting conflict and existing of combat assets reaches for cheaper solutions, for example: Afghanistan, Libya, Columbia, Ethiopia, and Somalia. The pictured modifications deserve special

[1] The last phase of the conflict between Libya and Chad which took place in 1987 in the northern Chad and on Libyan-Chad border is frequently called 'the Toyota war' due to the mass usage of this brand during fights.

attention, as the installation of a dismounted BMP-1 turret with 73 mm gun proves creativity and skills of constructors. The application of these constructions can be seen in films presented in the Internet [see: Al Sham 2006]. In practice, similarly to catapults, the time required to reach readiness and fire an accurate shot as well as low resistance to fire disqualify these construction from conducting high intensive operations in which high maneuverability is expected. Normally, a BMP-1 turret is mounted on a chassis with the curb weight of 10 tones, not on a 3.5-tonne personnel vehicle.

In the assessment of the authors of the study, the differences in masses of chassis negatively impacts on weapons accuracy, because forces emerging during fire will not be properly absorbed. The range of the device can be hardly assessed however, it can be assumed that the accuracy is significantly lower from BMP-1.

Unguided missile launchers S-5 (Mi-24) can be regarded as the further example of creativity and resourcefulness of opposite sides. Mounted on loading platforms of off-road vehicles (Fig. 8) and deprived of dedicated sights are highly imprecise. Also their operational efficiency can hardly be specified. It results from the wide range of installed warheads [see: Szulc 1993; Gruszczynski 1993]:

- S-5M – the fragmentation-demolition warhead, after the explosion 75 fragments of 1 g were dispersed;
- S-5MO – the fragmentation-demolition warhead, in which 360 fragments of 2 g were dispersed;
- S-5K – designed to destroy armored objects, capable of piercing 130 mm of steel;
- S-5P – designed for passive jamming of en enemy radiolocation stations and armed with a charge containing rope chaffs reflecting electromagnetic waves. The projectile, after a defined period of time since launching starts successively propelling three rope chaffs which while scattering create jamming clouds. Filling the projectile with a type of the rope schaff is adjusted according to needs;
- S-5MO – is equipped with a warhead with forced charge fragmentation resulting in creation of fragments of defined shape and mass;
- S-5KO – armed with shaped-fragmentation charge;
- S-5KP (S-5KPB) – equipped with a piezoelectric instantaneous contact fuse, capable of piercing 150 mm to 200 mm of armor;
- S-5S – filled with several-centimeters metal arrows killing manpower.

Similarly to the BMP-1 turret, the lack of appropriate shock absorption of the launcher deteriorates its accuracy and significantly hampers correction of fire[2]. It can be compared to medieval guns which moved back after each shot and all aiming procedures had to be repeated.

[2] In case of missing a target, a gunner based on observation of fire effects can implement corrections by shifting an aiming point.

Fig. 7. Toyota vehicles with mounted BMP-1 turrets, Libya, 2013
Source: [Libyan technical… 2016].

Fig. 8. Toyota vehicles with installed UB-32A-24 launcher-pod dismounted from Mi-24 helicopter
Source: [Taylor 2011].

23 mm anti-aircraft gun (Fig. 9) and 12.7 mm or 14.5 mm heavy machine guns (Fig. 10) are subsequent examples of armament mounted on loading platforms. By virtue of their rate of fire, range and firepower they constitute most frequently installed weapons. In the Polish Armed Forces, the dual purpose anti-aircraft gun ZU-23-2 is mounted on an open cargo platform of high-mobility truck Star 266 of 7350 kg curb weight. Anti-aircraft units are equipped with this system – called 'Hibneryt' which is designed to fight against air-assets, personnel and light-armored vehicles. The system is capable of striking air targets at the range up to 2500 m and surface targets up to 2000 m.

It is highly efficient and reliable weapons. Handling simplicity causes that it is frequently chosen by armed groups. In case of 14.5 mm weapons the effective range reaches 2000 m, whereas 12.7 mm weapons enables conducting effective fire at the range up to 1500 m.

However, as it can be observed in footages available in the Internet, the fire is often executed at longer distances – even up to 4 km. However, it is to be noticed that the execution of fire at the distances preventing from usage of sights is highly inefficient and not applied by professional armies. One of the authors encountered such type of fire during deployment in Afghanistan, where coalition forces were fired by an enemy with 7.62 mm PK machine gun from the approximate distance of 2500 m, counting on an accidental hit.

Fig. 9. Toyota vehicles with dual purpose 23 mm anti-aircraft guns mounted
Source: [Pinterest (Website) n.d.].

Fig. 10. Toyota vehicles with 14.5 mm heavy machine gun mounted
Source: [Truck gun… 2016].

While firing in bursts anti-aircraft guns and rifles are subjected to very intensive recoil. In accordance to instructional provisions, ZPU-1 machine gun, presented in Figure 10, should

be positioned on the ground in order to maintain stability. In the Polish version, 23 mm anti-aircraft guns are mounted on Starr 266 trucks which provide a strong platform. It results from the fact that the lack of reliable platform negatively impacts the accuracy of these constructions and prevents from taking full advantage of their combat capabilities. As it can be seen in the Internet[3], users of this type of weapons are aware of the fact that it is not possible to maintain accuracy while firing in bursts (anti-aircraft weapons is characterized by significant rate of fire required to fight air targets) therefore, single or short bursts fire is mainly preferred. Having been equipped with optical sights, this weapon in hands of an experienced gunner can appear to be a very effective combat asset. Mounting the armament on chassis of civilian vehicles provides them high mobility especially in urban terrain characterized by narrow roads and passages. It also facilitates concealment against air surveillance as vehicles can be camouflaged in sheds or ordinary vehicle garages. It is also beneficial from the accessibility of spare parts perspective. In case of military vehicles, they are frequently dedicated to a specific type of weapons without possibility of using substitutes. The described modifications do not reflect all occurring means of pickups' utilization. The authors are convinced that adaptations of civilian vehicles for military purposes can constitute valuable subject for further cognitive inquiries.

Armed conflicts of positional nature frequently become an area of sharpshooters activities. Intervals between offensives launched by opposite sides during WW I on the Western Front and the Battle of Gallipoli were the scenes of so-called sharpshooters' duels. During the duels, miscellaneous constructions which enabled shooting from behind a cover or from a trench were used. Apart constructions offered by weapons manufacturers (Fig. 11), those produced in primitive conditions were commonly applied (Fig. 12).

Fig. 11. Special designs facilitating shooting from behind a cover during WW I. The picture presents Lebel M 1886 rifle
Source: [Top 10 Strangest Weapons… 2016].

Currently, similar situation can be observed in Syria where opposite sites[4] compete in constructing and manufacturing precision weapons. Application of anti-aircraft guns' barrels for manufacturing sniper rifles[5] constitute an innovative solution, specific for militants

[3] See: https://www.youtube.com/watch?v=y99ZJ2L8usw [Accessed: 2 August 2016].

[4] Due to significant number of fractions fighting currently in Syrian territory, the authors are not able to unequivocally determine, based on footages and pictures, which of presented constructions belong to a particular fractions.

[5] The rifle dedicated to sharpshooters for single fire at long-range distance with significant accuracy, designed to eliminate single targets of the utmost importance for an enemy (mainly personnel) at the

fighting in Syrian cities (Figs 13 and 14). Based on available pictures and films, the authors distinguished two types of such weapons, of 23 mm and 14.5 caliber. The former ones come from barrels dismounted of ZSU[6] anti-aircraft systems developed in the 1960s in the USSR. The design of the barrel provides the capability of destroying surface targets (personnel and light armored vehicles) at the distance up to 2000 m. The latter rifle (Fig. 14) possesses the barrel from ZPU-1 anti-aircraft system of soviet construction, which shoots with 14.5 × 114 mm ammunition designed in 1940 as an anti-tank projectile [see: Torecki 1985].

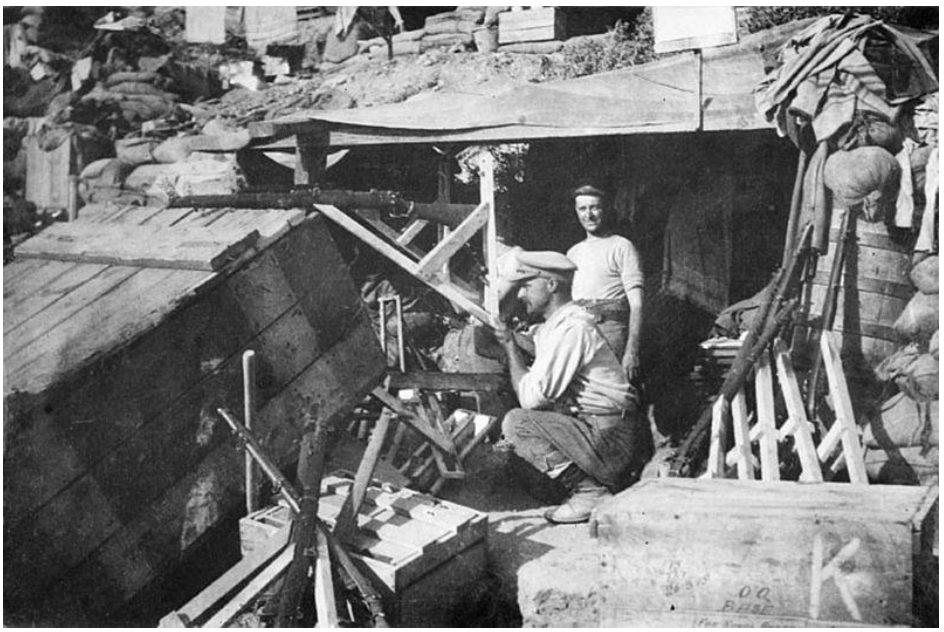

Fig. 12. Production of weapons periscopic pads on Anzac Cove beach during fights of Gallipoli peninsula, WW I
Source: [Louis 2013].

According to Capt. Zbigniew Szymocha[7], dealing with ballistic issues, mounting optical sights on such type of the constructions does not allow achieving the accuracy compered to contemporarily used sniper rifles: *As for the sights, the issue is even more complicated as I have not encounter the completed applications for 14.4 mm and 23 mm calibers, any sight designed for sniper rifles will sustain such significant overstraining occurring during fire – perhaps except several top brands but I am not aware of any verified tests.* According to the authors the accuracy of such constructions can be compared to anti-tank rifles from the time of WW II.

distance up to several-hundred meters. It is a selected type of standard weapons or an original construction designated solely for this purpose.

[6] The abbreviations comes from the Russian name Zienitnaja samochodnaja ustanowka (russian Зенитная самоходная установка – self-propelled anti-aircraft gun.

[7] Capt. Zbigniew Szymocha – the assistant at the Institute of Theory and Practice of Shooting of the General Tadeusz Kościuszko Military University of Land Forces in Wrocław.

Fig. 13. Rifle manufactured based on 23 mm anti-aircraft gun's barrel
Source: [Thornhill 2014].

Fig. 14. Rifle manufactured based on 14.5 mm anti-aircraft gun's barrel
Source: [Homemade 23 mm… n.d.].

To conclude, it is to be stated that the article reflected only minor part of the issue related to the use of selected and the most representative, in the authors' opinion, pieces of homemade weapons. Their commonness in contemporary armed conflict was identified which allows for placing the thesis on the trend towards the future production and development. The attempt to catalogue and describe the methods of production, tactical-technical parameters and combat capabilities seems to be reasonable. It will serve for better understanding of the phenomenon and will allow for undertaking countermeasures limiting its production and reducing the effects of its use by a potential enemy in the future. This is in the line with one of the goals of the current publication that is increasing the interest in the subject under consideration of individuals dealing with widely understood security.

Acknowledgement

No acknowledgement and potential founding was reported by the authors.

Conflict of interests

The author declared no conflict of interests.

Author contributions

All authors contributed to the interpretation of results and writing of the paper. All authors read and approved the final manuscript.

Ethical statement

The research complies with all national and international ethical requirements.

ORCID

Krzysztof Gruca – The author declared that he has no ORCID ID's

Artur Zielichowski – The author declared that he has no ORCID ID's

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How to cite this paper

Gruca, K. and Zielichowski, A. (2018). DIY (do it yourself) weapons in 2011-2016 conflict in Syria. *Scientific Journal of the Military University of Land Forces*, vol. 50, no. 3(189), pp. 43-56, http://dx.doi.org/10.5604/01.3001.0012.6226