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## REFLECTING ON THE REVOLUTION IN MILITARY AFFAIRS: IMPLICATIONS FOR THE USE OF FORCE TODAY

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Nearly a quarter of a century after US-led coalition forces relied extensively on information technology, hi-tech precision weapons and joined-up military doctrine to comprehensively defeat Saddam Hussein's Iraqi army in Operation Desert Storm, the concept, implications and legacy of the so-called Revolution in Military Affairs (RMA) remains both contested and indistinct. While the swift and impressive military victory in early 1991 ignited a widespread scholarly and policy debate about the transformative nature of modern technology in warfare<sup>1</sup>, and became commonplace in Strategic Studies literature and policy guidelines throughout the 1990s and early 2000s, the military challenges of the past decade and a half have increasingly called in to question the efficacy of the RMA concept and its application. Conflict and intervention in Afghanistan, Iraq, Lebanon, Gaza, Mali, Libya, and most recently in Ukraine and Syria, and against the group known as Islamic State (IS), have all pointed to a different type of challenge for modern militaries – and provided a difficult test for the RMA concept. As a result, the notion of an RMA has slowly disappeared from both academic and policy debates in the last decade and a half, as traditional and conventional conceptions of warfare have given way to asymmetric conflict and more complex use-of-force scenarios (at least that is, for the time being). However, RMA-based thinking and decisions continue to impact and affect the way modern militaries around the world approach and plan for future conflict, and many are still dealing with the effects of RMA-inspired decisions taken during the 1990s and/or continue to base military planning at least partly on these ideas.

## What was the RMA?

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Despite its ubiquity and prominence during the 1990s and early 2000s, the notion, specifics and genesis of a Revolution in Military Affairs remains somewhat nebulous, and continues to drive a heated and passionate debate. Indeed, the idea of a military revolution is nothing new, and history is littered with periods where changes in military technology or doctrine appear to represent a break from the past.<sup>2</sup> However, the current RMA debate emerged in the 1970s when the United States made the move to an 'all volunteer' military force, shifted its focus from Southeast Asia to Europe, and in particular to the adoption of the "Air Land Battle" doctrine in 1982.<sup>3</sup> In fact, with nuclear détente among the superpowers, Pentagon planners began to conclude that any future war with the Soviet Union would be based on the maintenance of a qualitative edge in technology and training in conventional forces rather than on purely numerical superiority. This became known as the 'offset strategy'. Of course, it wasn't without coincidence that this thinking occurred during a time of major advances in information technology and precision guided munitions, or 'smart bombs', the first of which were dropped in the closing years of the Vietnam War.<sup>4</sup> That said, the RMA also emerged from the writings of Soviet military planners in the 1980s in response to the growing sophistication of American technology. The Pentagon's Soviet counterparts began writing about a 'Military Technical Revolution' (MTR) in which they saw "computers, space surveillance, and long-range missiles" shifting the balance of power in

favour of NATO.<sup>5</sup> By the mid-1980s, the Chief of the Soviet General Staff, Marshal Nicolai Ogarkov, had become the leading advocate of MTR and sought to transform the Soviet Union's military forces along the lines of information technology.<sup>6</sup> As Dima Adamsky points out "although it was the US that was laying the technological groundwork for the RMA, Soviet rather than the American military theorists were the first to intellectualize about its long-term consequences."<sup>7</sup>

However, with the end of the Cold War in 1989 and the dissolution of the Soviet Union by 1991, many of these reforms and innovative changes remained unimplemented.<sup>8</sup> Instead, it was the impressive U.S.-led victory in the 1991 Gulf War that crystallized the notion that there was a revolution in the conduct of war in western thinking.<sup>9</sup> As William Perry remarked at the time:

In Operation Desert Storm the United States employed for the first time a new class of military systems that gave American forces a revolutionary advance in military capability. Key to this capability is a new generation of military support systems – intelligence sensors, defense suppression systems and precision guidance subsystems – that serve as 'force multipliers' by increasing the effectiveness of US weapons system.<sup>10</sup>

It was also remarked that the high-tech actions in the Gulf War fostered a perception among the western publics and politicians that war could be successfully waged without the likelihood of friendly casualties.<sup>11</sup> Nevertheless, the role of satellites, precision-guided munitions, and airpower in transforming the way planners understood warfare during the Gulf War became reinforced as the early post-Cold War years saw defence funding dry up and a growth in operational demands to major security challenges, such as in Somalia and the Balkans. The combination of these factors created an onus on defence planners to be innovative in designing their force structures.<sup>12</sup>

While these changes were occurring in the late-1980s and early-1990s, Andrew W. Marshall and Andrew Krepinevich, followers of the Soviet MTR literature and employees of the Pentagon's Office of Net Assessment, concluded that the military world had entered a 'revolution in military affairs'.<sup>13</sup> Unlike the MTR, they viewed the RMA as something beyond technology and hence made the connection that an RMA includes technological advances and doctrinal changes – in effect, the former influences the latter.<sup>14</sup> Hence, the Office of Net Assessment defined RMA as,

A major change in the nature of warfare brought about by the innovative application of *new technologies* which, combined with dramatic changes in *military doctrine* and *operational and organizational concepts*, fundamentally alters the character and conduct of military operations.<sup>15</sup>

Since this time, numerous scholars have expanded and debated what the RMA means in practical terms. Andrew Richter suggests that the current RMA is by characterized by "the ability to collect, analyze, disseminate, and act upon information", which has allowed militaries to gather, process, and fuse data in real time.<sup>16</sup> This quick processing is then transmitted to designated military units which act with "speed, precision, and with great effect over long distances".<sup>17</sup> Taking a less definitive tone, Elinor Sloan contends that

RMA comprises five themes: first, militaries are structured around being lighter, more deployable, expeditionary forces; second, is “battlefield mobility”, (e.g. medium-to-heavy lift helicopters and light tanks); third, air power-oriented doctrines relying on precision weapons and standoff force; fourth, “jointness”, or the seamless use and integration of the three armed services (army, navy, air force) to achieve military objectives, and; fifth, a transitioning of the role of the navy from blue water operations to littoral combat in support of ground and air forces.<sup>18</sup>

In contrast to the above, Lawrence Freedman disputes the notion that there is a revolution in military affairs; instead he states that if there is a revolution it is in strategic affairs, suggesting that technological advances have only allowed Western states to achieve their political goals in more diverse strategic ways.<sup>19</sup> Nevertheless, he concurs with Richter’s notion that this RMA (or RSA) is dependent “on the interaction between systems that collect, process, fuse and communicate information and those that apply military force”.<sup>20</sup> This ‘system-of-systems’, first articulated by U.S. Navy Admiral William A. Owens in the 1990s, supposedly allows for planners to control a multi-dimensional perspective, or ‘battlespace’, in war. Such control, it is argued, would effectively remove the proverbial ‘fog of war’ identified by Prussian military theorist Carl von Clausewitz in *On War* (hence Michael O’Hanlon’s description of RMA proponents being ‘anti-Clausewitzian’).<sup>21</sup>

## The RMA Comes Under Scrutiny

Time and a slew of military operations since the pinnacle of RMA discussions in the 1990s and early-2000s has seen the RMA concept placed under a more critical lens. A number of analysts have remarked on the fallacy of using the Gulf War as the textbook case study of RMA. Daryl Press states that the emphasis on technology in cementing allied victory in 1991 is misleading, for the level of combat skills training among the mostly U.S., U.K., and French ground forces was of such a high level that it negated the coalition’s technological edge. This was especially acute during the Battle of al-Burqan when two Iraqi brigades launched a surprise counterattack against U.S. Marines under the cover of burning oil fields and morning fog (a literal fog of war). The combat skills of the lightly armed Marines repulsed the armoured attack before the smoke cleared and airpower and artillery could be called in. The Marines suffered zero fatalities but destroyed at least 100 Iraqi armoured vehicles. In a word, the success of allied forces in the Persian Gulf had a lot more to do with Iraqis’ “poor marksmanship, low rates of fire, and ineffective fire coordination” than their technological inferiority.<sup>22</sup>

Thomas Mahnken and Barry Watts similarly unpeel the Gulf War-RMA thesis, noting that the Iraqis’ resistance to re-orientating from an entrenched attrition strategy in the face



of overwhelming allied airpower essentially meant that the Iraqis fought on allied terms. In this sense, they argue, the Gulf War was hardly transformative or revolutionary; an RMA would need to involve a symbiosis “between technology, operational concepts, doctrine and organizational changes” and the Gulf War was not it.<sup>23</sup> Stephen Biddle suggests that the infatuation of RMA advocates with the Gulf War has a lot to do with the extremely low allied casualty rates that defied pre-war predictions by many magnitudes (less than 1/200th of official reported projections). Such distortions fed into the belief that the technological superiority and ability of United States armed forces represented something truly revolutionary when in fact it was simply a lopsided win akin to the Israeli victory in the Six Day War.<sup>24</sup> As has been already noted, many of the advanced weapons platforms used in the 1991 conflict can be traced back to the Vietnam War; the first use of precision-guided munitions was in the 1972 ‘Linebacker’ raids while the first operational use of a stealth aircraft (the Y0-3A) occurred in the early 1970s. As such, it has been said that the RMA was less a revolution and more of an evolution of technology and doctrine over the preceding two decades.<sup>25</sup>

The American-centrism of the RMA has also been the target of critics. Martin van Creveld, for one, links the emergence of RMA in the post-Cold War era as the result of the American political-military elites’ desire to overcome ‘Vietnam syndrome’ and fight a short, decisive conventional war on the Pentagon’s terms.<sup>26</sup> Meanwhile, Jeremy Black associates the development of RMA thinking in the 1990s as part-and-parcel of American unilateralism and its sole superpower status. In his words, “the RMA was symptomatic of a set of cultural and political assumptions that tell us more about the aspirations of the 1990s and early 2000s than they do about any objective assessment of military capabilities.” In short, RMA reflects an American belief in technology and “overcoming a sense of decline.”<sup>27</sup> Further disapproval of RMA has come in the form of its implied ‘anti-Clausewitzian’ claims in technology being able to overcome ‘the fog of war’ and ‘friction’ on the battlefield. Eliot Cohen retorts that the notion that the fog of war can be lifted is something that is often articulated by the technologically-driven air forces and navies of the world. Ground forces, on the other hand, often wonder how any technology or doctrine can clarify “when an opponent attempts to conceal its force or attacks the information systems that observe it”.<sup>28</sup> Cohen therefore regards RMA as more of an aspiration than a reality; something that “is predicated on the inability of other countries to systemically deny the United States the information its weapons systems need”. Williamson Murray states that neither new capabilities or concepts will negate the “fundamental nature of war”; that being how “friction together with fog, ambiguity, chance, and uncertainty will dominate future battlefields as it has in the past”.<sup>30</sup> Equally prominent are the countless examples of operations where GPS-satellites, precision weaponry, and ‘system of systems’ communications networks failed to pierce the fog of war: the inability of allied special forces, satellites, and airpower to eliminate the Scud missile threat in the Gulf War;<sup>31</sup> the undetected Iraqi armoured brigade counterattack against the Third Infantry Division in the 2003 fight for Baghdad; the presence of Fedayeen Saddam paramilitaries attacking coalition convoys in southern Iraq; and al-Qaeda’s concealment of half of its positions and at least 350 fighters during Operation Anaconda in Afghanistan in 2002.<sup>32</sup> Because of these examples, Tim Benbow argues that RMA’s biggest failing is by not incorporating political and military changes occurring in international security; instead RMA concepts remain fixated on technology and designing militaries to fight nation-state, conventional foes.<sup>33</sup> Hence, HR McMaster referring to the RMA as a “fantastical theory”

divorced from battlefield realities.<sup>34</sup>

By the early 2000s, American defence planners began recasting RMA as ‘military transformation’. With essentially the same attributes (high-technology, speed, precision, information control, fewer ground forces, etc...) the use of the term military transformation helped bring some parameters to RMA in reflecting what many saw - 10 years after the Gulf War – as being less of a revolution in military affairs (with a definite end-point) and more of an ongoing exercise in developing new technologies, doctrines, and structures. This terminological shift, and the lack of distinction between the RMA and military transformation, was best made in a 2002 Foreign Affairs article by then U.S. Secretary of Defense Donald Rumsfeld, in which he made the case that transformation was about precision-guided munitions, special forces, intelligence, space, and jointness in the use of military force.<sup>35</sup> The criticisms of RMA still applied, however. Transformation still suffered from the same problem as RMA in that it continued the notion that future wars “could be won quickly and efficiently, at low cost by small forces.”<sup>36</sup>

Nevertheless, with the onset of the insurgency in Iraq in late-2003 it had become apparent that the agile, force-multiplying technology of the RMA was not only becoming unsuited to waging a counter-insurgency campaign, but at times, it was a liability. In the various battles for the Iraqi city of Fallujah in 2004, the punitive use of airstrikes, artillery, and tanks by the US-led coalition forces embittered the civilian population against the occupation, feeding the ranks of the insurgency. In Lebanon in 2006, the Israelis encountered a similar situation when their reliance on airpower and artillery against Hezbollah militants embedded within the civilian population led to unnecessary civilian casualties and a loss of the international public relations battle. The much-vaunted RMA, with its reliance on effects-based operations, system of systems integration, and battlefield dominance was increasingly at odds with the unconventional conflicts that Western militaries were being confronted with. Accordingly, the concept began to lose favour – first in the United States and then with its allies – so much so that by mid-2000s there was very little reference to it in either scholarly or practitioner circles.

## Looking Back on the RMA

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In the last decade, the notion of a Revolution in Military Affairs has largely disappeared from both the academic and policy debate and literature, and is now far removed from its heyday after the Gulf War and during the 1990s. At least part of this can be explained by the experience of military conflict since this time, which has overwhelmingly been characterised by unconventional and asymmetric warfare that appear far removed from the hi-tech traditional battles envisaged by the RMA, planned for the last decades of the Cold War, and embodied by Operation Desert Storm in 1991. However, the RMA concept – and

particularly its main tenets and central dynamics - continues to affect the way that a wide variety of states think about military strategy and doctrine, and many of these actors are still wrestling with RMA-inspired changes that they made in the past, or that were made by others.

Perhaps the most important thing to remember about the RMA is that it was not simply an inherently and exclusively American idea – in fact, the antecedents of the RMA can be found in the Soviet Union and the notion of a “Military Technological Revolution” that first emerged in the 1970s.<sup>37</sup> Likewise, the experience of the RMA has not been purely American either, as the impact and legacy of these developments has naturally spread far and wide to a multitude of different actors. Indeed, and while the RMA has appeared to become almost synonymous with the massive power and sophistication of the United States military, these developments also had important implications for other actors within the international system, including US allies, peer competitors and so-called rising powers, as well as those that might be classified as adversaries – whether state-based or not. That said, the impact has been different and diverse; notwithstanding a decade of unconventional conflict in the Middle East, RMA type themes – especially the use of hi-tech weaponry - remain central to US military planning; key allies such as the UK<sup>38</sup>, Canada<sup>39</sup> and Australia<sup>40</sup> sought to adopt RMA-type technologies and doctrine at least in part to ensure continued interoperability with the US – and many of these actors continue to live with the implications of these decisions; Russia – seeing US and NATO conventional military modernisation as a potential threat has sought to focus on strategic nuclear-level relations with the West – primarily through mutual deterrence - as it devises new strategies for conflicts and disturbances along on its considerable land borders – particularly the notion of ‘hybrid warfare’<sup>41</sup>; Israel has vacillated between RMA based conceptions as it has engaged various unconventional enemies and threats over the past two decades – and it remains uncertain where this will develop in the future<sup>42</sup>; India consciously chose a different path given its perceived security requirements and the delicate nuclear balance with Pakistan<sup>43</sup>; while it must be assumed that the adoption of guerrilla and unconventional tactics by non-state actors or other adversaries, is at least partly due to the (perceived) supremacy of Western RMA-based conventional doctrine. All of these actors reacted to, understood and internalised the dynamics of the RMA in different ways, for different reasons, and with different implications and therefore legacies for military policy.

A second key dynamic that emerges is the central question of whether the developments in military strategy of the late 1980s and early 1990s are best thought of as a “revolution” or something less transformative and permanent. By implication, the word revolution suggests that something has shifted fundamentally and perhaps irreversibly, and that has transformed the nature of certain phenomenon (in this case the military art). While developments in precision weapons, battle management systems, and particularly the incorporation of myriad new developments from information technology and the “information revolution” have certainly changed the way that states can approach and fight wars, this is perhaps best thought of as an evolution in military tools or even context, rather than a revolution in military affairs more generally. Likewise, the coinciding changes in military doctrine and tactics – particularly “jointness”, network-centric and effects-based operations - that accompanied these technological developments has struggled to cope with the realities of post-Cold War and especially post-9-11 warfare. The result is that while



certain capabilities and military thinking have undoubtedly evolved, it has been far from straightforward to match these with real-world military requirements and experience. As such, the past two decades have been less a revolution and more a period of flux as militaries have sought to balance new suite of supply-side capabilities with a set of fresh and changing demand-side requirements; that said, and despite disappearing from mainstream academic and policy literature, the ideas and central dynamics embodied by the RMA remain central in modern military thought.

Arguably a key reason why the RMA concept became so prevalent in the 1990s and at the same time why it has fallen away in recent years, is the significance of domestic drivers of policy, and in particular the importance of key personalities in shaping strategy. In this regard, the first thing to note is the extent to which RMA thinking was and remains bound up with the notion of an idealised “Western way of warfare” that maximises hi-tech capabilities and minimises civilian and military casualties. In this sense, at least for the United States, the RMA was about avoiding the type of attritional warfare confronted in Vietnam and utilizing US comparative advantages in hardware and technology. Indeed, the 1991 Gulf War was memorably summed up then President George H.W. Bush: “... by God, we’ve kicked the Vietnam syndrome once and for all.”<sup>44</sup> Such cultural pressures were also very important for various US allies – notably the UK, Canada, Australia and Israel - who sought both greater efficiency and efficacy in military operations, and at the same time, a way to remain interoperable with the United States and that would be palatable to voters at home.

A second important dynamic is the extent to which military strategy has been driven by domestic internal variables and personalities; across all nations impacted by the RMA there has been a key figure associated with the concept; it began with Marshal Nikolai Ogarkov in the Soviet Union; in the US it was Andrew Marshall and Andrew Krepnevich and the Office of Net Assessment<sup>45</sup>; Sir Nigel Bagnall was the key figure in the UK; General Rick Hiller in Canada and Brigadier General Shlomo Brom in Israel. These figures, and others like them, were integral in formulating national strategy during the 1990s, and their legacy and influence remains a key component of military thinking in these countries. More broadly, we can reflect that domestic and bureaucratic politics – and especially budgetary pressures and inter-service rivalry – were at least as important to how states responded to and incorporated RMA thinking as any external factors and the types of wars that these militaries might have to fight.

As Eliot Cohen presciently remarked with regard to the Israeli RMA debate: “The enemy never really figured very much into the RMA debate, and this may have been the worst mistake of all.”<sup>46</sup> Evidence suggests that this holds true for other actors too. Idealized visions of how war might be fought appeared to supersede the realities of the type of wars they were likely to be involved in, and what troops on the battlefield would face and actually require.

## Reflections and Projections

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While the RMA concept has largely disappeared from the canon of modern military thinking, it would be erroneous to assume that the central ideas and concepts have too; in fact, many developments in the military field bear strong correlation with the ideas of the early 1990s. The advent of “cyber” capabilities and new methods of information warfare – especially Chinese anti-access area-denial (A2AD) and “informationalisation” strategies – clearly link with RMA type conceptions – and may in fact be a direct response to perceived developments in US doctrine starting in 1991 – as does the continued quest towards an ever-more digitized battlefield.<sup>47</sup> The same might be said for the proliferation and universalization of “drone” technology or unmanned aerial vehicles, and the concurrent developments in “remote control warfare.”<sup>48</sup> This also holds true on the strategic level where advances in air and missile defences, ever more capable ballistic and cruise missiles – increasingly for conventional global strike operations, alongside advances in battle management and command and control systems, and the on going quest to control space, continue to progress unabated. This desire to rely increasingly on high technology for military operations and security is unlikely to diminish.

Planning for future military operations is a fundamentally difficult task and by its very nature will rely to some extent on hedging and attempting to cover all bases, but it is important not to take the military experience of the past two-decades as a blueprint for the future. Indeed, and while it may be somewhat cliché to accuse militaries of preparing to fight and learning the wrong lessons from the last war, there is no reason to suggest that a possible return to traditional interstate geopolitical competition might also see us return to traditional symmetric types of conflict too. In this sense, it would be foolish to assume that just because the last two decades have been characterised primarily by guerrilla and unconventional conflict that warfare will primarily remain like this in the longer term. Indeed, in such an uncertain global environment, it is not inconceivable that we might see RMA-type technologies and thinking return to prominence again sometime in the future.

Today, Western militaries confront a dual challenge. Their RMA-influenced force structures have been altered somewhat by the pressures of having to contend with more than a decade’s worth of counter-insurgencies and stabilization operations in Iraq, Afghanistan, Lebanon, Gaza and Mali. Ground forces, for example, saw a growth in personnel numbers and the purchasing of operational-specific equipment, such as IED-resistant armoured vehicles. At the same time, many states across the globe, notably the US, Russia and China are pursuing advanced conventional, high-tech forces and associated structures, like that envisioned in the 1990s. With an unstable global financial situation and the lingering effects of the 2008-09 recession Western governments are sensitive to any additional pressures on their treasuries. In fact, budget restraints, sequestration, and downsizing have arguably become the principal opponents of many Western militaries. Moreover, the political and, indeed, public will to get involved in more casualty-inducing stabilization missions means, rather paradoxically, that responses to international security threats will likely be dealt with by airpower, precision-guided munitions, special forces, and cyber-warfare, at least for the foreseeable future. Consequently, the current civil war in Syria and the rise of ISIS in the Middle East has demonstrated both strengths and limitations to relying upon a technological-heavy approach to warfare. Airpower, precision-guided munitions, and real-time surveillance have allowed U.S.-led coalition forces to interdict ISIS movements while facilitating the retaking of previously-held ISIS strongholds, in conjunction with local

ground forces. The corollary though, is that ISIS has adapted to such advanced technological edges, reducing their daylight movements, entrenching command and control functions in built-up urban areas, like Raqqa. The militants have even used the cover of sandstorms, which limit coalition airpower and satellites, to launch attacks on cities such as Ramadi.<sup>49</sup>

Despite much hype about the transformative impact of new technologies, tactics and doctrine, we have not escaped the inherent logic of war first theorised by Carl von Clausewitz nearly 200 years ago. That is not to say that things haven't changed – they certainly have – only that the label of a revolution is too strong for the changes experienced over the past two decades. Perhaps the biggest reason for this is the inherently inward-looking and ethnocentric nature of the RMA concept – it was essentially based on an idealised type of war that militaries wanted to fight, and therefore focussed rather less on the enemy and how they might respond. In this sense, the 1991 Gulf War was the exception that proved the rule. As conflict in Africa, Afghanistan, Iraq, the Caucuses, Lebanon, Libya, Ukraine, Syria, and elsewhere has shown, adversaries have adapted and sought to counteract the central tenets of RMA-based thinking. That said, the strong desire to limit casualties, rely on hi-tech systems and weapons, and pursue an idealised “western way of war” mean that the central tenets of the RMA are never likely to be far away. The result is that we may now in fact be back to stage one when it comes to thinking about military strategy, but this may be no bad thing as military strategists plan for the requirements and conflicts of an uncertain future.

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<sup>1</sup> For an excellent overview of this, see Eliot Cohen, “A revolution in warfare”, *Foreign Affairs*, 75:2 (1996) pp.37-54

<sup>2</sup> On this see, Colin Gray, “Strategy for chaos: revolutions in military affairs and the evidence of history”, (London, Frank Cass: 2002)

<sup>3</sup> On AirLand battle, see John L Romjue, “The evolution of the AirLand Battle concept”, *Air University Review*, 35:4 (1984) pp.4-15

<sup>4</sup> Elinor Sloan, *Military Transformation: Key Aspects and Canadian Approaches* (Calgary: CDFAI, 2007) p.2

<sup>5</sup> Keith L. Shimko, *The Iraq Wars and America's Military Revolution* (Cambridge: Cambridge University Press, 2010) p.6

<sup>6</sup> Frederick W. Kagan, *Finding the Target: The Transformation of American Military Policy* (New York: Encounters Books, 2006) pp.xi-xix; Jeremy Black, *War and Technology* (Bloomington: Indiana University Press, 2013) p.228

<sup>7</sup> Dima P Adamsky, “Through the looking glass: the Soviet military-technical revolution and the American Revolution in Military Affairs”, *The Journal of Strategic Studies*, 31:2 (2008) p.258

<sup>8</sup> Max Boot, *War Made New: Technology, Warfare, and the Course of History 1500 to Today* (New York: Gotham Books, 2006) p.8

<sup>9</sup> Max Boot, *War Made New: Technology, Warfare, and the Course of History 1500 to Today*, pp.7-8; Shimko 2010: 3

<sup>10</sup> William J. Perry, “Desert Storm and deterrence”, *Foreign Affairs*, 70:4 (Fall, 1991) p.66

<sup>11</sup> Michael Ignatieff, *Virtual War: Kosovo and Beyond* (Toronto: Penguin, 2006) p.160

- <sup>12</sup> James R. Fitzsimonds and Jan M. Van Tol, "Revolution in Military Affairs," *Joint Force Quarterly* 4 (1994) pp. 26-27; see also Lawrence Freedman, "The revolution in strategic affairs," *Adelphi Paper* 318, (London & New York: Oxford University Press, 1998) p.5
- <sup>13</sup> For an overview of this see, Andrew Krepinevich & Barry Watts, "The last warrior: Andrew Marshall and the shaping of American defense strategy," (New York, Basic Civitas Books: 2014) particularly Chapter 8.
- <sup>14</sup> Shimko, *The Iraq Wars and America's Military Revolution*, p.6
- <sup>15</sup> Cited in Sean M. Maloney and Scot Robertson, "The revolution in military affairs: possible implications for Canada," *International Journal* 54 (1999) p.445; see also Elinor Sloan, *Modern Military Strategy: An Introduction* (London: Routledge, 2012) p.51
- <sup>16</sup> Andrew Richter, "Lessons From the Revolution: What Recent US Military Operations Reveal About the Revolution in Military Affairs and Future Combat," *Journal of Military and Strategic Studies*, 7:3 (2005) p.2
- <sup>17</sup> Andrew Richter, *The Revolution in Military Affairs and Its Impact on Canada: The Challenge and the Consequences* (Vancouver: UBC Press, 1999) p.2
- <sup>18</sup> Sloan, *Military Transformation: Key Aspects and Canadian Approaches*, pp.1-2; See also Maloney and Robertson, "The revolution in military affairs: possible implications for Canada," p.444
- <sup>19</sup> Freedman, "The revolution in strategic affairs".
- <sup>20</sup> Richter, *The Revolution in Military Affairs and Its Impact on Canada: The Challenge and the Consequences*, pp.10-11
- <sup>21</sup> Richter, "Lessons From the Revolution: What Recent US Military Operations Reveal About the Revolution in Military Affairs and Future Combat," p.3. Originally coined by Carl von Clausewitz, the 'fog of war' refers to the uncertainty that exists in war about one's own forces, opponent, and environment.
- <sup>22</sup> Daryl G. Press, "Lessons from Ground Combat in the Gulf: The Impact of Training and Technology," *International Security*, 22:2 (1997) pp.138-143
- <sup>23</sup> Thomas G. Mahnken and Barry D. Watts, "What the Gulf War Can (and Cannot) Tell Us about the Future of Warfare," *International Security* 22:2 (1997) pp.159-161
- <sup>24</sup> Stephen Biddle, "The Gulf War Debate Redux: Why Skill and Technology Are the Right Answer," *International Security*, 22:2 (1997) p.164
- <sup>25</sup> Jeremy Black, *War and Technology* (Bloomington: Indiana University Press, 2013) p.235; John F. Guilmartin, Jr., "Technology and Strategy: What are the Limits?," in Michael Howard and John F. Guilmartin, Jr, *Two Histories in Technology and War* (Carlisle, PA: Strategic Studies Institute Monographs, 2004) pp.16-19
- <sup>26</sup> Martin van Creveld, *The Age of Airpower* (New York: Public Affairs, 2011) p.331
- <sup>27</sup> Black, *War and Technology*, pp.232, 240
- <sup>28</sup> Cohen, "A Revolution in Warfare," pp.40-41
- <sup>29</sup> *Ibid.*
- <sup>30</sup> Williamson Murray, "Thinking About Revolutions in Military Affairs," *Joint Force Quarterly*, (Summer 1997) p.76
- <sup>31</sup> Guilmartin, Jr., "Technology and Strategy: What are the Limits?," p.19
- <sup>32</sup> H.R. McMaster, "On War: Lessons to be Learned," *Survival*, 50:1 (2008) pp.22-23
- <sup>33</sup> Tim Benbow, "Talking' Bout Our Generation? Assessing the Concept of 'Fourth-Generation Warfare,'" *Comparative Strategy*, 27:2 (2008) pp.148-149
- <sup>34</sup> McMaster, "On War", p.19
- <sup>35</sup> Donald Rumsfeld, "Transforming the military," *Foreign Affairs*, 81:3 (2002) pp.21 & 25
- <sup>36</sup> McMaster, "On War: Lessons to be Learned," p.21
- <sup>37</sup> See Dima P Adamsky, "Through the looking glass: the Soviet military-technical revolution and the American Revolution in Military Affairs," *The Journal of Strategic Studies*, 31:2 (2008) pp.257-294
- <sup>38</sup> Andrew Dorman, "A peculiarly British revolution: missing the point or just avoiding change," chapter in Jeffrey Collins & Andrew Futter (eds.), "Reassessing the Revolution in Military Affairs: transformation, evolution and lessons learnt," (New York, Palgrave MacMillan: 2015)

<sup>39</sup> Jeffrey Collins, "The perpetual search for efficiency: the Canadian approach to the RMA and military transformation", chapter in Collins & Futter (eds.), "Reassessing the Revolution in Military Affairs".

<sup>40</sup> Rachel Bryson, "The interruption and evolution of Australia's RMA", chapter in Collins & Futter (eds.), "Reassessing the Revolution in Military Affairs".

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