Evolution in military affairs in the battlespace of Syria and Iraq

Péter Marton[1]

Abstract

This paper will consider developments in the Syrian and Iraqi battlespaces that may be conceptualised as relevant to the broader evolution in military affairs. A brief discussion of different notions of „revolution" and „evolution" (in Military Affairs) will be offered, followed by an overview of the combatant actors involved in engagements in the battlespace concerned. The analysis distinguishes at the start between two different evolutionary processes: one specific to the local theatre of war in which local combatants, heavily constrained by their circumstances and limitations, show innovation with limited resources and means, and with very high (existential) stakes. This actually existential evolutionary process is complicated by the effects of the only quasi-evolutionary process of major powers' interactions (with each other and with local combatants). The latter process is quasi-evolutionary in the sense that it does not carry direct existential stakes for the central players involved in it. The stakes are in a sense virtual: being a function of the prospects of imagined peer-competitor military conflict. Key cases studied in the course of the discussion include (*inter alia*) the evolution of the Syrian Arab Air Force's use of so-called barrel bombs as well as the use of land-attack cruise missiles and other high-end weaponry by major intervening powers.

Keywords: RMA, warfare, militaries, tactics, strategy, Syria, Iraq

Introduction: Evolution in military affairs

Evolution, in the case of more complex organisms, is the combined effect of genetic re-combination and natural selection that results in the adaptation of different species to their

[1] Péter Marton is Associate Professor at Corvinus University's Institute of International Studies, and Editor-in-Chief of COJOURN. In conducting work for the research presented here, Péter Marton benefited from support by the New Program of National Excellence of the Ministry of Human Capacities, Hungary.

environment. The former causes change in the population mean for all significant characteristics of a species, while the latter guarantees that such change be shaped by environmental conditions (Kutschera and Niklas, 2004).

Something similar is at play in the field of warfare, as evidenced by how much talk there generally is of „evolution" in the context of war. Suprisingly, this evolutionary process has not been properly conceptualised, nor have its peculiarities (e.g. differences from natural evolution) been clearly formulated.

Rather, the discourse is heavily skewed in favour of „RMA" or the „Revolution in Military Affairs." The latter originates largely from the United States, where the recognition at around the time of the 1991 Gulf War of unprecedented US military superiority over „peer competitors," i.e. other state powers, led to the articulation of the concept. Although it cannot be associated with a neat, self-evidential definition, most authors who make reference to RMA speak of the role of information and knowledge, technology and networks. These factors combined result in highly mobile assets using increased firepower with great precision and general battlespace awareness. Together with the rapid scientific and technological advancement in the contemporary era, this leads to irrevocable change and potentially „a continuous revolution" in military affairs (Metz and Kievit, 1995: 10). In an environment where both sides may have embarked on the RMA path, the need for remotely manned assets as well as stealth abilities, concealment and extreme hardening (of targets for protection) all become necessary. Taking away the other party's „sight" (of the battlespace) may be an imperative equal in importance to command or at the least control of the commons, especially over the air and the sea, and increasingly space too.

With new scientific revolutions underway, and while humanity awaits to see and at least partly understand the significance of developments in biotechnology, nanotechnology and Artificial Intelligence that are already happening, the above perspective is understandable – yet it requires critical examination in light of a fundamental contradiction that is inherent to the idea of RMA. With the rise of networks, emphasised by RMA theorists themselves, hierarchically organised actors, especially state actors, may eventually be at a disadvantage against asymmetrical adversaries (Arquilla and Ronfeldt, 2001). RMA theorists thus often talk of the decline of the nation-state which then raises the question: why should one be focused on „peer competitors"? Regardless of whether network structures enjoy a systemic advantage today, or whether the nation-state is entirely obsolete and bound to dissolve, state powers have historically

often had to confront non-state adversaries in the kind of strategic engagement where their technological advantages counted for little – the US military's experience in Iraq (2003-2011) being a case in point. The kind of asymmetrical warfare that is frequently seen in insurgencies can be adapted and even state actors can harness some of its benefits when facing stronger or more advanced rivals. Information warfare, propaganda, intelligence and espionage, cyber-operations as well as lawfare[2] can be used to game-changing effect.

That we speak today of „hybrid war"[3] – something actually not very new (seen e.g. in the context of the Vietnam War as well, to offer but one example) – shows how this adaptation *is* really taking place. Once we conclude that RMA induces effective adaptive processes, it is but one further step to conclude that there is constant evolution, and that instead of technological change taking us suddenly to an entirely new level of warfare, methods of overcoming adversaries familiar from the historical past persist in their effectiveness in a changed environment.

It may be tempting to think of this „military" evolution (shaped often not by militaries but by actually very differently organised actors) as „intelligent design" where adaptation is non-random, but if we are to place it on a spectrum from complete randomness to non-randomness, what we find should be placed somewhere in-between in reality.

A telling and useful study in this respect is the analysis by Castaldi, Fontana and Nuvolari (2009) of the evolution of tanks from the end of World War I up to WWII. They show how key parametres such as speed (with reference to different kinds of mobility, i.e. strategic, operational and battlefield mobility), armour and armament calibre form an interdependent set of variables that designers tried to manipulate in the interest of adaptation, similarly to how nature re-arranges the characteristics of the entire population of a species – but in this case in an intelligent process of course. The attempt at controlling the impact on the environment and configuring optimal adaptation to the conditions on the battlefield is, however, complicated by a host of factors. Known as well as unknown

[2] Lawfare generally refers to how actors look to take strategic advantage of normative factors, e.g. humanitarian law or other norms, for instance by making the adversary's actions look worse than their own in a moral sense.

[3] Hybrid war is the nowadays popular expression used typically to describe the presence of a mixture of regular and irregular approaches to war in situations that may not even be characterised as clearly constituting war – in peacetime – with peacetime strategic tools of conflict such as propaganda and opportunistic diplomacy.

„unknowns,"[4] unexpected deviation from plans as a result of these resulting in „friction"[5] make controlling an environment that is at a distance in time an impossible challenge. To paraphrase an old military wisdom from the US Civil War, „the enemy may also have something to do with" the effectiveness of one's design. How the designed platforms are put to use similarly makes a great difference: tactics, doctrines, operational art, and strategy. The latter evolve seemingly at smaller disconnect from the actual events in the battlespace but in reality human perceptions, wishful thinking, erroneous information-processing, vested interests (e.g. of industrial interest groups), and other factors may skew the process of this parallel attempt at strategic adaptation. In short, political leaders, military planners and military commanders may all draw the wrong conclusions as to why a battle or a war was won or lost – or may choose to act regardless of such conclusions. If battlefield evolution is intelligent design, then, it is dumbed down by multiple intelligences messing up each other's designs based on at times widely diverging logics.

To understand the enormous complications arising from this, one further reference may suffice: namely, to Glaser and Kaufman's study of the „offense-defense balance" (1998), which, almost accidentally, points out six key dimensions of military evolution in which parametres change, resulting in a reconfiguration of survival requirements – these are mobility, firepower, protection, logistics, communication and detection. To this list one may actually add more. But if interdependent technological parametres need to be manipulated together with dependent tactics, doctrines, operational art and strategy, to produce adaptation to survival requirements in at least six (interdependent) dimensions, and between multiple (often conflicing or disagreeing) actors, the outcomes of battlefield evolution seem more random. This bird's eye view of battlefield evolution awakens one to the reality that in spite of noble intellectual efforts, war is indeed messy, its results are difficult to control, it is ususally not purely the continuation of politics and policy by other means, and the selection of winners and losers may not be too dissimilar to the process of natural selection.

[4] With reference to the term often used by Donald Rumsfeld, US Secretary for Defense at the time of the Iraq War of 2003, under the first term of President George W. Bush.
[5] Reference to the classical Clausewitzian term implying the inevitable deviation of reality from plans („war on paper").

The local evolutionary process

With reference to William Lind's classification of „generations of warfare" (Lind, 2004), the conflict in the Syrian/Iraqi theatre is best seen as a blend of the generations. There is both a war of attrition on several fronts (2nd generation warfare), with slowly (if at all) moving lines of engagement, but there is also the element of 4GW (Fourth Generation Warfare) in the form of subversion and terrorist attacks and the use of very irregular tactics. Fixed lines exist in places, for example in urban environments, in spite of the superiority of the Syrian Arab Forces (i.e. government forces) in certain respects: e.g. in the field of tactical air support, area-effect weapons and rolling armour. This is because a built-up environment allows for enough protection against firepower to make advances even by a better equipped force difficult (if possible at all). Elsewhere, lesser actors respond with counter-mobility tactics, including the layered use of IEDs, and the extensive construction of berms, trenches and tunnels (Hubbard, 2015; Blake, 2015).[6] Siege situations are also common, and, depending on the allocation of the respective sides' resources, the besieged may belong to various parties: government garrisons as well as opposition-held towns were frequently surrounded and pressured in the course of the war, resulting in an especially dire humanitarian situation and a large number of civilian casualties – partly due to the use of indiscriminate or deliberately terroristic tactics by the various parties.

Against this backdrop, it is interesting to take a look at the evolution of the use of so-called „barrel bombs" by the Syrian Arab Air Force (SAAF). Two hypotheses may be formulated related to what is behind their use as a tactic. It is a typical interpretation in media reports to write this off as „collective punishment," designed to „deter and depopulate" opposition-held areas whose population government forces do not really seek to protect (Kozak, 2015: 9). The null-hypothesis, in contrast, is that any tactic in war, especially where resources are scarce,[7] has to have some direct use in overcoming an adversary – otherwise it is but an ill-affordable expression of emotions.

[6] Transnational terrorism has also been used in retaliatory form by the Islamic State at least in the case of the November 2015 Paris attacks to which the IS command's direct connections seem to be the most strongly established (Arany, N. Rózsa and Szalai, 2017: 50). The brutal execution of captured combatants also carries some deterrent effect and may thus be seen and understood as forming a part of warfare repertoires in this context where combatant parties join the fight with highly asymmetrical capabilities.

[7] A set of conditions that may be theorised as generally enhancing comparatively innovative practices and, per consequence, evolutionary processes in warfare (the author wishes to thank Máté Szalai for raising this point).

It may be worth noting in advance of examining these two propositions that combatant identification from aerial platforms in an urban environment is difficult in any case, resulting in difficulties with precise targeting – just as it is well known from experience that needless atrocities often happen in the course of violent conflict.

Supplying strong evidence in favour of the first hypothesis (excessive destruction and violence) is the high number of civilian casualties, the oft-observable low precision of the air strikes (specific targeting may be altogether absent in many instances, with, frequently, certain districts and large residential buildings constituting the target of attack). „Double tap attacks" are also documented to have taken place – this tactic is clearly illegitimate as the second (repeat) strike in the same location cannot reasonably be expected to be non-harmful to search-and-rescue and medical personnel. Barrel bombs are also typically used as area-effect weapons, with scrap metal filled into the body of the bomb to spray the targeted area with shrapnel. Similarly in order to affect a larger area, barrel bombs are very likely to have been used with a chemical payload in a number of instances and as (high-explosive) Fuel-Air Weapons (Higgins, 2015).

It is also possible, however, to identify certain arguments and considerations in favour of the null-hypothesis (battlespace rationality). It is, for instance, a misunderstanding related to „barrel bombs" that they are all made of oil barrels – they are more precisely called improvised aerial bombs, as they can be (and are) built from various different kinds of basic components. It is similarly wrong to think that the use of these weapons is unprecedented. Air forces in need have used them extensively in the past, including Israel against Arab forces in the first Arab-Israeli war, or Croatia against rump-Yugoslavia in the 1990s, to name but a few examples (Bodetti, 2015). „Need" in the above sentence is key: an air force lacking precision aerial bombs (Precision-Guided Munitions or PGMs) as well as an environment where combatant identification is difficult and difficult-to-identify/low-value targets proliferate may both create this need.

That the SAAF is interested in getting some precision in its targeting is evidenced by the details of the evolution of this tactic. Initially only very primitive barrel bombs were used (from 2012 already). The fuse was lit by crude means (in one widely shared video a Syrian soldier lights the fuse with his cigarette[8]). The lit fuse was hoped to create an explosion at around the time of impact, but in fact often failed to do this, leading to premature aerial explosions, or bombs remaining unexploded („dud"). Beginning towards

[8] Available as of 18 January 2017 at https://www.youtube.com/watch?time_continue=70&v=rj1WJWcke4s (watch from 0'40'').

the end of 2013, and reportedly with the help of Iranian engineers, barrel bombs have been redesigned for improved flight stability (with the introduction of tail fins) and impact fuses (for reliable explosion upon impact). Typically, a three-fin arrangement came to be used instead of a symmetrical four-fin design – this is due not to lack of interest in optimal solutions but platform limitations: this is how the bomb can be comparatively easily slid out the back of SAAF helicopters. It is also signficant that the helicopters typically need to operate from a higher-than-ideal altitude because of the presence of aerial defence weapons in the hand of hostile factions, including MANPADS (Man-Portable Air Defence Systems) or shoulder-fired ground-to-air missiles, resulting in decreased accuracy in targeting.

With a view to the evolution seen in Syria, it is instructive to look at the example of Iraqi forces – when the Islamic State made its shocking advances in northern Iraq in mid-2014, the Iraqi air force also had to resort to using improvised aerial bombs. Their design clearly lacked the marks of evolution (fins and impact fuse) already showing at this time over on the Syrian side of the border (Lloyd, 2013).

Having said that, it is clear that Syrian government forces do not have very high regard for civilian casualties even as they are interested in battlespace efficiency. If there is a clear element of terror in their attacks, it is not in fact independent of an amoral logic of overcoming adversaries – depopulating urban territories where they need to fight creates more favourable conditions for their victory, and thus the originally strongly contrasted hypotheses (of excessive destruction vs. battlespace rationality) are in fact not mutually exclusive possibilities in a full extent.

The quasi-evolutionary process: Global actors join the fight

It is illuminating to consider the following quote from a US Air Force intelligence officer, commenting on Russia's involvement in Syria (quoted in Majumdar, 2015):

> "While it appears that the Russians are following their standard doctrine with regard to the deployment/employment of their ground and air assets, it's certainly not out of the question to use their newer air-to-air assets as a form of 'operational testing' in the real world environment. In a sense, we're doing the same thing with our F-22s."

Operational testing is clealry a motive in many instances. This testing provides benefits for later, prospective, higher-stakes use for the advanced militaries concerned. It

is thus a (mostly/comparatively) non-directly-existantial kind of involvement in the Syrian/Iraqi theatre on their part.

There also arise valuable opportunities to test/observe adversaries in the course of this. In the same news report, the same Air Force officer is quoted observing about the presence of Russian aircraft and air defence assets that

> „[Being in Syira with their assets] may be a way for them to 'characterize' the F-22's radar emissions on their radar warning receivers (RWR) in a real-world environment. Not traditional intelligence collection per se, but could be a way to see how their RWRs receive and display an F-22's radar emissions." (*ibidem*)

A particularly illustrative case, of benefits external to the Syrian conflict, may be Russia's use of its Land-Attack Cruise Missiles (LACMs): the air-launched, long-range, low-observable Raduga Kh-101 and the ship-launched, high-manoeuvrable Novator Kalibr missile (Tzoneva, 2016). It is difficult to judge if the use of these weapons systems was absolutely required against the targets that they were spent on, but a number of benefits external to such considerations can be identified easily. Both cruise missiles were combat-tested in 2015 for the first time. There has also been some rumoured interest in buying Kalibr missiles by weapons importers – demonstrating the missile's capabilities may thus have been useful in an economic sense. Moreover, demonstrating the use of these LACMs from both the Mediterranean and the Caspean Seas showed Russian power-projection capability in the Middle East from two directions. Even if the Black Sea was somehow closed off to Russia, it would still have this capability – highlighting its importance as a player in the region. Furthermore, LACMs are an important part of Russia's arsenal, potentially even in a nuclear conflict. In the absence of air superiority and the ability to operationally safely deliver bombs to above enemy targets with its aircraft, low-observable cruise missiles with or without a nuclear warhead are an important punch they can pull in a fight (Sokov, 2015).

Mingling with the locals: Actual strategic adaptation on the part of global actors

The challenge of the proliferation of difficult-to-identify/low-value (DI/LV) targets is one that eventually air forces more advanced than the SAAF also had to face in their air operations over Syria and Iraq. This brought about a full reconfiguration of Russian air operations in Syria by March 2016, and produced some spectacular decisions in the US case as well.

The realisation of the need for aerial assets capable of using cheaper options to take out DI/LV targets, with more loitering time, and giving a better opportunity to observe the environment over the area of prospective targets, led to Russia take its jet bombers out of Syria (e.g. the Sukhoi Su-24s and Su-25s) and bring in combat helicopters (Bronk, 2016). Living up to Soviet/Russian traditions in this respect, a competitive situation was created whereby the Kamov Ka-52 and the Mil Mi-24 are both seeing their combat debut in Syria, using weaponry that saw only limited combat testing in Chechnya so far, such as the Ataka and Vikhr missiles which these helicopters can carry (Karnozov, 2016). As in the case of LACMs, here as well, Russia can count on arms-exports-related benefits given Egypt's and other prospective buyers' interest in these platforms and the weapons systems that can be used along with them (Akulov, 2016).

As to the United States: in its air campaign against the Islamic State, the A-10 Warthogs only joined operations towards the later part of 2014. Initially F-16s and F-15s, multi-role aircraft, were flying most of the combat sorties against emerging targets. These planes are limited in terms of the minimum speed at which they have to conduct an air strike, the time they can spend above target, and the range of weapons systems they can use against hostile forces on the ground. It was thus a logical decision to bring in the A-10s which immediately led to improvements in the mentioned dimensions. By mid-January 2015 the Warthogs flew 11% of the combat sorties against the Islamic State, quickly making up for the delay in their entry in-theatre (Mehta, 2015). Related to this, and also with a view to experiences from Afghanistan, the service time of the A-10s has been extended into the 2020s (Prigg, 2016). An even more interesting decision was the experimental introduction of the OV-10 Bronco, a turbo-prop Vietnam-era combat aircraft over Iraq, a return to something that actually works quite well against hostile forces with limited air defence capabilities (Browne, 2016). Having mentioned the A-10s and the OV-10s, a very important role in combat support rests with the AH-64 Apache helicopters as well.

The need for these types of aerial platforms is thus, by now, obvious even to advanced air forces addicted to the idea of the Revolution in Military Affairs, investing in „next generations" of fighter aircraft that have relevance primarily in the quasi-evolutionary process of preparing for possible peer-to-peer (i.e. major-power) conflict. This need is all the more obvious to actors without a similar abundance of resources – looking beyond the Syria/Iraqi theatre it is instructive to see the use of „air tractors"

(agricultural aircraft converted into means of tactical air support) in Libya (Delalande, 2017).

Conclusion

As the article showed, evolutionary processes can be defined in the context of warfare and provide important insight into the dynamics of armed conflicts. Local evolutionary adaptation was demonstrated in the changing use of so-called barrel bombs or improvised aerial bombs by the SAAF, which was eventually contrasted with Iraqi forces' lower level of preparedness and more primitive use of the same type of weapon by mid-2014. The quasi-evolutionary nature of global actors' involvement in-theatre was studied with reference to Russia's use of advanced LACM systems that may or may not have been replacable for the missions in which they were put to use. Regardless of the latter issue, they certainly may have provided important external (economic as well as strategic) benefits to the user (i.e. the Russian Aerospace Forces). Eventually, the article also pointed out, however, that even global actors needed to make important adaptations to serve their specific interests in their respective operations – as demonstrated, the presence of a large number of DI/LV targets required, and eventually induced, the introduction of more appropriate aerial assets for tactical support.

References

Akulov, Andrei (2016): „Russian Ka-52 «Flying Tank» Combat Helicopter: Success Story." Online Journal, Strategic Culture Foundation, 9 April 2016, at http://www.strategic-culture.org/news/2016/04/09/russian-ka-52-flying-tank-combat-helicopter-success-story.html (accessed on 18 January 2017).

Arany Anett – N. Rózsa Erzsébet – Szalai Máté (2017): *Az Iszlám Állam kalifátusa: Az átalakuló Közel-Kelet*. Budapest: Osiris-KKI.

Arquilla, John and Ronfeldt, David (2001): *Networks and Netwars: The Future of Terror, Crime, and Militancy*. Santa Monica, Ca.: RAND Corporation.

Blake, Paul (2015): „Ramadi assault: How a small change in tactics helped Iraqi forces." *BBC*, 22 December 2015, at http://www.bbc.com/news/world-us-canada-34902757 (accessed on 18 January 2017).

Bodetti, Austin Michael (2015): „The Use of Barrel Bombs." *Offiziere.ch*, at https://www.offiziere.ch/?p=25477 (accessed on 18 January 2017).

Bronk, Justin (2016): „Analysis: Russian gunships replace jets in Syria." *Al-Jazeera*, 8 April 2016, at http://www.aljazeera.com/news/2016/04/gunships-replace-jets-russias-air-campaign-syria-160407111014579.html (accessed on 18 January 2017).

Browne, Ryan (2016): „Vietnam era planes used against ISIS." *CNN*, 11 March 2016, at http://edition.cnn.com/2016/03/11/politics/decades-old-planes-used-against-isis/ (accessed on 18 January 2017).

Castaldi, Carolina – Fontana, Roberto – Nuvolari, Alessandro (2009): „'Chariots of fire': the evolution of tank technology, 1915–1945" *Journal of Evolutionary Economics* 19, 545-566.

Delalande, Arnaud (2017): „Erik Prince's Mercenaries Are Bombing Libya: For-profit combat pilots fly Emirati Air Tractors." *War is Boring*, 11 January 2017, at https://warisboring.com/erik-princes-mercenaries-are-bombing-libya-88fcb8e55292#.vw3nzotqx (accessed on 18 January 2017).

Glaser, Charles L. and Kaufmann, Chaim (1998): „What is the offense-defense balance and can we measure it? (Offense, Defense, and International Politics)" *International Security* 22:4, 44-83.

Higgins, Eliot (2015): „A Brief Open Source History of the Syrian Barrel Bomb." *Bellingcat*, 8 July 2015, at https://www.bellingcat.com/news/mena/2015/07/08/a-brief-open-source-history-of-the-syrian-barrel-bomb/ (accessed on 18 January 2017).

Hubbard, Ben (2015): „New U.S.-Backed Alliance to Counter ISIS in Syria Falters." *The New York Times*, 2 November 2015, at https://www.nytimes.com/2015/11/03/world/middleeast/new-us-backed-alliance-in-syria-exists-in-name-only.html?_r=0

Karnozov, Vladimir (2016): „Russian Kamov Ka-52 'Alligator' Sees Combat Debut in Syria." *AIN Online*, 5 April 2016, at http://www.ainonline.com/aviation-news/defense/2016-04-05/russian-kamov-ka-52-alligator-sees-combat-debut-syria (accessed on 18 January 2017).

Kozak, Christopher (2015): „'An Army in All Corners': Assad's Campaign Strategy in Syria" *Middle East Security Report* 26, Institute for the Study of War, April 2015.

Kutschera, Ulrich and Niklas, Karl J. (2004): „The modern theory of biological evolution: an expanded synthesis." *Naturwissenschaften* 91, 255–276.

Lind, William S. (2004): „Understanding fourth generation war.” *Military Review*, September-October 2004, 12-16.

Lloyd, Richard M. (2013): „Syria's Barrel Bomb Technology Relative To Aleppo Syria Attacks - The Good, The Bad And The Ugly.” *Brown Moses*, 22 December 2013, at http://brown-moses.blogspot.hu/2013/12/syrias-barrel-bomb-technology-relative.html (accessed on 18 January 2017).

Majumdar, Dave (2015): „Russia's Air War in Syria: A Chance to Spy on America's F-22 Fighter?” *The National Interest*, 1 October 2015, at http://nationalinterest.org/blog/the-buzz/russias-air-war-syria-chance-spy-americas-f-22-fighter-13987 (accessed 18 January 2017).

Mehta, Aaron (2015): „A-10 Performing 11 Percent of Anti-ISIS Sorties.” *Defense News*, 19 January 2015, at http://www.defensenews.com/story/defense/2015/01/19/a10-strikes-isis-11-percent/21875911/ (accessed on 18 January 2017).

Metz, Steven and Kievit, James (1995): „Strategy and the Revolution in Military Affairs: From Theory to Policy.” US Army War College, 27 June 1995, available in full at http://www.au.af.mil/au/awc/awcgate/ssi/stratrma.pdf (accessed on 18 January 2017).

Prigg, Mark (2016): „Air Force saves the Warthog: 40 year-old 'tankbuster' bomber's retirement delayed so it can attack Islamic State.” *The Daily Mail*, 15 January 2016, at http://www.dailymail.co.uk/sciencetech/article-3401857/Air-Force-saves-warthog-40-year-old-tankbuster-bomber-s-retirement-delayed-attack-Islamic-State.html (accessed on 18 January 2017).

Sokov, Nikolai (2015): „Bill Gertz, New Russian SLCM, and the True Nature of Challenge to US and NATO,” a guest post at *Arms Control Wonk*, 25 August 2015, at http://www.armscontrolwonk.com/archive/207801/sokov-on-russian-cruise-missiles/ (accessed on 18 January 2017).

Tzoneva, Desi (2016): „Russian Kalibr vs. US Tomahawk.” *South Front*, 9 January 2016, at https://southfront.org/russian-kalibr-vs-us-tomahawk/ (accessed on 18 January 2017).