RESEARCH PAPER

No. 142

APRIL

2010

THE REVOLUTION IN MILITARY AFFAIRS: THEORETICAL UTILITY AND HISTORICAL EVIDENCE

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INTRODUCTION

REVOLUTION IN MILITARY AFFAIRS: AN INTELLECTUAL CONSTRUCT

> *"The fact that slaughter is a horrifying spectacle must make us take war more seriously, but not provide an excuse for gradually blunting our swords in the name of humanity".*
>
> Carl Von Clausewitz, *On War*

Is the term "revolution" appropriate to describe past (and future) episodes of profound change in the way war is fought? This point has been too hastily overlooked by the early advocates of the Revolution in Military Affairs (RMA)[1] in the 1990's, although it seems to be an inescapable issue when we turn the attention to the debate on the Military Revolution[2] which, in the opinion of several historians, took place at the onset of the modern era. When we look at how the history of military revolutions has been debated we inevitably face the issue of periodization of the analyzed phenomena, in the sense that a "revolution" in warfare can hardly take months but rather years and even centuries to reach maturity. This does not necessarily mean that, by using the term "revolution" to describe a historical phenomenon developed over a long time period, we are bound to theoretical fallacy. Nonetheless, failing to focus on the temporal dimension of an alleged revolutionary change creates an inevitable conceptual confusion about the issue. The industrial revolution has indeed fundamentally changed the character of economic activity, and still it lasted

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1 Major contributions to the RMA debate are, among others: A. Krepinevich, *Cavalry to Computer. The Pattern of Military Revolution*, in "The National Interest", XLV, Fall 1994, pp. 30-42; T. Galdi *Revolution in Military Affairs? Competing Concepts, Organizational Responses, Outstanding Issues*, Federation of American Scientists, 30 nov. 1995, p. 8. Available at http://www.fas.org/man/crs/95-1170.htm; C. Gray, *Strategy for Chaos: Revolutions in Military Affairs and the Evidence of History*, London-Portland, Frank Cass, 2002; W. Murray, M. Knox (ed.), *The Dynamics of Military Revolution 1300-2050*, Cambridge; New York: Cambridge University Press, 2001.

2 The most comprehensive historical studies on the issue are: G. Parker, *The military revolution*, Cambridge [England]; New York: Cambridge University Press, 1988; J. Black, *"A military revolution? Military change and European society 1550-1800"* Atlantic Highlands, NJ : Humanities Press, 1991; C. Rogers, *The Military Revolutions of the Hundred Years' War* in "The Journal of Military History" 57, no. 2 (April 1993): 241-278; D. Eltis, *The military revolution in sixteenth-century Europe*, London: I. B. Tauris, 1998.

for more than a century.[3] However, if it is legitimate to use the "revolutionary" label to describe a very long process of change, what is the theoretical rationale for not using instead the term "evolution"? A reasonable answer would be that by underestimating the undeniable, profound variations that occurred at some points in the history of warfare, there is the risk of both ignoring the lessons of the past and denying ourselves the chance of understanding (and hopefully anticipating) future patterns of radical change. If we uncritically accept the idea that the history of warfare is made only of cumulative, evolutionary change, we would hardly be able to explain those variations that are clearly evident in the "grammar of war", as Clausewitz would say. Thus, a balanced approach is needed in order to recognize patterns of continuity and discontinuity, which inevitably overlap in ways that we can attempt to describe only through a problematic inquiry.

Since the 1990's Gulf War, RMA advocates in the United States began to emphasize the revolutionary impact of the advancements of Information and Communication Technology (ICT) on the nature of war, ranging from the strategic implications of using precision-guided munitions (PGMs) to futuristic concepts such as "system of systems" or "network-centric warfare". Indeed, some authors have gone as far as arguing that the massive use of ICT on the battlefield would ultimately reward the "revolutionary" armies with the ability to "lift the fog of war" once and for all.[4] This "technological dream", i.e. the creation of light, professional and high-tech armed forces capable to obtain decisive military success with minimum costs in terms of human loss (a very sensitive issue in what has been defined an age of "post-heroic warfare"[5]) and negative political consequences, appears to be one of the main determinants behind the

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[3] Geoffrey Parker offers this example to counter criticisms against his thesis in: G. Parker, *The military revolution*, 1988, p. 158.

[4] See Admiral William C. Owens' idea of an emerging "system of systems", cit. in W. Murray, *Clausewitz Out, Computer In. Military Culture and Technological Hubris*, in "The National Interest", XLVIII, Summer 1997, pp. 57-64.

[5] Luttwak, Edward. "Toward Post-Heroic Warfare." *Foreign affairs* 74, no. 3 (1995): 109.

rationale of the theses advocated by RMA "enthusiasts". By using this expression, it is not our intention to dismiss the importance of technological advancements applied to military matters: technology obviously *is* an extremely relevant factor in war. Nevertheless, while the RMA debate largely came to an end with the beginning of the XXI century, a fundamental issue remains: how can we think of the military revolution hypothesis as a *tool* (rather than an end in itself) to study the technological dimension of war without underestimating other factors? The concept and narrative of RMAs are, as Colin S. Gray has noted, not historical "facts", but rather intellectual constructs[6] created by scholars in order to isolate and define a set of phenomena, describe their characteristics, and (usually) to propose normative prescriptions for policy-makers. The implications of this inherently subjective nature behind the RMA theory are often too easily forgotten, thus deviating any analysis towards a reductive focus only on the immediate interests of policy-makers and other relevant parties (a prominent private actor is obviously the military industry). Unfortunately, this is for the most part what happened during the RMA debate. Hence, instead of arguing about the validity of the RMA hypothesis *per se*, it seems more useful to investigate whether this concept has served well the ambitions of its proponents or not. Besides all the difficulties to reach an agreed definition, and the obstacles that this shortcoming posed to empirical research, can the concept of RMA satisfactorily explain profound discontinuities in warfare? What is the role of technology, doctrine and organizational innovation during an RMA? Does an RMA necessarily bring about increased military effectiveness in war? At a more general level, what is the relationship between war, strategy and the RMA concept?

Since the structure that I have decided to follow may reasonably appear unusual to the reader, before describing the contents of the following chapters it is necessary to offer a clarification. In the preceding paragraphs, I have expressed my scepticism on asking if the RMA notion is something

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[6] Gray, Colin S., Strategy for chaos: revolutions in military affairs and the evidence of history. London; Portland: Frank Cass, 2002, p. 8-10.

"real", as if it was a hypothesis that we can empirically verify. But then, does it make sense to begin this study from the historical case (the Early Modern military revolution), while any evaluation of the RMA phenomenon ultimately depends not on the "facts" but rather on the preferences of the observer? My personal answer is decidedly negative. Hence, I have deemed reasonable to organize this writing following not a chronological order, but one which first of all allows us to determine what the RMA concept really is about, and then how it can be useful for improving our understanding of discontinuities in the history of warfare.

The first chapter will be devoted to a critical analysis of the RMA definition, or rather *definitions*. In fact, it is far from easy to isolate a sufficiently coherent and comprehensive account of the term itself and of its components. The origins of the term RMA, as will be shown, are to be traced back to Soviet military theory, and were later reformulated by several American authors. The historical context in which the RMA hypothesis was first advanced is crucial for understanding its theoretical evolution, and allows us to appreciate how the strategic thinking of the Cold War continued to influence (mostly through mere intellectual inertia) that of the 1990s in ways that may not be immediately clear. The great debate on the RMA was later ignited by Operation Desert Storm after 1991, mainly due to the enthusiasm that resulted from the performance of the U.S. military against the Iraqi army. In the aftermath of the Gulf War, an astonishing quantity of contributions were devoted to the "revolutionary" effects of new technologies such as precision-guided munitions (PGMs), stealth aircraft and sensors. In addition to that, an impressive amount of evocative terms (such as "system of systems", network-centric warfare, effects-based operations, to name just a few) was introduced in the discussion, certainly creating a lot of confusion around the key issue. Nevertheless, the RMA debate should not be entirely ignored or dismissed; as Colin S. Gray notes, "there can be no denying, on the one hand, the appeal of riding the wave of revolutionary change, or, on the other, the fear that one might be the victim

of some other polity riding that wave."[7] With the conclusion of the XX century, the RMA debate came to an end, but not without leaving its mark on both the field of strategic studies and U.S. defence policy (in the latter domain the catchword became "transformation"). However, the definitions offered by RMA advocates suffer from a series of shortcomings which pose serious doubts to the cautious researcher, and numerous questions about the validity of both the assumptions and the conclusions of the RMA hypothesis remain unanswered. After assessing the main definitions proposed within the RMA debate, I will illustrate the official U.S. defence reviews issued by three different administrations during the 1990s. This analysis is important because the RMA debate was essentially an American one.[8] As I will show, the impact of the ideas proposed by RMA enthusiasts was largely contradictory: while many concepts derived from the debate were officially adopted by the U.S. military establishment, there was basically no genuine implementation of those ideas in either defence planning or force posture.

The second chapter will illustrate my understanding of revolutionary change in warfare, based on the mentioned assumption that this is not a verifiable phenomenon that exists independently from the judgement of the researcher. I will first propose a series of definitions regarding a few crucial terms (war, strategy and warfare) which are necessary to fully appreciate not only the relationship between military innovation and war, but the fundamental nature of war itself. Secondly, I will provide a review of what can be termed as "general theoretical frameworks" advanced by some prominent scholars on the RMA hypothesis. Finally, I will make an assessment of the most persuasive ideas suggested in these theoretical approaches. In my opinion, any attempt at building a theory of revolutionary change in warfare would be inherently disputable at best; hence, the ultimate aim will be to incorporate the most convincing

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[7] Gray, Colin. Recognizing and understanding revolutionary change in warfare: the sovereignty of context. Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2006.

[8] Gray, Strategy for chaos. p.15.

arguments about the utility of the RMA notion within a broader conceptual framework, that can be then employed to understand the dynamics of innovation in the early modern European period. In this context, I will explain the reasons for which, from a theoretical point of view, a comparison between the “revolution in military affairs” and the “military revolution” is legitimate. Finally, I will argue that the strategic context within which revolutionary change emerges has a decisive role that has been incautiously ignored by the main advocates of the RMA.

The third chapter will be dedicated to an assessment of the works of military historians who debated one of the most radical changes in military matters of modern times: the introduction of firearms and artillery on the European battlefields. The concept of a “military revolution”, introduced by Michael Roberts in 1956, has been examined by numerous scholars over the last decades, and although no consensus has been achieved on the precise characteristics of the phenomenon, the fact that it received so much attention signals its potential relevance as a theoretical tool to deepen our understanding of military change. Hence, this historical period is potentially an ideal case study for conducting a balanced assessment of the ideas expressed in the previous chapter, and to derive some conclusions on past patterns of discontinuity in the history of warfare.

CHAPTER I

THE 1990S REVOLUTION IN MILITARY AFFAIRS

The term “revolution in military affairs” began circulating in the U.S. largely as a result of the 1991 Gulf War against Iraq. To many analysts and military officials, the stunning success of the international coalition formed under the auspices of the United Nations and led by the U.S. against the Iraqi army, seemed to prove that the use of high-tech weapon systems would become the decisive factor in any future military operation. Moreover, some commentators and scholars of military strategy began to advance a more radical view of the impact of Information Technology in combat, which would be as powerful as to change the very nature of war.

This chapter will first illustrate the historical context in which the RMA hypothesis was developed, given that its theoretical foundation can be fully appreciated only by acknowledging its late Cold War origins. In fact, the legacy of both Soviet and U.S. strategic theories developed before the fall of the U.S.S.R. was often treated with insufficient attention by RMA enthusiasts, and it is essential to give at least an overview on the issue. Moreover, it is also necessary to analyse the impact of Operation Desert Storm, which served as a powerful catalyst for the subsequent 1990s RMA debate and offers interesting insights regarding the American defence culture.

Then I will focus the attention on the most important definitions of RMA that have been advanced by scholars and analysts. In doing so, I will examine their basic assumptions, the different perspectives that they offer, and their major shortcomings. Three aspects of these definitions will be specifically underlined: the first is the already mentioned (and certainly controversial) emphasis on the necessary role of technological change for the realization of an RMA; the second, highly disputable point is that successful revolutionary change implies what Colin Gray calls *strategic*

effectiveness[9]; the last, and maybe most important aspect that can be found in these definitions is an inadequate (in fact, almost absent) appreciation of the adversarial dimension of war.

After reviewing the most relevant definitions within the RMA literature, I will briefly describe two main perspectives on the so-called "Information Warfare" (IW). The first version of this notion is relatively "conservative", as it underscores the impact of information technology on the utility of air power. The second, more radical interpretation is based on the assumption that IW constitutes a new dimension of conflict, and that those militaries possessing "information dominance" will be able to obtain decisive victory with extremely low costs in terms of casualties.

Finally, I will provide an account of the degree of influence of the RMA debate on U.S. defence policy during the 1990s. This review will include the four main official reports elaborated by the Department of Defense (DoD) during the 1990s: the Base Force (1992), the Bottom-Up Review (1993), and the first two Quadrennial Defense Reviews (1997 and 2001). An analysis of these documents is useful to illustrate the essential continuity of the strategic principles endorsed by the U.S. military, and ultimately to underline the contradictory behaviour of the U.S. armed forces regarding the proposals of the more "radical" views expressed within the RMA debate.

Historical origins and context of the RMA debate

The terms "revolution in military affairs" and "military-technical revolution" (MTR) appeared for the first time after World War II in Soviet military studies[10], and were used to describe such discontinuities in warfare as the development in the 1920s of mechanized forces and the combination of nuclear warheads with self-propelled delivery systems (in their cruise and ballistic missile variants). During the 1970s Soviet military thinkers

[9] Gray, Strategy for chaos. p.5.

[10] Adamsky, Dima. "Through the Looking Glass: The Soviet Military-Technical Revolution and the American Revolution in Military Affairs." *Journal of Strategic Studies* 31, no. 2 (April 2008): 257-294.

began to claim that an MTR was coming in the form of high-tech precision weapons and communication systems which would revolutionize war by generating a dramatic increase in operational depth. This view was derived from the analysis of the U.S. AirLand Battle (ALB) concept and its NATO counterpart, the Follow On Force Attack (FOFA). These doctrinal innovations (developed during the 1980s) were devised in order to counter the menace posed to the Western European theatre of operations by Soviet conventional superiority and its in-depth tactical doctrine (which envisaged the use of several "echelons" to be concentrated only at the point of attack). Both the ALB and the FOFA essentially consisted in the development of deep strike capabilities through the use of stand-off weapons whose speed and accuracy had been highly improved thanks to technological innovations.

Marshal Nikolai Ogarkov, Chief of the Soviet General Staff since 1977, was the most vocal supporter of the MTR thesis: he maintained that the combination of high-tech weapons and organizational and doctrinal adaptation constituted a profound discontinuity in the nature of war which deserved the revolutionary label. For the Soviets, there were two major implications of this MTR: first, the decreasing importance of nuclear weapons and the corresponding increase in conventional forces' capabilities. Second, the blurring of the line separating defensive and offensive postures deriving from the versatility of high-precision weapons. At a more general level, the idea was that "future equipping of the military with new means of fire, reconnaissance and control would occur at an equal rate on both sides. *The superiority however would be gained by whichever side realized their application more rapidly and on a broader scale*"[11]. In brief, the MTR imagined by the Soviets would consist of a coherent integration of intelligence assets, stand-off fire platforms and manoeuvring elements of the extended battlefield.

The influence of the Soviet MTR debate on U.S. military analysis

[11] Adamsky, cit. pag. 269 (emphasis added).

was scarce until the end of the 1980s, when Albert Wohlstetter and a few other prominent figures in the defence establishment claimed that the strategic implications of an increased reliance on precision-guided munitions (PGMs) had been until then ignored by the high ranks of U.S. armed forces. The turning point of the early RMA debate was a classified report (*"The military technological revolution"*) published in 1992 by the Pentagon's Office of Net Assessment (ONA) and authored by Andrew Marshall and Andrew Krepinevich. The main argument, later reiterated in a 1994 National Interest article, was that an RMA[12] occurs when the combination of technological change with innovative operational concepts and organizational adaptation fundamentally changes the nature of warfare[13].

The grand debate of the 1990s on the coming revolution in warfare would probably not have been as steadfast as it became without the 1991 Gulf War. In fact, Operation Desert Storm provided the RMA enthusiasts with a striking example of the direction to pursue in order to maintain U.S. military primacy in the post-Cold War security environment. Most of the early post-war assessments suggested that it was U.S. technological superiority which allowed the sensational (and largely unexpected in its proportions) success against the Iraqi army. Hence, RMA proponents claimed that future defence policy had to be massively focused on increasing the armed forces' reliance on IT and developing a coherent military doctrine around such ideas as the "system of systems" or "network-centric warfare". Nonetheless, a more balanced account of Desert Storm offers quite a different, mixed picture[14]: the U.S. technological advantage could be fully exploited because of major Iraqi defensive mistakes, thus the relative skill of the enemy was all but relevant for the final outcome.

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[12] The MTR acronym was deemed to excessively emphasize the technological dimension of the "revolution", hence "RMA" became the acronym of choice.

[13] A more detailed description of Krepinevich's thesis will be proposed in the following paragraphs.

[14] Biddle, S. "Victory Misunderstood: What the Gulf War Tells Us about the Future of Conflict." *International Security* 21, no. 2 (1996): 139-179.

Without those mistakes, U.S. forces would probably not have achieved such a swift success.

Moreover, the outcome of Desert Storm on the U.S. military culture was particularly worrisome: there was the sense that the Vietnam-era faith in modern technology and "business management" of warfare was coming back. In 1947 George Marshall claimed that he "doubt[ed] seriously whether a man can think with full wisdom and with deep convictions regarding certain of the basic issues today who has not at least reviewed in his mind the period of the Peloponnesian War and the fall of Athens".[15] Such views were widely echoed inside the military establishment. This awareness of history and of the intrinsic uncertainty of war was largely forgotten within a couple of decades, replaced by Robert McNamara's business culture and the use of "benchmarks" to assess military success. The bitter experience of Vietnam rightfully inflicted a fatal blow to this way of thinking, and was followed by a much-needed interest and acceptance for the Clausewitzian primacy of the human factor in war.[16] The Gulf war thus represented the concrete implementation of this attention for professional military education and the lessons of history. Yet along with victory against the Iraqi army in the Gulf War, a powerful tendency towards a blind faith in technology emerged once again. As the Vietnam War generation was leaving active duty in the armed forces, a major shift in the cultural and intellectual background was eroding the Clausewitzian narrative, at the hands of a younger military leadership. Among others, Williamson Murray expressed his grave concern over the widespread illusion that technology would guarantee "total battlespace and foreign policy dominance in the next century".[17] While duly acknowledging the potentially vigorous leverage offered by technology against prospective opponents, Murray underlines the serious danger posed by this resurgent technocratic view in a resolute manner: "it is wholly disconnected from what others think, want, and can

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[15] Cit. in: Connor, W. *Thucydides*. Princeton N.J.: Princeton University Press, 1984. p. 3.

[16] Official endorsement of Clausewitz's principles is manifest to any reader of doctrinal manuals of the time, such as the 1986 FM 100-5.

[17] Murray, Williamson. "Clausewitz Out, Computer In." *The National interest*, no. 48 (1997): 57.

do".[18] A similar point is made by Lawrence Freedman when he maintains that "the revolution resulting from the Gulf War was one of expectations. Up to 1991, the US seemed to have lost its grip on the art of warfare; after Desert Storm, it appeared unbeatable – at least when fighting on its own terms."[19] In addition to that, it has been noted that behind the enthusiasm for the victorious war in the Gulf and the widely accepted notion of an imminent revolution in warfare, rested a "moral subtext"[20]: there is no question that the outcome of Desert Storm perfectly suited the American way of war. Two reasons justify this assertion: the war ended with a decisive victory that claimed a very low number of casualties, and the aim of the intervention was successfully presented to the public as indisputably "just". In this context, the RMA symbolized the ultimate effort to restore the political utility of war that was so frustrated during the Cold War era, an effort intimately associated to Western, and particularly American, desires.

RMA definitions

In the previous paragraphs I have generally referred to the RMA as a uniform hypothesis: it is however necessary to recognize that this is an oversimplification. In fact, the "revolution in military affairs" resembles more a "narrative" than a coherent theory. This is largely due to the conceptual vagueness that characterizes the terminology adopted by its proponents. Definitions of the RMA certainly do not lack, but very few (if any) of them possess the virtue of theoretical clarity. Early views of the RMA were distinctly affected by the Soviet MTR debate, in both a negative and positive fashion. While Andrew Marshall and others (among them Andrew Krepinevich) rejected the MTR label as excessively focused on technology in favour of the more comprehensive RMA, several authors enthusiastically adopted the Soviet belief (if not their terminology) that the

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[18] Ibidem.

[19] Freedman, Lawrence. *The revolution in strategic affairs*. London; New York: Oxford University Press for the International Institute for Strategic Studies, 1998. p. 29.

[20] Bacevich, A. "Just War II: Morality and High-Technology." *The National interest.*, no. 45 (1996): 37.

future of warfare would be largely determined by a technological revolution.

Marshall defines RMAs as "fundamental, far-reaching changes in how advanced militaries either plan to conduct, or actually prosecute, military operations."[21] Later on, he added that "[t]he term revolution is not meant to insist that change will be rapid [...] but only that the change will be profound, that the new methods of warfare will be far more powerful than the old. Innovations in technology make a military revolution possible, but the revolution itself takes place only when new concepts of operations develop, and, in many cases, new military organizations are created."[22]

Krepinevich's definition was probably the most influential, although interestingly enough he did not use the RMA acronym, observing instead that a *military revolution* (MR) is "what occurs when the application of new technologies into a significant number of military systems combines with innovative operational concepts and organizational adaptation in a way that fundamentally alters the character and conduct of conflict. It does so by producing a dramatic increase – often an order of magnitude or greater – in the combat potential and military effectiveness of armed forces."[23] Moreover, Krepinevich adds that "while advances in technology typically underwrite a military revolution, they alone do not constitute the revolution".[24] He also maintains that four factors play a necessary (but not sufficient) role in these revolutions: technological change, systems development, operational innovation, and organizational adaptation. Finally, Krepinevich emphasizes two additional elements as extremely important for the emergence of a MR: the degree of State competition in the international system and the strategies the competitors choose to pursue in exploiting the potential of the emerging military revolution.

A third interesting interpretation is that given by Richard O.

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[21] Cit. in Roxborough, Ian. "From revolution to transformation: the state of the field - Military Transformation." *Joint Force Quarterly* 32 (Autumn 2002).
[22] ibidem.
[23] Krepinevich, A. "Cavalry to Computer." *National Interest*, no. 37 (1994): 30.
[24] Ibidem.

Hundley, who maintains that “an RMA involves a paradigm shift in the nature and conduct of military operations which either renders obsolete or irrelevant one or more core competencies of a dominant player, or creates one or more new core competencies, in some new dimension of warfare, or both.”[25]

Theodor Galdi offers another definition which needs to be fully quoted: “a revolution in military affairs takes place when one of the participants in a conflict incorporates new technology, organization, and doctrine to the extent that victory is attained in the immediate instance, but more importantly, that any other actor who might wish to deal with that participant or that activity must match, or counter the new combination of technology, organization, and doctrine in order to prevail. The accomplishments of the victor become the necessary foundation for **any** future military activities in that area of conflict.”[26]

The first two definitions share the idea that technological innovation, though not being sufficient in itself, is a necessary enabler of revolutionary change in warfare: in other words, an RMA must follow from some “efficient” adaptation of doctrine and organization to a given technology. This interpretation appears certainly reasonable at a first glance, but if we accept the idea that change will be profound, but not necessarily rapid, wouldn't it be equally reasonable to view the process more as an *evolution* rather than a *revolution*? Moreover, both Marshall and Krepinevich do not take into sufficient consideration the adversarial dimension of war: suggesting that an RMA increases both combat potential and military effectiveness indicates that the relationship between the two terms must be linear and predictable. But if we deem the lesson of Clausewitz as still valuable, this kind of interpretation hides a highly contentious implication

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[25] Hundley, Richard O. Past Revolutions, Future Transformations: What Can the History of Revolutions in Military Affairs Tell Us About Transforming the U.S. Military? Santa Monica, CA: RAND, 1999. p. 9

[26] Galdi, Theodor. *Revolution in military affairs? Competing concepts, organizational responses, outstanding issues*. Washington D.C.: Congressional Research Service Library of Congress, 1995. (Emphasis in the original text).

about the nature of war. Furthermore, this argument does nothing to help understanding how increased combat potential (a rather obscure expression) and military effectiveness contribute to the ultimate ambition of any armed forces: strategic success. It must not be forgotten that "RMA is not a necessary, let alone a sufficient, condition for victory."[27]

Hundley's definition has certainly more merit, in that it provides a way to test RMA candidates for gauging their consistency with the proposed theory. The crucial factor in this theoretical framework is the term *core competency*, which Hundley defines as "a fundamental ability that provides the foundation for a set of military capabilities"[28], offering as an example the ability of the U.S. Military to detect and hit enemy targets through precision weapons. Nevertheless, there is an implicit paradox in this line of reasoning: if we accept it, we would hardly be able to explain the strategic defeat of the United States in Vietnam, or the current entanglements in Iraq and Afghanistan. Furthermore, in Hundley's definition there is a high risk of reification of the very concept of RMA: in fact, his analysis treats the RMA as an empirical phenomenon which can be more or less consciously pursued by the "judicious" military establishment.

Galdi's interpretation is undeniably flawed in its assumption that military victory *must* follow revolutionary innovation; moreover, it suffers from the same misconception observed in the definitions of Krepinevich and Marshall, in that it considers a technological change as essential in the RMA. Nevertheless, Galdi deserves credit for taking into account the persistent risk that, in a permissive area of conflict, an adversary might effectively counter the abilities originated by a given RMA.

An important issue that characterized the RMA debate was the contextual use of related, but allegedly different, terms like the "military revolution" (MR) and the "military-technical revolution" (MTR). The rationale of this conceptual differentiation consists in the "reach" that the given revolution possesses: thus, a military revolution influences a broader

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[27] Gray, C. Strategy for chaos. p. 4.
[28] Hundley, cit.

range of political and social aspects which contribute to fundamentally alter the character of warfare. The alleged difference between RMA and MR, and its potentially relevant implications for the present study will be addressed in detail in the next chapter.

The main elements of the 1990s RMA hypothesis

Several authors tried to summarize the fundamental features that emerged from the RMA debate, which basically revolved around the role of information in war. Bjørn Møller, in a 2002 publication of the Copenhagen Peace Research Institute, offers an interesting description of the main components of the information-led RMA that was allegedly emerging during the 1990s. Møller briefly illustrates the central “themes” of the RMA, which essentially represent more or less radical interpretations of the so-called “Information Revolution”.

The practical effects of this revolution on everyday life are evident when we consider the increasing diffusion of high-tech consumer products, such as the mobile phone, satellite television, the personal computer, the internet, and GPS (Global Positioning System) devices. At a more general level, it is undeniable that the information revolution has dramatically reduced the costs of real-time communication even at great distances. Moreover, there is also the potential for what has been called “global transparency” (meaning that events occurring in remote parts of the globe can be broadcast to the rest of the world in real time).

Most of the new technologies developed in recent years are “dual-use”, hence they have powerful military implications (indeed, some of them were initially invented for military use). Therefore, the impact of the information revolution on military matters is certainly not surprising; rather, the dispute revolves around the depth of this impact. Although a dichotomous approach may result in oversimplification, Møller's analysis is certainly useful for the purpose of offering a generic review of the opinions about information and warfare, as he maintains that there are two main interpretations (one more conservative, the other more radical) of the

relationship between these two phenomena.

Information as a Force Multiplier

The more prudent view of the information revolution implies that information technologies enhance military operations through better intelligence, target acquisition and communications, permitting long-range precision strikes thanks to high-tech sensors, computers and advanced platforms, including satellites. Within this approach, information technologies essentially function as "force multipliers".

This interpretation rests on the assumption that the combination of surveillance and target acquisition with stand-off precision weapons allows for accurate strikes against enemy forces. The result, as Martin Libicki put it, would be that once the armed forces achieve so-called Dominant Battlespace Knowledge (DBK) "only psychological reasons (…) remain to justify most classical ground operations except for territorial occupation".[29] This is essentially the same logic behind the idea that air power is (at least potentially) superior in comparison to land and sea power, and that it may even be possible to win wars through the sole use of stand-off weapons.

Two implications of such precision air strikes capability are more or less explicitly emphasized by RMA advocates, and deserve to be noted here (in fact, they have already been mentioned in a more general context). The first is a considerable reduction of collateral damage, thus allowing for "clean" wars perfectly suited for "post-heroic" warfare and contemporary "just war" theories. Secondly, and more importantly, the combination of air power and precision weapons would minimize the risk of own casualties.

In conclusion, nothing genuinely new about the role of information emerges in this perspective: it is conceived as a long-established tool, strongly enhanced by new technologies, to wage war more or less on the same terms described by classical strategic theorists such as Sun Tzu or Liddell Hart.

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[29] Libicki, Martin. *Dominant battlespace knowledge*. Rev. ed. Washington DC: National Defense University Press, 1996. p.11.

War in the "Information Dimension"

The second, more radical view of "information warfare" sees it as a distinct dimension of conflict[30]. The Pentagon endorsed this approach in 1992, and Information Operations were the subject of a US Army Field Manual (FM 100-6), which defines them as "continuous military operations within the MIE [Military Information Environment] that enable, enhance, and protect the friendly force's ability to collect, process and act on information to achieve an advantage across the range of military operations. IO include[s] interacting with the global information environment and exploiting or denying an adversary's information and decision capabilities".[31]

An evocative (and contentious) description of the consequences of the information revolution is offered by Arquilla and Ronfeld, when they maintain that "[...] warfare is no longer primarily a function of who puts the most capital, labor and technology on the battlefield, but of who has the best information about the battlefield".[32] After explaining that "cyberwar" is about organization as much as technology, these two authors argue that it will transform the very nature of war. The post-modern battlefield, they continue, "stands to be fundamentally altered by the information technology revolution, at both the strategic and the tactical levels."[33] Their conclusion is that decisive, "war-winning" advantages will be achieved through information dominance, and that a "cyberwar doctrine" would entail the ability to obtain victory (at least in conventional wars) at low cost in both blood and treasure.

As many critics noted, the ultimate battlefield (or "battlespace", as RMA advocates call it) is the enemy's "will". While it is reasonable to maintain that new technologies allow for increased information, there is a

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[30] Freedman, Lawrence. *The revolution in strategic affairs*. London; New York: Oxford University Press for the International Institute for Strategic Studies, 1998. p.49.

[31] Starry, Michael. "FM 100-6: Information Operations." *Military review.* 76, no. 6 (1996): 3.

[32] Arquilla, John, and David F. Ronfeldt. *In Athena's camp: preparing for conflict in the information age*. Santa Monica Calif.: Rand, 1997. p.23.

[33] Ibidem, p.32.

great deal of difference between superior knowledge *per se* and superior understanding. At the tactical level, possessing "information dominance" does not automatically ensure that the information gathered is actually relevant, nor that it can be correctly processed.[34] At the strategic level the very concept of IW is based on the questionable idea that the more technologically advanced military will necessarily benefit from the information revolution, while the opposite (i.e. that the technologically-dependent will suffer from a greater strategic vulnerability) may very well be true.[35]

In conclusion, as Lonsdale correctly notes, many of the ideas described earlier are "not only astrategic and ignore the paradoxical logic of strategy; they also implicitly rely upon unrealistically effective operations, and thereby seemingly ignore the presence of friction."[36]

The Pentagon's RMA

The United States military has a long history of fascination for revolutionary change in warfare. Hence, some argue, it would be contrary to this cultural inclination for U.S. military planners to accept the idea of continuity and dismiss that of revolution. At the same time, U.S. policy-makers also have long despised the maintenance of large standing armed forces or the creation of an arms industry. This attitude was behind the improvisation evident in the American management of both World Wars and the subsequent demobilization of its armed forces and the conversion of most of its military-industrial complex.[37]

Nonetheless, there is some disagreement over the fact that high technology has always been the dominant element in U.S. strategic culture. Some authors argue that a heavy reliance on technology emerged only after

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[34] Betz, D. "The more you know, the less you understand: The problem with information warfare." *Journal of Strategic Studies* 29, no. 3 (2006): 505-533. p.515.

[35] Ibidem, p. 508.

[36] Lonsdale, David. The nature of war in the Information Age: Clausewitzian future. London;New York: Frank Cass, 2004. p.7.

[37] Møller, Bjørn. *The revolution in military affairs: myth or reality?* København: Copenhagen Peace Research Institute, 2002.

the end of World War II, when the U.S. defence establishment began to emphasize the need to ensure a qualitatively superior military equipment.[38] Instead, other scholars point to the fact that there is a distinctly American "way of war" based on the need to replace manpower with firepower, exemplified by General Van Fleet's desire (expressed at the time of the Korean War) "to expend fire and steel, not men"[39]. This underlying approach led ultimately to a continuous effort to depend less and less on quantitative material superiority and attrition to ensure victory. Colin Gray even traced this persistent preference for mechanical solutions back to the nineteenth century, due to the shortage of craftsmen, which has since become a distinctive American cultural feature.[40]

Since the beginning of the Cold War, the existence of a single strategic adversary led the U.S. military to develop a threat-based planning system, in which the predictability of the Soviet threat allowed for a sufficiently clear definition of priorities for the allocation of resources. With the fall of the USSR, however, the strategic context was entirely overhauled: absent the danger of a nuclear escalation that constrained American ambitions and military engagements around the globe, and endowed with superior logistical capabilities built during the preceding years, U.S. planners could decide to fight war in their preferred fashion without any limit to conventional innovation.[41]

As one author alarmingly observed in the early post-Cold War years, the U.S. abandoned a long established American tradition by choosing to retain its large standing armed forces in the absence of any clear threat to its own security.[42] The lack of a clear external threat paradoxically pushed the

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[38] O'Hanlon, Michael. *Technological change and the future of warfare*. Washington D.C.: Brookings Institution Press, 2000.

[39] Cit. in: Davis, Norman C. An Information-Based Revolution in Military Affairs, in Arquilla, John, and David F. Ronfeldt. In Athena's camp: preparing for conflict in the information age. Santa Monica Calif.: Rand, 1997.

[40] Gray, Colin. *Irregular enemies and the essence of strategy can the American way of war adapt?* Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2006. p. 35.

[41] Freedman, Lawrence. *The revolution in strategic affairs*. London; New York: Oxford University Press for the International Institute for Strategic Studies, 1998. p. 32.

[42] Bacevich, A. J. "Tradition abandoned." *The National Interest*, no. 48 (1997): 16-25.

U.S. defence apparatus either to search for new enemies, or to find a way to formulate its military posture in the absence of a significant adversary. In any case, military planning had to face new, and increasingly pronounced factors into consideration.

Three main elements shaped the defence planning process at the time: consistent budget reductions (the so called "peace dividend"), the already cited heightened risk-aversion of the U.S. public for the use of military force abroad, and what one author calls the "humanitarian imperative"[43], which brought the U.S. to intervene in several civil wars around the globe during the 1990s. This latter tendency put a particularly powerful pressure on how military force could be used: if it was to be employed for protecting human rights and/or to alleviate human suffering, the use of force had to be as discriminating and non-lethal as possible. Hence the pursuit for "non-lethal weapons" and for minimizing collateral damage.[44]

During the years dominated by the RMA debate, between 1991 and 2001, there were four major defence planning reviews: the "Base Force" in 1991 (which was delineated in the 1992 U.S. National Military Strategy), the "Bottom-up Review" in 1993, and two consecutive "Quadrennial Defense Reviews" in 1997 and 2001. An account of these documents will be offered in order to describe how the RMA thesis gained importance in the U.S. defence establishment.

The Base Force

The Base Force was aimed to meet the needs of the post–Cold War era: it entailed a profound change in strategy and force structure in order to replace the defence planning adopted by the U.S. during the confrontation with the Soviets, which was centred on deterrence and forward defence in the European and Pacific theatres. The new strategy was designed to address regional threats and maintain a permanent military presence

[43] Møller, cit. p.33.
[44] Ibidem. p.34.

overseas.

While the Base Force was being drafted (from the initial stages in 1989 until its presentation in 1991), U.S. armed forces were dispatched to several theatres of operation: Panama, Iraq/Kuwait and Haiti. In the same period, U.S. forces were also deployed for evacuation operations in Liberia, Somalia, the Philippines, and for humanitarian relief operations in northern Iraq and Somalia. Moreover, a growing number of USAF aircraft were stationed overseas in the early 1990s, especially during and after Desert Storm, on a scale that was truly unprecedented.[45]

At the beginning of 1989 an economic slowdown and an increasing deficit prompted the Office of Management and Budget (OMB) to demand considerable reductions in the FY 1990 defence budget, while the Joint Chiefs of Staff (JCS) requested a real 2 percent increase. The Bush administration chose to freeze spending for one year while planning a real 1.2 percent increase over the Future Years Defense Program (FYDP), under the assumption that within a year the threat environment and the consequent defence requirements would become less ambiguous.[46]

The rationale underlying the Base Force consisted in the development of a new military strategy and force structure fit for the post-Cold War environment, but it also entailed a cautious approach to force reductions in order to face the risks of a resurgent Soviet/Russian menace. The Base Force and the national security review were both predicated on the assumption of a 25 percent reduction in force structure and a 10 to 25 percent reduction in defence resources. The declared objectives of the Base Force, as expressed by the Chairman of the Joint Chiefs of Staff Colin Powell, were the maintenance of the minimum force needed to "deter aggression, provide meaningful presence abroad, respond to regional crises, and rebuild a global warfighting capability".[47]

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[45] Larson, Eric. Defense planning in a decade of change: lessons from the base force, bottom-up review, and quadrennial defense review. Santa Monica CA: Rand, 2001. p.8.

[46] Ibidem.

[47] The national military strategy of the United States. U.S. Government Printing Office, 1992. p.17.

Powell's efforts were focused on securing the support of the service chiefs for the Base Force. For this reason he proposed a carefully balanced reduction of budget and manpower among the four services, thus avoiding a more aggressive path of transformation. In addition to that, Defense Secretary Richard Cheney was convinced, not groundlessly, that past U.S. force reductions (after World War II, Korea and Vietnam) had a hugely negative impact on the health of the U.S. military.[48]

Overall, the Base Force was not influenced at all by the RMA debate (which had just begun in those years and had yet to gain momentum), but it is still important to illustrate some strategic assumptions which continued to shape subsequent defence reviews. The most relevant of these are: a post-Cold War defence posture tailored on regional threats, a persistent emphasis on strategic deterrence and defence, forward presence and crisis response. Nonetheless, the idea that after the fall of the Soviet Union there would not be the possibility of long-term contingency operations was soon contradicted by the stationing of tactical air forces in the Persian Gulf and South-East Asia.[49]

The Bottom-Up Review 1993

At the beginning of the Clinton administration, Secretary of Defense Les Aspin initiated the second major defence review of the 1990s: the Bottom-Up Review (BUR). In Aspin's view, the BUR was aimed at implementing "a comprehensive review of the nation's defence strategy, force structure, modernization, infrastructure, and foundations."[50] By the end of FY 1993 the Base Force's intended 25 percent reduction of forces had been mostly attained, and the BUR further mandated total reductions amounting to one-third relative to FY 1990.

At the time the The U.S. military had to confront several regional crises and tensions around the globe (Somalia, Bosnia, the former Soviet

[48] Larson, p.10.
[49] Ibidem, p.39.
[50] Aspin, Les. *Report on the bottom-up review*. Washington D.C.: U.S. Dept. of Defense, 1993. p.iii.

Union), and this led to a large deployment of its Air Force for contingency operations. From January to September-October 1993, the average number of U.S. aircraft engaged in contingency operations rose from about 175 to some 225 aircraft.[51] This increase resulted from the Clinton administration's activist conception of engagement, which put a premium on the use of military forces in a broad range of operations overseas.

The BUR openly declared that the "[t]he threat that drove [U.S.] defense decision-making for four and a half decades (…) [was] gone"[52], and subsequently indicated four main "new dangers" falling into four categories: the proliferation of weapons of mass destruction (WMD); regional dangers resulting both from large-scale aggression by major regional powers and from more limited (often internal) ethnic, religious, and other forms of conflict; dangers to democracy and reform in the former Soviet Union, Eastern Europe, and elsewhere; and economic dangers due to a failure to build a strong and growing U.S. economy. The BUR maintained that the U.S. military was central to combating the first two of these dangers, but it also stated that the Armed Forces could play a significant role in meeting the last two.

The planning strategy devised in the BUR was based on the need to achieve four fundamental objectives[53]:

- to defeat aggressors in major regional contingencies (MRCs);
- to maintain overseas presence to deter conflicts and provide regional stability;
- to conduct smaller-scale intervention operations (peace enforcement, peacekeeping, humanitarian assistance, and disaster relief);
- to deter attacks with WMD against U.S. territory, U.S. forces, or the territory and forces of U.S. allies.

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[51] Larson, cit. p.42.
[52] Aspin, cit. p.1.
[53] Larson, cit. p.46.

The most relevant objective, in the context of force structure planning, was to achieve victory in two MRCs. In this regard, four possible options were formulated in the BUR: (1) win one MRC; (2) win one MRC with hold in the second ("win-hold-win"); (3) win two nearly simultaneous MRCs; and (4) win two nearly simultaneous MRCs plus conduct smaller operations. Although in late May and early June 1993 DoD sources recommended the second strategy (win-hold-win), both at home (Congress and the press) and abroad (U.S. allies) there was serious criticism regarding this choice.[54] Hence, the option endorsed in the BUR was the third, as it was deemed as providing "sufficiently capable and flexible military forces to position the United States to be a leader and shaper of global affairs for positive change".[55] It is important to note that the underlying assumption was that these MRCs would be relatively similar to the 1991 Gulf War.[56]

The deployment of U.S. military forces overseas in peacetime was considered an essential element not only in the event of emerging regional threats, but also as a tool for pursuing new "opportunities". Three reasons were indicated to justify this view. The first was that the peacetime overseas presence was the most effective proof of U.S. commitment to defend national and allied interests around the world, while assuring a strong military, political and economic influence in vital regions. A second reason was that maintaining an overseas presence greatly improved U.S. crisis response capabilities, and it also enhanced military cooperation with its allies. Finally, in case of war or other types of crisis, possessing forces and bases abroad facilitated the deployment of additional troops in the relevant region.[57]

The third objective outlined in the BUR consisted in providing for a variety of low-intensity operations (peacekeeping, peace enforcement and unilateral interventions short of war). Although initially the U.S. seemed to accept these kind of involvements, the misadventure in Somalia greatly

[54] Ibidem, p.50.
[55] Aspin, cit. p.30.
[56] Møller, cit. p.35.
[57] Aspin, cit. p.8.

reduced their will to participate in such contingencies again.

Finally, the BUR put a renewed emphasis on ballistic missile defence and non-proliferation.[58] On the one hand, it was aimed at preventing hostile states (especially Iraq, Iran and North Korea) from acquiring weapons of mass destruction (WMD). On the other hand, it focused on the need to deploy an effective range of capabilities to defend the U.S. (and, to some extent, its allies) against ballistic missiles, either by defensive means (with a ballistic missile defence system) or offensively, through preemptive attack.

The BUR did not dedicate much attention to specific technologies nor to the emerging RMA debate, but it did suggest changes in military innovation and research and development (R&D). A particular emphasis was given to the need for investing in dual-use technologies and promoting a more unrestricted flow of technology between the military and civilian sectors. The BUR also stated the need to "design a balanced modernization program that safeguards this [technological] edge and the necessary supporting industrial base without buying more weapons than we need or can afford"[59], thus expressing the intention to boost the development of prototypes of new weapons systems while postponing industrial production and deployment until needed.

Finally, some RMA-related concepts were included in the BUR under the label of "force enhancements": Battlefield Surveillance; Command, Control, and Communications (C^3) and "advanced munitions". However, these developments were not deemed as "revolutionary": they were instead seen from a positive, but still evolutionary, point of view. The benefits of the Joint Surveillance and Target Attack Radar System (JSTARS), the Airborne Warning and Control system (AWACS), and the Milstar satellite communications system were deemed able to guarantee a tactical advantage in intelligence and communications. The only explicit reference to "smart munitions under development" estimated their potentially dramatic impact on the capacity to destroy armoured vehicles

[58] Ibidem, p.6.
[59] Ibidem, p.12.

and invading ground forces, while allowing for more effective long-range destruction of fixed targets.[60]

The 1997 Quadrennial Defense Review

In 1996, at a time when the RMA thesis was the "acronym of choice" in the American defence establishment, the U.S. Congress requested a new review and instituted the quadrennial defense reviews, the first to be completed in 1997. The main goal of the 1997 QDR was to readjust the defence program and budget in order to redress the flow of funds from modernization to operations expenditures. The U.S. Armed Forces, according to the report, needed to achieve three fundamental capabilities: shaping the international security environment in ways favourable to U.S. interests, responding to the full spectrum of crises when directed, and preparing now for an uncertain future.[61] In general, the strategic assumptions and goals remained roughly the same as those of the BUR, including the ability to win two major regional contingencies at the same time, but there was a new and relevant emphasis on the possible future of warfare.

Three strategic alternatives were discussed in the QDR: the first focused on near-term contingencies and implied maintaining the force structure exactly as it was, while postponing radical innovation; the second option pointed in the opposite direction, downplaying the current dangers and emphasizing a profound restructuring of the Armed Forces; the third option entailed a balanced path, with the purpose of largely maintaining the force structure while at the same time building the future force. It goes without saying that the third option was the preferred one, as the first two represent a clear example of political parlance.

Behind this focus on future warfare there were many elements derived from the RMA narrative, which had been endorsed in 1996 by a report of the Joint Chiefs of Staff called *Joint Vision 2010.* The document's

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[60] Aspin, cit. p.18.

[61] The Quadrennial Defense Review, full text released by the Office of the Secretary of Defense, 19 May 1997, at www.fas.org/man/docs/qdr/

stated objective was to offer a template providing "a common direction for our Services in developing their unique capabilities within a joint framework of doctrine and programs as they prepare to meet an uncertain and challenging future."[62] The concept of Full Spectrum Dominance (defined as the capability to dominate an opponent across the range of military operations) was seen as the key feature that the U.S. Armed Forces had to acquire in the near future. The fundamental assumption was that, since the end of the Cold War, superior technology had been crucial for success in combat. The combination of technology with information superiority would enable the U.S. military to achieve "the effects of mass – the necessary concentration of combat power at the decisive time and place – with less need to mass forces physically than in the past".[63] Moreover, the four services of the U.S. Armed Forces needed to be organized in a strongly integrated framework (defined by the word "jointness") in order to fully exploit this technological edge.

To this end, four operational concepts were enunciated in Joint Vision 2010: dominant manoeuvre, precision engagement, full dimensional protection and focused logistics. Unfortunately, these four notions are poorly defined in the report: the means indicated to achieve their desired ends suffer from continuous references to a visionary optimism regarding the almost immediate practical effects of new technology on warfare.[64]

Overall, the abundant references to the RMA (to which was curiously added an alleged "Revolution in Business Affairs" – RBA) that permeated the 1997 QDR represented the culminating point of its official endorsement by the defence establishment. Nevertheless, there was not much more than empty rhetoric. As Michael O'Hanlon noted, "even as it accepted the RMA hypothesis, the Department of Defense made few plans

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[62] Shalikashvili, John. *Joint Vision 2010*. Ft. Belvoir: Defense Technical Information Center, 1996. p.1.

[63] Ibidem, p.18.

[64] For an interesting parallel between the narratives of the RMA and the Strategic Defense Initiative see: O'Hanlon, Michael. *Beware the "RMA'nia!"*, paper presented at the National Defense University, September 9. 1998.

to reorganize its main combat units, increase their interdependence and jointness, or alter priorities within the weapons modernization program."[65] The contradiction in this approach is manifest: the official acceptance of the coming revolution was inexorably dismissed by the decision to pursue only superficial adjustments to force structure and weapons programs.

The 2001 Quadrennial Defense Review

The 2001 Quadrennial Defense Review was mostly completed before the September 11, 2001 attacks on the United States, and was published shortly after them. Obviously, it focused on the defence of the United States as the top priority and entailed the explicit intention of exploiting 21st century technology through the "transformation" of the U.S. military.

The "two major-theater war" framework that had been the operational assumption for force planning since the early 1990s was finally replaced in the QDR. The new force structure was based on four aims:

- Defend the United States;
- Deter aggression and coercion forward in critical regions;
- Swiftly defeat aggression in overlapping major conflicts while preserving for the President the option to call for a decisive victory in one of those conflicts - including the possibility of regime change or occupation;
- Conduct a limited number of smaller-scale contingency operations.

This renewed set of objectives led to a more complex force-planning framework called "One-Four-Two-One":

- Defend the homeland. (One)
- Operate effectively in four strategic areas: Europe, Northeast Asia,

[65] O'Hanlon, Michael. *Technological change and the future of warfare*. Washington D.C.: Brookings Institution Press, 2000. p.19.

the East Asian Littoral, and the Middle East and Southwest Asia. (Four)

- Fight two major combat operations nearly simultaneously, and swiftly defeat our adversaries in each theatre. (Two)
- Win decisively in one of the two major operations, at the direction of the President – including, if necessary, regime change. (One)

Another major shift from previous military planning was represented by the aim to abandon "threat-based" planning in favour of "capabilities-based" planning. This new approach consisted in focusing "more on how an adversary might fight rather than specifically whom the adversary might be or where a war might occur."[66] In order to implement this approach, the report advocated the adaptation of existing military capabilities to new conditions, while at the same time new military capabilities were to be developed. The ultimate aim of this approach was "to extend America's asymmetric advantages well into the future" through the "transformation" of U.S. military.

This process of transformation was largely inspired by ideas emerged within the RMA debate, as the recurrent appearance of the term "revolution in military affairs" in the QDR proves. The basic assumption of the RMA hypothesis was manifestly accepted in the report, as it stated that "new military technologies can revolutionize the form of military competition and the nature of armed conflict in ways that render military forces and doctrines of great powers obsolescent."[67] It is also clear that the RMA that was officially endorsed entailed a comprehensive view of the various dimensions that needed to be taken into account beyond mere technology: operational concepts, organizational adaptations, and training and experimentation. Apparently, it was more or less Andrew Marshall's RMA that seemed to have received explicit recognition by the new Secretary of

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[66] *Quadrennial defense review report*. Washington, D.C.: Dept. of Defense, 2001. p.iv.
[67] Ibidem, p.3.

Defense Donald Rumsfeld. Nonetheless, a closer examination of the 2001 QDR reveals how this official endorsement of the RMA through the process of "defense transformation" was not followed by a consistent change in procurement and defence spending. In fact, notwithstanding a decade-long debate arguing in favour of a less platform-centred approach to warfare, the US defence budget was still dominated by platforms.[68]

Conclusions

The aim of this chapter was to examine how the RMA concept was developed at the end of the Cold War era, and it has illustrated the critical influence that the strategic thinking of that period maintained over the subsequent debate. From this point of view, it is clear that the historical context had an enormous impact on the evolution of that concept. Later on, another major historical event (Operation Desert Storm) provided the RMA advocates with additional incitement for their enthusiastic predictions about the imminent revolution in warfare. This trend continued for several years in the United States, sustaining the RMA debate in both the defence and academic communities (much less so in the rest of the world).

The large number of RMA definitions proposed during that debate resulted in a very limited understanding of revolutionary change in warfare, one which was initially focused almost exclusively on technological innovation, and was later pushed towards a broader perspective which, nevertheless, maintained a biased view favouring the technological dimension of war over the others. Every definition suffered from a lack of recognition that war is not only multidimensional, but it is also an inherently adversarial phenomenon that cannot be fully appreciated from a single point of view. Moreover, most RMA advocates seem to suggest that there is a direct causal relationship between, on the one hand, the realization of revolutionary change through technological innovation and, on the other, strategic effectiveness: this is a view that should be firmly rejected because

[68] Freedman, Lawrence. *The transformation of strategic affairs*. Abingdon; New York: Routledge for the International Institute for Strategic Studies, 2006. p.15.

of its potentially disastrous consequences, as the Vietnam parallel offered by Murray shows. Finally, treating the RMA as an empirically observable "fact" inevitably leads to a reification of the concept, while the most appropriate way to evaluate its utility consists in considering it as an intellectual construct.

The debate over the nature of "information warfare" can be seen essentially as a relatively autonomous part of the whole RMA conceptual paradigm. While both the positions described deserve some credit for their attention to important aspects of the role that information has on the conduct of war, they are based on controversial assumptions and possess a fundamentally a-strategic outlook that should be ultimately rejected.

In conclusion, an analysis of the U.S. defence reviews of the 1990s shows that even in the country where the RMA debate emerged and flourished, the official rhetorical acceptance of the assumptions and implications of the theory of revolutionary change in warfare was never translated into a profound deviation from previous evolutionary patterns of innovation. Moreover, the rise of "transformation" as the new popular term in the American defence establishment, while on the one hand seems to signal an acceptance of the RMA thesis, on the other hand looks like a manifestation of the scarce utility of the very RMA narrative and indicates a shift in favour of a more limited interpretation of its ideas. As Donald Rumsfeld himself put it, "[t]ransforming the military is not an event; it is an ongoing process. There will be no point at which we can declare that U.S. forces have been transformed."[69]

[69] Rumsfeld, Donald. "Transforming the Military." *Foreign affairs* 81, no. 3 (2002): 20.

CHAPTER II

THEORETICAL APPROACHES AND THE PRIMACY OF CONTEXT

The ultimate purpose of this chapter is to provide a reformulation of the RMA hypothesis within a more complex framework, so that the various contexts that shape what Colin Gray calls *strategic history* ("the course of historical events most directly affected by the threat or use of force"[70]) are taken in due account. This objective needs to be pursued in order to address the main problem of the RMA hypothesis (which has been already mentioned several times), namely the flawed notion that RMAs are not only empirically testable phenomena, but they are also susceptible to the will of enlightened "masters". Instead, I will treat the RMA as an intellectual construct that, in order to be usefully employed for the analysis of the Military Revolution of the early modern era, should be seen as a tool to firmly link discontinuities in the character of war to contingent strategic realities.

The first part of this chapter will be devoted to defining a few fundamental terms (RMA, war, warfare, strategy) without which a comprehensive study of the relationship between war and innovation (more specifically, technological innovation) can be neither possible nor useful. A rigorous description of these terms can only be based on the thoughts of a few prominent authors, *in primis* Clausewitz.

Then I will provide a description of what can be seen as "general theoretical frameworks" that have been suggested by some authors on the RMA hypothesis. Although the word "theory" has been commonly used to describe these contributions, it is reasonable to refrain from using that term, because they generally fail to produce testable hypotheses, with one partial exception. Nonetheless, almost all of these theoretical frameworks offer some useful insights that will be duly underlined.

Finally, I will summarize the most sensible ideas that emerge from

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[70] Gray, Colin. *Strategy for chaos*, cit. p.3.

the theoretical approaches analysed. Here I need to make clear that, because the purpose of this study is not to build a comprehensive theory of revolutionary change in warfare (an endeavour which, in my opinion, would be inherently disputable in any case), I will limit the discussion to an assessment of those concepts which can be most usefully applied to understand the dynamics of innovation in the early modern European period.

Definitions

The lack of an agreed definition of RMA inevitably precludes the possibility of analysing the effects of a revolutionary change on the various aspects of warfare. It is certainly improper to claim that a revolution in military affairs "exists", but it would be probably useful to find out how the concept of RMA can contribute to our understanding of war. For this purpose I will adopt Colin Gray's minimalist definition of the RMA as "a radical change in the character or conduct of war"[71], which has the merit of eliminating the supposed necessary role of technology as the driving force for change. The second virtue of Gray's definition is that it limits the dependent variable which the RMA affects: it is not the *nature* of war which can be changed, but rather its character or conduct. In order to explain this point it is crucial to illustrate what is my understanding of three fundamental terms: war, warfare and strategy.

The renowned historian Michael Howard, commenting on the relationship between technology and war[72], reaffirmed the fully intact persuasiveness of Clausewitz's definition of war as "an act of force to compel our enemy to do our will"[73], as in these words we can truly find a fundamental guidance about what war is and is *not.* This is much more than a pedantic question of semantics: the essence of war as a social phenomenon consists in its adversarial dimension and should not be

[71] Ibid. p. 5.
[72] Howard, M. and Guilmartin J. F. *Two historians in technology and war*. Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, 1994.
[73] Clausewitz, Carl. *On war*. Princeton N.J.: Princeton University Press, 1976. p. 13.

mistaken for the way it is conducted at any specific time in history. Thus, any claim that the nature of war can be altered by an RMA (or by any other conceivable kind of change in the character or conduct of war) must be firmly rejected.

As to the term *warfare*, a differentiation is needed in its relation to *war*: while the first term refers to military action in its concrete form, the second has a broader sense because, as illustrated earlier, it is aimed at forcing an opponent to do one's own will. The point here is that war derives its meaning by the political context, while warfare is the instrument through which each political unit acts within the military dimension of that context.

There have been numerous attempts at defining the term *strategy*, all of them facing some sort of controversy, sometimes criticized for their normative connotation[74], certainly heavily influenced by the historical context. Moreover, the extensive use of the term *grand strategy*[75] causes a conceptual conflation of policy and strategy which shifts the focus from the use or threat of use of force towards a broader (and necessarily weaker) conceptualization of the domain of strategy.[76] Even so, there are two definitions that deserve particular merit: the first has been suggested by Colin Gray, the second by General André Beaufre. Gray defines strategy as a bridge between war and politics: it is "the use made of force and the threat of force for the ends of policy"[77]. The main virtue of this formulation is that it limits the scope of strategy to the domain of military conflict, hence without including other elements (economic, ideological, ethnic, to name a few) of confrontation between political actors, which are best understood at a higher level of analysis. Nevertheless, this definition falls short of

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[74] See Luttwak, Edward. *Strategy: the logic of war and peace*. Rev. and enl. ed. Cambridge Mass.: Belknap Press of Harvard University Press, 2001. p. 267-269.

[75] According to Basil H. Liddel Hart, the role of the grand strategy is "to coordinate and direct all the resources of the nation towards the attainment of the political object of the war – the goal defined by national policy". Cit. in: Strachan, Hew. "The lost meaning of strategy." *Survival* 47, no. 3 (2005): 33-54. More recent formulations (see for example: Luttwak, *Strategy*) do not add much to Liddel Hart's original definition.

[76] Strachan, cit.

[77] Clausewitz's influence is manifest in this formulation, and is acknowledged by the author. See: Gray, *Strategy for Chaos*, cit. p. 3.

sufficiently highlighting the adversarial dimension of war. In this regard, Beaufre's formulation is helpful: strategy is "the art of the dialectics of wills that use force to resolve their conflict"[78]. A comprehensive reformulation of these two definitions would be the following: *strategy is the art of the dialectics of wills that use or threaten the use of force for policy ends*. This definition allows us to conceive strategy as a junction between policy and war (with the important inclusion of the threat of using force), but also to firmly associate it to the intrinsic nature of war as described earlier. In this sense, it might help to address the justified concern expressed by Hew Strachan when he says that "[o]ne of the reasons we are unsure what war is is that we are unsure about what strategy is or is not".[79]

Two additional aspects of strategy need to be highlighted: the first is its paradoxical logic so brilliantly illustrated by Luttwak, the second is its inherent difficulty. The paradoxical aspect of strategy is a direct consequence of the nature of war as defined earlier in the words Clausewitz's: the relationship that develops between the combatants is a permanent source of unexpected reaction, which causes counter-intuitive behaviour to be so often rewarded.[80] An associated issue is strategy's intrinsic difficulty, which derives from its various and interwoven dimensions and is further reinforced by the fact that in war a huge number of things can go wrong: there are just too many sources of "friction".

RMA theoretical frameworks

Like the numerous RMA definitions described in the previous chapter, there are probably as many theoretical frameworks of the RMA as are the scholars who wrote about the issue.

In the following paragraphs, I will illustrate three RMA paradigms that, with different degrees of success, stand out as insightful attempts to define and explain revolutionary change in warfare. But first, as an

[78] Cit. in Luttwak, *Strategy*. p. 269. In the original French: "l'art de la dialectique des volontés employant la force pour résoudre leur conflit".
[79] Strachan, cit. p. 49.
[80] Luttwak, cit.

admonition against an undue overemphasis in favour of discontinuities in the history of warfare, I will briefly illustrate what can be called an "evolutionary" view of military innovation.

The first RMA model that will be described is derived from the Toffler's "three-wave" theory, which postulates a causal relationship between, on the one hand, the means used by societies to create wealth and, on the other, the ways in which those societies wage war. Next, I will illustrate what Williamson Murray and MacGregor Knox call the "dynamics" of military revolutions, which is based on a conceptual distinction between "military revolutions" and "revolutions in military affairs". Murray and Knox suggest that in both cases, the role of technology has been historically very limited, and that a more comprehensive approach that includes the strategic context is needed to understand revolutionary change in warfare. Finally, I will describe the important contributions of Eliot H. Cohen, and especially Colin S. Gray. The latter's *Strategy for chaos* stands out as the most convincing work on the RMA to date, primarily because of the author's valuable effort to interpret revolutionary change as strategic behaviour. Moreover, he points out that if the RMA concept has to be useful, it should be not seen as an empirical phenomenon that (with the benefit of hindsight) we can search for in history books, but rather it must be treated as a conceptual tool.

Continuity in Military Affairs?

Before analysing the theoretical models which focus their attention on the RMA concept, or more generally on profound discontinuity in strategic history, it is necessary to illustrate an alternative, deeply sceptical outlook of the whole idea that these discontinuities actually occurred in the past, or at least that they ultimately do not prevail over previous patterns of warfare. This "conservative" approach considers military innovation and transformation as a continuous evolution driven by the uncertain quest to deal with the complexities of war. Thus, while technological advances and organizational innovations are certainly relevant, they are only one segment

in the multidimensional picture of strategy and war, in which friction and the human factor always escape predictability. A main proponent of this view is Stephen Biddle, who maintains that the RMA hypothesis is essentially flawed because it neglects the enduring realities of modern warfare. Although on the whole quite convincing, Biddle's theory is too specifically focused on the contemporary RMA to be useful for the purpose of this chapter. Nonetheless, he makes two empirical points that have important theoretical implications, and deserve to be quoted here. The first is that "the effectiveness of military technology depends heavily on human behavior"[81], and the second is that "military organizations vary widely in their ability to cope with the growing complexity"[82]. If these two claims are true (and this is at least extremely plausible) not only the technological focus of the RMA suffers a powerful blow, but (perhaps more importantly) also innovation in the organizational dimension is revealed as deeply problematic. In Biddle's view, military organizations not only have to overcome their institutional reluctance to change, but must also be able to manage more, not less, complexities derived by the innovation itself. Thus, in Biddle's opinion, the ability to cope with complexity has been a more significant determinant of success or failure than major innovation.

Colin Gray explicitly recognizes the force of continuity in strategic history when he quotes the British historian Cyril Falls:

> "[…] the student should not believe everything moves only when he sees the process at a glance, and stands still when he does not see it moving. It is his eyes which are at fault. They see movement of a pattern and in circumstances which are familiar to them; they fail to detect it when those are unfamiliar. The more scholarly the enquirer becomes, the more conscious is he of endless change."[83]

Falls' considerations do not prevent us from exploring discontinuities in strategic history, but his admonition that the eyes of the scholar can ultimately betray him is as penetrating as it is useful for our inquiry.

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[81] Biddle, Stephen. "The Past As Prologue: Assessing Theories of Future Warfare." *Security Studies* 8, no. 1 (1998): 1-74. p. 12.

[82] Ibidem.

[83] Falls, Cyril. A hundred years of war, 1850-1950. Cited in: Gray, Strategy for chaos. p. 44.

Revolutionary Waves

One of the most influential theses underpinning much of the 1990s RMA literature was authored by Alvin and Heidi Toffler in their books *The third wave* and *War and anti-war*. The Tofflers argue that there have been three great "waves" of social change in human history, each corresponding to a particular age[84]:

- The agricultural age: beginning about 10,000 years ago, it originated the rise of civilization and was based on muscle power and agricultural production.
- The industrial age: it began in the early 18th century, and saw an increase in scientific and technological progress which turned peasants into industrial workers, and ultimately led to an era based on mechanical power, mass production, mass surpluses, and mass culture.
- The information age: has begun in the late 20th century and is built on the control of information. This era will be characterized by specialization and greater diversity of forces and actors.

In their second book, *War and Anti-war*, the Tofflers argue that to each age in human history corresponded a distinctive way of waging war. In the agriculture age, the food surplus was the necessary condition for raising and maintain small armies, because the needs of agricultural production prevented the creation of large armed forces. With the industrial revolution, a massive increase in production, both agricultural and industrial, allowed for a large number of men available for military service, thus establishing the huge armies of the 20th century. With the coming "information age", the Tofflers argue, the way war is fought will change once again, and the extensive use of information technologies will be the most powerful

[84] Nofi, Albert A. *Recent Trends in Thinking About Warfare*. Alexandria, Va: CNA Corp, 2006. p.11. Available at http://cna.org/documents/D0014875.A1.pdf.

weapon in the hands of highly trained soldiers.

The basic assumption behind the Tofflers' argument is that changes in productive activity and wealth creation triggered the rise of these sequential “waves”, which in turn shaped the distinctive styles of warfare in each age. As numerous authors did not fail to observe, these arguments reveal a manifest and heavy influence of Marx's theories, resulting in a combination of economic and technological determinism with an overarching chronological framework.[85] Nevertheless, the works authored by the Tofflers (particularly *War and anti-war*) had an impressive success within the U.S. political and military establishment during the 1990s, and many RMA enthusiasts accepted the fundamental implications of their theoretical framework[86]. It must be acknowledged that the Tofflers’ social-wave model is certainly the one for which the term “theory” can reasonably be applied: it is elegant, simple and establishes a clear causal relationship between social change and military revolutions. Unfortunately, it suffers from substantial flaws from the historical point of view, and it ultimately needs a great deal of qualifications. In fact, it is hard to object to the harsh criticisms advanced by DiNardo and Hughes, when they claim that “any system that seeks to grossly simplify something as complex and nuanced as the entirety of human history is bound to founder on those immovable obstacles, the facts.”[87]

At the same time, the Tofflers are generally right when they argue that the conditions for, and character of, warfare were revolutionized by the innovations of agriculture, of the industrial revolution, and of a knowledge-based economy. A significant merit of the Tofflers’ three-wave theory lies in their recognition that, for understanding strategic history, context matters. Nonetheless, while they emphasize essentially the economic context, it is

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[85] Among others, see: DiNardo, R, and Daniel J. Hughes. “Some Cautionary Thoughts on Information Warfare.” *Airpower journal* 9, no. 4 (1995): 69. p.2.

[86] For example, see: Binnendijk, Hans. *Transforming America's military*. Washington D.C.: National Defense University Press, 2002; Mazarr, Michael. *The revolution in military affairs: a framework for defense planning*. Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, 1994; Hundley, *Past Revolutions, Future Transformations*; cit.

[87] DiNardo and Hughes. Cit. p. 2.

also necessary to acknowledge the role of cultural and strategic contexts in order to grasp the determinants of warfare in each specific era. Moreover, as noted by Gray[88], the idea that military revolutions result from complex economic, social, political, and technological change is most useful in order to reject the American attitude (so evident in most of the arguments of RMA enthusiasts) to view strategic affairs as isolated from politics and society. If it is true that defence planning, in order to be strategically effective, needs to be driven by probable and possible threats (and it would be naïve at best to refuse this claim), then we should fully appreciate the implication of the three-wave theory of the Tofflers (and of other similar approaches), namely that rare but powerful transformations in the context(s) and character of warfare are ineluctable. This assertion, in a broad sense, *must* be true. At the same time, it is hardly capable of offering a solid base on which we can build sensible and detailed predictions of the future of warfare like those suggested by the RMA advocates.

RMAs and Military Revolutions

First in the seminal article *Thinking About Revolutions in Military Affairs*[89], and later as co-editor of the collection of essays *The Dynamics of Military Revolution, 1300-2050*, Williamson Murray attempted to redress what he calls "an outstanding lack of historical consciousness"[90] that permeates most of the enthusiasts' contributions to the RMA debate. As a historian, Murray is naturally inclined to examine the RMA hypothesis in light of the numerous studies on the "military revolution" debate (which will be described in detail in the next chapter). Murray's essential argument is that a necessary distinction is required between "military revolutions" (MRs), of which he finds five in modern times, and the more frequent

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88 Gray, *Strategy for chaos*. Cit. p. 33.

89 Murray, Williamson. "Thinking About Revolutions in Military Affairs,." *Joint Force Quarterly* 16 (Summer 1997).

90 Knox, MacGregor, and Williamson Murray. *The dynamics of military revolution, 1300-2050*. Cambridge UK; New York: Cambridge University Press, 2001. p. 5.

RMAs, which in his view amount to nothing less than 26[91].

Murray and Knox compare MRs to "earthquakes" in the history of warfare, meaning that they were "uncontrollable, unpredictable, and unforeseeable"[92]: these systemic changes occurred on such a scale that they profoundly overhauled the character of politics and society, and military organizations necessarily followed suit. Moreover, these changes allegedly produced "additive" effects: those States which missed the early MRs would not be able to achieve military success by just adopting the latest weapons, because the social and political conditions created by each revolution are, according to the authors, the decisive factors for effectively *using* those weapons.

The five "military revolutions" indicated by Knox and Murray are:

- The rise of modern nation-state in the seventeenth century, and of organized and disciplined armed forces.
- The French Revolution of the late eighteenth century, which merged the forces of nationalism with military power.
- The Industrial Revolution, beginning in the late eighteenth century, which provided national armies with modern technologies and logistics.
- The First World War, which represented the synthesis of the forces unleashed by the French and Industrial Revolutions.
- The invention of nuclear weapons, which prevented full scale war between the Superpowers during the Cold War.

These historical changes were not at the disposal of military "innovators" of their times. For governments and their military commanders, the best they could aspire to was adaptation: there was simply no way to "manage" the revolution, let alone ignite it. For this reason, if the "information

[91] It must be noted that in his earlier article Murray counted four MRs (he did not include the invention of nuclear weapons) and 21 RMAs.

[92] Knox and Murray, *The dynamics of military revolution*. Cit. p. 7.

revolution" will be comparable in its consequences to these five past MRs, Murray claims that there is hardly any possibility for modern armed forces to succeed in planning for it.

Nonetheless, history would seem to suggest that there are "ancillary" revolutions, which do not have the deep and pervasive impact of a MR, but still signal a significant transformation in the way war is fought. These are the kind of secondary phenomenon that the authors call "revolutions in military affairs", and their most remarkable characteristic is that they are allegedly susceptible to human intervention. Essentially, RMAs "require the assembly of a complex mix of tactical, organizational, doctrinal, and technological innovations in order to implement a new conceptual approach to warfare". [93] These transformations are inherently difficult to manage, and only the test of battle would make it clear which one of the militaries innovated most effectively. In Murray's view, RMAs have four main characteristics: they need considerable time to develop; military organizations face many difficulties to ignite an RMA in wartime, but even more so during a period of peace; RMAs are always either precursors, associated, or a product of MRs; RMAs can be led by many factors, one of which is technological innovation (the term "military-technical revolution" – MTR – is used to describe a technologically driven RMA).

At first glance, Murray's arguments about the RMA concept and its relationship with broader, and less frequent MRs appear highly persuasive, and they also enjoy the support of a careful consideration for historical facts. From a broad perspective, his idea that military revolutions result from deep and broad changes, and have such complex consequences and implications that they cannot be managed by enlightened "revolutionaries" certainly deserves to be praised.

A valuable historian, Murray seems somewhat reluctant to build a cogent theory upon his propositions, yet he does try to establish causal relationships between independent (widespread political and social change)

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[93] Ibidem, p. 12.

and dependent (MRs) variables. Ultimately, his attempt appears unconvincing in that these causal relationships are far from clearly articulated: profound political and social changes cause ungovernable military revolutions, which in turn create another wave of political and social transformation, and so on. For all its untenable reductionism, from a strictly theoretical point of view, the Toffler's three-wave theory is at least unambiguous as to what is the primary cause of military revolutions. The greatest merit of Murray's theoretical approach is that it takes into account the broader contexts by which warfare is inevitably influenced, but his attempt to impose a rational pattern on strategic history by classifying MRs and RMAs candidates should be firmly rejected. Another remarkable contradiction appears when Murray claims that "[m]ilitary revolutions in the past have transformed with startling speed and force all aspects of war, from policy and strategy to tactics"[94], while he himself maintains earlier in his book that RMAs need a lot of time to develop: admittedly, MRs should take even more time than the more limited RMAs. Where he is certainly and most laudably right is in pointing that historically the role of technology in MRs has been anything but decisive, and it is also interesting to note his suggestion that "[t]echnology did not simplify war, as contemporary superstition now claims: *it made it exponentially more complex*"[95]. On this point, Murray concludes arguing that military revolutions cannot change the underlying nature of war (in this amending his previous *Joint Force Quarterly* article), and then expressing his critical view about technological utopians and their illusions about "lifting the fog of war" and eliminating friction.

As already mentioned, when analysing specifically past RMAs in history, Murray depicts them as lengthy "periods of innovation" during which a deep review of doctrine, tactics, procedures and technology is attempted by the armed forces; these require broad experimentations (which can often lead to failure) and also a cultural openness to change on the part

94 Ibidem, p. 176.
95 Ibidem. Emphasis in the original.

the military establishment. Murray also points out that RMAs almost exclusively affect the operational level of war, hence they fall short of influencing the strategic level. Again, he stresses in the clearest terms that "revolutions in military affairs *always* occur within the context of politics and strategy – and that context is everything"[96], thus quite persuasively claiming that in the past RMAs were successfully pursued by armed forces facing a concrete adversary. This assertion allows Murray to reject, once again, the illusions of American innovators which in his view operate not only in a "strategic vacuum", but also in an operational one. A final, possibly confusing, certainly contradictory point on past RMAs deserves our careful attention here, namely that "revolutions in military affairs despite their name in fact consist primarily of evolutionary peacetime changes through which military organizations alter their conceptual picture of future war in response to technological change"[97]. The first reaction to this claim would inevitably lead us to entirely dismiss the very notion of RMA: if what we really are talking about is *evolution*, what is the point of using the revolutionary label at all? Murray's wording is unquestionably misleading, and yet there must be something true in the broad assertion that strategic history has experienced a certain number of discontinuities, for which using either the term "military revolution" (as defined by Murray himself) or "evolution" would be inappropriate. Indeed, this is the crucial issue that is still left without a clear answer (if ever it is possible to provide one).

Gray makes a valuable point when he refers to Jeremy Shapiro's distinction between the "historians' view" and the "strategists' view" of military revolution.[98] Shapiro claims that:

"[t]here are two radically different, though perhaps complementary, ways to view a military revolution. Historians typically take a long view and see a military revolution as an observable breaking point between two recognizably different types of warfare.

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96 Ibidem, p. 180. Emphasis in the original
97 Ibidem, p. 185.
98 Gray, *Strategy for chaos*, Cit. p. 37.

This view of military revolutions tends to downplay the role of human agency in the making of a revolution. Such revolutions stem from exogenous forces which were bound, sooner or later, to spark a fundamental shift in the methods of war. Technological, demographic, or social changes in this sense 'push' the revolution into being."[99]

This approach suits relatively well with the Toffler's theory and with Murray's definition of "military revolution". It also accurately describes the historian's debate on the early modern military revolution that will be reviewed in the next chapter. As to the second view, Shapiro maintains that:

"[t]he strategist is more concerned with the problems of the here and now and, as a result, sees a revolution as consisting of essentially clever, new solutions to previously insoluble geostrategic problems. These solutions usually, but not necessarily, use new technologies. In any case, the impetus is not some new exogenous technological or social reality but rather a particular nation's strategic problems."[100]

Shapiro's description of this second perspective is very close to Murray's view of RMA as opposed to MR. Furthermore, he persuasively attempts at reconciling the two positions through "an understanding that sees the short-run motor of the strategist's revolution determining the path if not the ultimate outcome of the historian's revolution". Hence, it seems that the real difference lies in the eye of the beholder: "the strategist's revolution is made; the historian's happens."[101]

As a final, cautionary and much needed consideration, Shapiro emphasizes a significant ambiguity in the views expressed by many RMA advocates during the 1990s:

"The current proposed information-based revolution in military affairs has been the most self-conscious military revolution in history, yet most commentators have largely passed over the question of whether they see themselves as creating a strategist's revolution or predicting a historian's. While both types of revolution have analytical validity in retrospect, the utility of the historian's viewpoint to inform the current debate is very limited. While

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[99] Shapiro, Jeremy. "Information and war: it is a revolution?" In *Strategic appraisal: the changing role of information in warfare*, 113-153. RAND, 1999. p. 136.
[100] Ibidem, p. 137.
[101] Ibidem, p. 137.

contemporaries can and must create military revolutions in the strategic sense, their ability to predict military revolutions in the historic sense is virtually non-existent… These revolutions only seem clear in retrospect."[102]

In light of the ultimate aim of this work, Shapiro's reflections are indeed valuable. They explicitly point not so much to an unfruitful search for past RMAs in order to provide evidence for the alleged information revolution of our times, but rather to an attempt to examine the *utility* of the very idea of revolutionary change in warfare. Thus, there is a great deal of wisdom in Gray's cautionary claim that the various fascinating buzzwords (MR, RMA, MTR, and so on) should not be taken "too seriously", lest they confuse more than clarify the broad picture of innovation in warfare.[103]

To be fair to Murray's indisputably precious work, it is precisely that "broad picture" that he successfully illustrates when claiming that "context is everything": for whatever astonishing new technology or doctrinal change or else, the underlying nature of war remains the same. And yet, that immutable nature, described at the beginning of this chapter, is accompanied by political, social and strategic realities that create a durable framework, which in the past has been subjected to a number of radical discontinuities. This broad context in turn constitutes the environment in which, under the pressure of a complex combination of factors (among which technology is certainly relevant, but often not decisive), the character of war can be transformed in important, but still minor ways. In order to try and understand the inherent complexity of the interplay between these different levels, the cautious researcher ultimately has only one speculative, but indispensable guidance: a comprehensive awareness of the true meaning of that bridge between war and politics that is strategy, whose role no technological innovation can ever replace. From this point of view, two final points made by Murray deserve to be emphasized. The first is that any RMA inevitably generates in the adversaries the will to create

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[102] Ibidem, p. 138.
[103] Gray, *Strategy for chaos*, cit. p. 38.

countermeasures[104], which they always successfully do: in fact, the outcome of a particular war does not depend on one's ability to pursue an RMA, but on being able to implement it in a way that is conducive to *strategic effectiveness*.[105] Finally, the second important consideration suggested by Murray is that, when the whole context of strategic behaviour is radically altered (i.e. when a MR occurs), militaries "will find themselves at best engaged in a desperate struggle to adapt to drastic changes in the very patterns of culture and society"[106]. The only alternative is obsolescence and, probably, ultimate defeat.

RMAs and the Realm of Strategy

This paragraph will illustrate the valuable contributions to the RMA debate of two scholars (Eliot H. Cohen and Colin S. Gray), who righteously warned against too partial a focus on technology in examining revolutions in warfare. In his 1996 article *A Revolution in Warfare*[107], Cohen expressed his belief in the validity of most of the RMA enthusiast's arguments. In fact, he states in the clearest terms that "[a] revolution in military affairs is under way"[108], thus decidedly siding with the RMA advocates. Nonetheless, he also maintains that "[t]he United States may drive the revolution in military affairs, but only if it has a clear conception of what it wants military power for – which it does not now have"[109]. Moreover, after comparing the information-led RMA to the revolutionary changes of the eighteenth century, Cohen persuasively argues that transformation in one dimension of warfare does not imply the irrelevance of all others. Most importantly, he also underlines the fact that revolutionary change in warfare is not driven only by technology, but rather stems "from an adaptation of the military

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[104] Knox and Murray, The dynamics of military revolution. Cit. p. 193.

[105] One need look no further than the German Blitzkrieg, which many RMA enthusiasts saw as one of the most successful revolution in military affairs (among others, see: Krepinevich, *Cavalry to Computer*, cit.) It goes without saying that even that ingenious innovation could neither compensate for Hitler's strategic mistakes nor prevent ultimate defeat.

[106] Knox and Murray, The dynamics of military revolution. Cit. p. 176.

[107] Cohen, Eliot A. "A Revolution in Warfare". *Foreign Affairs* 75, no. 2 (March 1996): 37-54.

[108] Ibidem, p. 54.

[109] Ibidem.

instrument to political purposes"[110]. Cohen's most significant argument is that strategic realities are decisive for the future character of warfare, and that if profound technological innovations may provide "tactical clarity", the risk that they would create "strategic obscurity" is real and highly problematic[111]. As a final admonishment against enthusiastic prophecies of future war, Cohen explicitly affirms that "revolution implies rapid, violent, and, above all, unpredictable change."[112]

In a 2004 article entitled *Change and Transformation in Military Affairs*[113], Cohen seems still persuaded by the RMA hypothesis, yet he describes what, in his opinion, are the four main problems that remain unsolved after nearly 20 years of debate. These open issues are:

1. the abstraction of RMA theorizing from the world of geopolitics;
2. its focus on technology at the expense of the softer aspects of military affairs (organization, doctrine, manpower, etc.);
3. a tendency to depict transformation as something that happens top-down, rather than bottom-up;
4. a failure to look at the response to RMA-type capabilities on the part of weaker opponents.

While the above problems were already reported (though less systematically) in Cohen's 1997 article, here he seems more aware of the negative implications deriving from the partiality of the arguments advanced by the RMA advocates. In general, the answers that Cohen gives are not very different from those expressed in his earlier paper. Although his treatment of the RMA as a "fact" does not fit with the view that is endorsed in this thesis (i.e. that the RMA is a theoretical tool, not an empirical phenomenon), Cohen's comprehensive analysis of revolutionary change in warfare as inextricably linked to strategic realities is definitely valuable.

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[110] Ibidem, p. 51.
[111] Ibidem, p. 53.
[112] Ibidem, p. 54.
[113] Cohen, Eliot. "Change and Transformation in Military Affairs." *Journal of Strategic Studies* 27 (September 2004): 395-407.

During the RMA debate of the 1990s, Colin Gray has been one of the most authoritative voices belonging to the "neo-Clausewitzian" school of strategic studies. His 1997 article *RMAs and the dimensions of strategy*[114] was a thoughtful critique of the enthusiastic endorsement of the RMA as a dramatic transformation in the nature of war. In that early assessment of the RMA concept, Gray pointed out the multidimensional nature of strategy illustrated by Michael Howard some 20 years earlier[115]. Regardless of the preferred number of those dimensions (Gray lists 17 of them, while Howard identified just four), his emphasis on complexity was certainly a precious argument for improving the quality of the RMA debate. Two substantial, yet too often overlooked observations were suggested in that article: "[t]he primary point is the stupefyingly obvious one that everything matters. The secondary point is that even wonderful improvements in military effectiveness [...] are likely to disappoint if political leadership is poor."[116]

A few years later, Gray's book *Strategy for chaos* constituted probably the most important analysis of the strengths and weaknesses of the RMA concept. Moreover, Gray's dense work offered not just a critical review of the 1990s debate, but was also an admirable attempt to find a connection between the RMA idea and the realm of strategy. This holistic approach allowed him to claim that RMAs can be usefully interpreted as "strategic behaviour". In 2006, Gray published the article *Recognizing and understanding revolutionary change in warfare: the sovereignty of context*[117], which represented a slightly updated (and more systematic) illustration of his theoretical framework.

In *Strategy for chaos*, Gray's analysis, after a critical review of the most relevant works on the RMA hypothesis, tries to answer a basic question that, in his opinion, remains still unsettled (notwithstanding the

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[114] Gray, Colin. "RMAs and the Dimensions of Strategy". *Joint Force Quarterly* 17 (1998).

[115] Howard, Michael. "The Forgotten Dimensions of Strategy". *Foreign Affairs* 57, no. 5 (Summer 1979): 975-986.

[116] Gray, "RMAs and the Dimensions of Strategy". Cit. p. 52.

[117] Gray, Colin. Recognizing and understanding revolutionary change in warfare: the sovereignty of context. Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2006.

impressive amount of books and articles about the subject): "Which episodes of military innovation most plausibly have had the greatest significance for the course of strategic history?"[118] This formulation is important in that it limits the theoretical ambitions towards the formulation of "grand theories" of revolutionary change, but at the same time allows for the establishment of a firm connection between military innovation and strategic realities. Gray makes a persuasive theoretical choice particularly relevant to this thesis when he claims that there is ultimately not much utility in searching for the "exact labelling" of revolutionary change in warfare (i.e. looking for differences between MRs, RMAs or MTRs). What really matters, in his view, is how the study of historical episodes of profound military innovation can help our understanding of war and strategy. Thus, Gray suggests that it is reasonable to use only the term RMA to describe these periods of innovation, and still it would be possible to acknowledge that some past RMAs have been more significant than others.

Before offering an illustration of Gray's view of how RMAs "work", it is important to briefly underline a crucial theoretical assumption that informs his whole analysis, namely his rejection of Alan Beyerchen's ideas on the chaotic and non-linear nature of strategy and war.[119] This is not the proper place for discussing in detail this complex subject. Suffice it to say that, while there is certainly some truth in the idea that war has an inherently unpredictable dimension, Gray is convincing when he claims that

> "[t]hough certainly complex, strategy is not beyond meaningful planning and execution. Similarly, although strategy can be nonlinear, much of strategic behaviour actually is linear. The better armies, like the better football teams, though in principle ever liable to a defeat, will win the bulk of their operational tests."[120]

Gray's theoretical approach is so rich and complex that it would be utterly pointless to attempt to summarize it here, but some of his main conclusions deserve to be illustrated, as they represent probably the most insightful

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[118] Gray, *Strategy for chaos.* Cit. p. 61.
[119] Beyerchen, A. "Clausewitz, Nonlinearity, and the Unpredictability of War." *International Security* 17, no. 3 (1992): 59.
[120] Gray, *Strategy for chaos.* Cit. p. 97.

analysis of revolutionary change in warfare.

First of all, Gray offers a reformulation of the "dimensions of strategy", by revisiting both Clausewitz's five elements (moral, physical, mathematical, geographical, and statistical)[121] and Michael Howard's four components (logistical, operational, technological and social)[122]. The resulting list of these dimensions is admittedly quite long: Gray finds no less than 17 dimensions.

Although there is some merit in Gray's attempt to enrich our capability for understanding strategy by enumerating its elements in detail, it is perhaps not ultimately very useful to adopt such a complex framework. To be fair, Gray himself admits that his list is not to be intended as an accurate description of what strategy is in reality, but just an analytical tool that allows him to grasp its complexity and multidimensional nature. In the end, much more important than the number of dimensions that we choose to consider (and I personally deem Howard's framework, with its elegant parsimony, as more appropriate), are Gray's considerations about how these dimensions should be analyzed.

[121] Clausewitz, Carl. *On war*. Princeton N.J.: Princeton University Press, 1976. p. 140.
[122] Howard, "The Forgotten Dimensions of Strategy". Cit.

Gray's Dimensions of Strategy (Strategy for chaos, 2002)

People and politics

1. People	4. Politics
2. Society	5. Ethics
3. Culture	

Preparation for war

6. Economics and logistics	9. Information and intelligence
7. Organisation (defence planning)	10. Theory and doctrine
8. Military administration (recruitment, training, procurement)	11. Technology

War proper

12. Military operations (fighting performance)	14. Geography

Gray's four most convincing points on this subject are:

1. Strategy's dimensions are analytically distinctive, but each (at least potentially) affects the performance of the others synergistically;
2. There is no hierarchy among the dimensions of strategy;
3. Since every episode in strategic history is unique, the historical reference for each dimension must always be locally specific and to some degree variable;
4. Strategy's dimensions can be manipulated purposefully in the quest for advantage and the struggle against disadvantage.

Then, Gray correctly argues that "RMA is not an event-sequence

apart from its political context"[123], meaning that the political dimension is quite probably the best place to start from in order to understand a particular period of military innovation. Even if that innovation does not occur under the pressures of a war, the presence of a visible enemy certainly helps in providing the necessary fuel for pursuing an RMA. Thus, argues Gray, for an RMA to ensure the highest possible chance of strategic success, it has not only to translate into politically defined goals, but these goals must ultimately be strategically achievable. Otherwise, any successful military innovation might at best only procrastinate defeat. After proposing a definition of strategy (and war) as a duel (which is consistent with the discussion at the beginning of this chapter, for it is based on the same Clausewitzian paradigm and has directly contributed to the definition I offered), Gray maintains that RMAs are "strategic behaviour". This is perhaps Gray's most penetrating argument in that it firmly roots the RMA concept into the multidimensional realm of strategy. He explains that "[f]or an RMA massively to enhance net military effectiveness, let alone the kind of strategic effectiveness of which political success is made, it has to work well enough across the board of strategy's dimensions".[124] An important consideration is that "military effectiveness is a relational variable"[125]: in the end, one does not have to achieve absolute superiority in all of war's dimensions (which would be quite an unrealistic task), but to be just slightly superior to the adversary. Moreover, even in case of strategic success, victory can reveal itself as unstable and ultimately ephemeral. Finally, Gray is also largely correct in emphasizing the issue of continuity in strategic history, which relates closely to the unchanging nature of strategy. An enduring awareness of this fact is what ensures against any temptation of viewing a particular discontinuity in some dimension of strategy as unmistakably decisive, be it in studying past episodes of revolutionary change or in predicting the future of warfare.

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[123] Ibidem, p. 240.
[124] Ibidem, p. 106.
[125] Ibidem, p.

In conclusion, Gray's theoretical framework allows him to suggest several persuasive insights on the RMA concept. Even if his characterization of the dimensions of strategy is perhaps too intricate, Gray's approach is extremely valuable in that it allows for a comprehensive view of the RMA as part of broad strategic realities. Furthermore, it correctly treats war and strategy as having an inherently adversarial dimension, and also underlines their unchangeable nature. In this context, there is certainly scope for profound discontinuities in strategic history, but these events are not able to alter the non-hierarchical structure that governs strategy. Moreover, no episode of historical RMA can ever be correctly understood if one neglects its political context: whatever may be the relative advantage derived from a particular innovation in one or more dimensions, if it is employed with an astrategic attitude, it will not guarantee strategic success. Finally, by using exclusively the concept of RMA rather than embarking on a futile attempt to spot the differences between cognate notions such as military revolutions and military-technical revolutions (even if this constitutes a conceptual conflation, as he openly recognizes), Gray's theoretical framework is remarkably helpful for the purpose of this study.

Conclusions

The main purpose of this chapter was to illustrate as best as possible how the RMA concept can be useful for our understanding of military innovation without neglecting the true nature of strategy and war. It is necessary now to briefly remind the definitions of those fundamental concepts illustrated in the first paragraphs of this chapter. I have subscribed to Colin Gray's minimalist definition of RMA as *a radical change in the character or conduct of war*, because it allows for including more than just technology as a relevant dimension of innovation, and it also implicates the recognition that the nature of war is fundamentally unchangeable. Then, I have illustrated what still appears to be the most persuasive definition of *war*, the one given by Clausewitz in his masterpiece: *war is an act of force*

to compel our enemy to do our will. For the sake of conceptual clarity, it was also necessary to distinguish war from *warfare* which is *the instrument through which each political unit acts within the military dimension of politics*. Finally, I have proposed a slight variation of classical definitions of strategy, which I see as *strategy is the art of the dialectics of wills that use or threaten the use of force for policy ends*. Two key characteristics of strategy have also been emphasized: its paradoxical logic, and its inherent difficulty.

In the subsequent paragraph, I have examined four theoretical perspectives which have been particularly influential both during and after the RMA debate. As a much needed cautionary warning, I have begun this review by describing an alternative approach that is certainly not a theory of revolutionary change in warfare, but quite the opposite. However, this was necessary to emphasize that if profound discontinuities in strategic history can certainly be found, their implications are too often overstated by those who neglect the true nature of war and strategy.

Alvin and Heidi Toffler's "three-wave" theory has been probably the most influential (and overstated) interpretation in the early years of the RMA debate. The Toffler's approach is extremely simple, undoubtedly elegant and, even more importantly, entails a vision of future war that is perfectly consistent with the cultural preferences of the most vocal RMA enthusiasts (and with the American attitude for astrategic interpretations of war). The three waves of social change described by the Tofflers offer an appealing reading of the history of mankind (divided in the agricultural age, the industrial age, and the coming information age). As many critics have noted, the theory's underlying assumption is based on a reinterpretation of the Marxist reductionist approach, which brought the Tofflers to maintain that changes in productive activity and wealth creation determined the consecutive advance of these three "waves", which in turn shaped the nature of war in each age. The fundamental point suggested by the Tofflers is that occasional transformations in the context(s) and character of warfare are simply ineluctable (an assertion that is as true as it is useless for the

purpose of the strategist). Moreover, it does not provide any practical indication for predicting the future of warfare, as the RMA enthusiasts would like. Thus, both for its theoretical inadequacy and for its manifest reductionism, the Tofflers' theory should be firmly rejected. Nevertheless, it does indicate a useful observation: namely, the idea that when examining the history of warfare and its discontinuities, "context matters".

The second theoretical model of the RMA presented here is the one suggested by two valuable historians: Williamson Murray and MacGregor Knox. Murray and Knox begin their analysis of revolutionary change in warfare by operating a distinction between revolutions in military affairs (RMAs) and military revolutions (MRs). The latter phenomenon, the authors claim, is best understood if compared to an "earthquake": it is uncontrollable, unpredictable, and unforeseeable. The consequence of this kind of events is a profound change in the character of politics and society, to which military organizations must necessarily adapt or succumb. Moreover, these changes have "additive" effects, meaning that those States which failed to adapt to the early MRs are unable to achieve military success through a sheer acquisition of the latest weapons. According to the authors, only five MRs occurred in the history of mankind, and if the alleged information revolution will resemble these previous radical changes there is no possibility for modern armed forces either to predict or to successfully prepare for the transformations it will produce. On the other hand, RMAs are more limited changes which can be effectively managed through human action. But managing these transformations is difficult, and success will be revealed only through the test of battle. Historically, RMAs were rarely driven by technological innovation: instead they were usually the result of a combination of innovations in diverse dimensions, among which the technological was just one. Ultimately, although their idea that military revolutions cannot be controlled by enlightened "revolutionaries" deserves to be praised, the causal relationships established by Murray and Knox are far from clear. Their claim is that political and social changes generate military revolutions, which in turn create other political and social

transformations, and so on: unfortunately, there is no precise definition of prime causes. The most relevant merit of this theoretical approach is that it includes the broader contexts by which warfare is influenced, but the attempt to impose a rational pattern on strategic history by classifying MR and RMA candidates is still unconvincing. There are some additional important observations advanced by Murray and Knox. In the past, technology did not simplify war, instead it made it exponentially more complex.[126] Moreover, past RMAs were usually lengthy "periods of innovation" which required experimentations and a cultural openness to change on the part the military. Murray also adds that since RMAs affect only the operational level of war, they have no effect on the strategic level. This brings him to claim that in the past, RMAs were more successful in the presence of a concrete adversary. An insightful distinction made by Jeremy Shapiro between the strategist's and the historian's perspectives on military revolutions helps us to focus our inquiry on the *utility* that the idea of revolutionary change can have for understanding the history of strategy and war. This leads us to conclude that conceptual distinctions between MRs and RMAs, for all their undeniable appeal, ultimately reduce our ability to examine the linkage between innovation and strategic history. In fact, this relationship does not depend on any single (if far-reaching) change in the way war is fought. Rather, it should be analysed from a broad perspective that does not neglect the fundamentally multidimensional nature of strategy. This is the reason why I have written that our paramount guidance rests precisely in the awareness of what strategy is and what is its role, one that no technological innovation can substitute.

The previous observations are well-suited to summarize the last theoretical framework illustrated in this chapter. As stated earlier, although I do not necessarily subscribe to the model that Colin Gray builds to test his hypotheses in *Strategy for Chaos*, his is by far the most convincing approach to the issue of revolutionary change. In fact, as he acknowledges,

[126] This point is interestingly analogous to the one made by Biddle, see the beginning the second paragraph.

his theoretical approach is ultimately neither true nor false, and is built around the case studies he chooses to analyse. I will suggest here that, rather than using the next chapter to empirically test Gray's model (which would be exceptionally difficult simply because the historical record is far from exhaustive), it would be more valuable to rework what, in my opinion, are his most persuasive conclusions in a way that may help our understanding of the early modern military revolution.

Before doing that, as a useful introduction to my findings (which are largely, but not exclusively, based on Gray's approach), I will reiterate here Cohen's most convincing argument, namely that RMAs entail a considerable risk: profound technological innovations may provide "tactical clarity" at the cost of "strategic obscurity". This is why successful revolutionary change in warfare must be driven by an adaptation of the military instrument to political purposes. Thus, Cohen establishes a firm link between an RMA and strategic realities: the former cannot achieve strategic effectiveness if its pursuers neglect the multidimensional nature of strategy.

It is now due time to present the key conclusions of this discussion, bearing in mind both the inevitably contentious nature of the RMA, if it is seen as an empirically verifiable phenomenon, and yet its plausible utility as a conceptual tool.

First, the nature of strategy (and war) is both complex and permanent, and no fundamental change in the character of war can ever transform these two inherent characteristics.

Second, for all its intrinsic complexity, strategy is still susceptible to human intervention: it does possess an unpredictable dimension (what Clausewitz in his trinity calls the "play of chance and probability"[127]), but this fact does not prevent potentially successful planning and execution.

Third, the nature of strategy is multidimensional. I deem Howard's classification of four dimensions of strategy (logistical, operational,

[127] Clausewitz, *On War*, cit. p. 30.

technological and social) both elegant and persuasive, but this is ultimately a subjective evaluation. What matters is that each of these dimensions affect all the others, that no dimension is hierarchically superior, that in each historical period the relative impact of each dimension must be assessed within the broader context, and that the strategist can (at least potentially) manipulate these dimensions to maximize advantages and minimize disadvantages.

Fourth, we can describe profound discontinuities in strategic history (which have been succinctly labelled RMAs) as those episodes of innovation that had a significant effect on the ever-changing character of war. Nevertheless, the importance of these episodes derives from subjective considerations, not from real "facts".

Fifth, the political dimension is the first that we need to examine for understanding a particular period of military innovation. For maximizing the probability of strategic success, the advantages offered by an RMA have to be translated into politically defined goals, and these goals must be strategically viable.

Sixth, RMAs are cases of "strategic behaviour", no matter how consciously they are pursued in the specific circumstances. Moreover, since military effectiveness is a relational variable, the purpose of these episodes of strategic behaviour is not to achieve absolute dominance in all of war's dimensions, but just to be superior to the adversary.

Seventh, since war is the "collision of two living forces"[128], any RMA generates in the adversary the will to find countermeasures, which it always successfully does.

In conclusion, in the complex realms of strategy and war there is no such thing as a "silver bullet" (neither technological, nor of any other nature), which might ease the efforts necessary to cope with the difficulty of strategic realities. At the same time, however carefully and thoroughly we examine the history of warfare, we will not be able find the "smoking gun"

[128] Ibidem, p. 16.

that unequivocally proves that an RMA has indeed occurred. And yet, this chapter has hopefully provided some useful guidance for interpreting how the RMA concept can improve our understanding of the relationship between military innovation and the realms of strategy and war.

CHAPTER III

THE "MILITARY REVOLUTION" OF THE MODERN ERA

Historians have debated the "military revolution" thesis since Michael Roberts introduced the idea in his 1955 opening lecture at the Queen's University of Belfast. Through the years, several historians have either deeply modified his argument (while accepting his basic view on the revolutionary character of military change in early modern Europe) or have totally rejected it by claiming that an evolutionary explanation is better suited to understand the same historical events analysed by Roberts.

There has been no systematic attempt to study the implications and outcomes of this debate from the perspective of strategic studies, the only exceptions being two monographs by Van R. Sikorsky (2001)[129] and Michael Horowitz (2004)[130]. The limit of these studies is mainly their superficial acceptance of the "military revolution" hypothesis, which is utilized instrumentally to justify RMA proponents in their attempt to promote a massive use of ICT by the U.S. Armed forces. Historical patterns of change in warfare during the early modern era are greatly oversimplified in order to reject criticism of the RMA hypothesis.[131]

The purpose of the following paragraphs is to describe the controversial dynamic of this "military revolution" and to stress the complexity of historical events, thanks to a more careful analysis of the debate among military historians. This attempt to clarify historical patterns of change will inevitably appear disputable, since the manifest variance in the competing theories about the "military revolution" cannot be easily dismissed. Nonetheless, a more systematic study of this debate will

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[129] Sikorsky, Van R. *Developing a Paradigm for the U.S. Army Transformation*. School of Advanced Military Studies Monographs. Fort Leavenworth, KS: US Army Command and General Staff College, 2001. <http://cgsc.cdmhost.com/u?/p4013coll3,439>.

[130] Horowitz, Michael. *Revolutions in Military Affairs: Past, Present, Future?* Paper presented at the annual meeting of the American Political Science Association, Hilton Chicago and the Palmer House Hilton, Chicago, IL, Sep 02, 2004. 2009-02-05 <http://www.allacademic.com/meta/p60064_index.html>

[131] In their analyses, Sikorsky and Horowitz draw overly optimistic conclusions about the ability of the U.S. military to control and shift the RMA to its advantage.

hopefully benefit our understanding of its implications for strategic studies and particularly for a more informed analysis of the RMA thesis.

Although valuable lessons could be drawn from the study of warfare between "revolutionized" and "non-revolutionized" (non European) armies, I will not take into consideration wars fought outside the European continent. Far from being due to a "Eurocentric" bias, this decision is justified by two reasons: the first is simply due to limits of space, while the second has a methodological rationale. If we accept the fact that the early modern military revolution was mainly a European phenomenon, we must also recognize that it was the possibility of communication and common experience on the battlefield which allowed the rival European states to compete with each other and achieve their military dominance in relation to external powers. In order to draw some useful lessons for the analysis of the contemporary RMA debate, we must consider the fact that the ongoing decrease in communication costs allows military-technical progress to spread across the world more similarly (from a theoretical perspective) to the process of imitation among the European states, which clearly did not have the same impact on extra-European armies. Furthermore, for reasons of space, the impact of technological change on maritime warfare will not be addressed in this work, as it would be impossible to examine thoroughly its implications on European expansionism abroad.

This chapter will begin by illustrating the origins of the "military revolution" idea, emphasizing both the controversial and the common aspects that emerged from the views of the historians who contributed to the debate. Then, our attention will be directed at offering an account of the transition between medieval and modern warfare, emphasizing the critical aspects that characterized war before the introduction of firearms. Afterwards, the strategic and tactical implications of the use of gunpowder weapons will be analysed in two specific contexts: infantry tactics and siege warfare. Infantry and fortifications are considered by many historians the two elements which were most affected by the "military revolution" (as far as land warfare is considered); hence, it is reasonable to limit our inquiry in

these two fields in order to review major patterns of change. Finally, at the end of the chapter concluding considerations will be suggested on the theoretical validity of the "military revolution" thesis, with particular attention to the alleged causal relationship between technological progress, institutional and doctrinal adaptation, and military superiority.

The "military revolution" thesis

Before analysing in detail the main characteristics of military change at the beginning of the modern era, it is necessary to make a survey of the major contributions to the "military revolution" debate. The idea of a "military revolution" developing in the years 1560-1660 was first expressed by professor Michael Roberts in 1955, as a result of his studies on Sweden's Gustavus Adolphus.[132] A first step was a "revolution in tactics", characterized by a shift from large squares of pikemen to linear formations of arquebusiers and musketeers and the simultaneous decline of the *caracole* in favour of cavalry charges, sabres in hand, for achieving shock effect. The impact of these changes, Roberts argued, was significant especially on the logistical dimension of warfare, as the increased training costs required the State to maintain a standing army rather than disbanding the troops at the end of each campaign (as the reforms implemented by Maurice of Nassau demonstrate). The second pillar of Roberts' thesis was the "revolution in strategy", mastered by Gustavus Adolphus: separate armies could be deployed at the same time on the battlefield, while their experience and skills sharply increased the chances of decisive military action. The third step was a dramatic rise in the scale of warfare in Europe in the years between 1560 and 1660: as the revolution in strategy gained ground, the number of troops grew in order to fulfil its promises; this led directly to the fourth and final point: the increasing impact of war, especially in terms of costs, on society. In conclusion, Roberts sees the military revolution as the result of tactical innovation and doctrinal change,

[132] Roberts' thesis is extensively summarized in: G. Parker, *The "Military Revolution" 1560-1660 – a Myth?*, in "The Journal of Modern History" 48, no. 2 (June 1976) 196-214.

while technology had a remarkable but secondary role.

Geoffrey Parker later modified Roberts' ideas[133], first by criticizing his periodization: he maintains that most of the innovations emphasized by Roberts were already present in the years before 1560, and that they emerged in the Italian peninsula during the invasion of Charles VIII. Parker claims that the increasing power of artillery was the catalyst behind the military revolution. In order to counter these powerful guns, a new type of military architecture was developed during the XVI century (the so-called *trace italienne*), and this is considered by Parker the main driving force of revolutionary change in military operations. The consequences on siege warfare were so remarkable that the revolution created "strategic problems for which there was no easy solution"[134]. According to Parker, the *trace italienne* was the defining characteristic of the art of war in the XVI and XVII century: no field battle could have significant impact on the course of war if these strongholds were not taken. Moreover, the success of firearms (whose origins too date back to Renaissance Italy) was allegedly due to the fact that they required "virtually no training to use"[135]. Then, the introduction of volley fire dramatically increased the importance of drill, and sharply limited the role of cavalry in favour of infantry. All of these innovations coincided with a huge expansion in the number of troops, together with the establishment of standing armies in order to manage the logistical impact of using such masses of men. In the end, the capacity to supply large armies was possible only thanks to strong, centralized governments. Unfortunately, these governments' political objectives were often unachievable: Parker maintains that "[t]he states of early modern Europe had discovered how to supply large armies but not how to lead them to victory"[136]. As a consequence, continues Parker, the European states began to develop naval fleets as a tool to escape the continental strategic

[133] G. Parker, *The military revolution*, Cambridge [England]; New York: Cambridge University Press, 1988.
[134] G. Parker, *The military revolution*, 1988, p. 16.
[135] Ibidem, p. 17.
[136] Cit., p. 80.

stalemate and expand their influence overseas. Parker's focus, as opposed to Roberts' interpretation, is clearly directed towards technological change as the main causal variable of the military revolution. Although Parker does not overlook tactical and doctrinal innovation and strategic imperatives, he claims that the presence of the *trace italienne* emerges as the fundamental factor for recognizing the impact of the revolution in a given geographical area.

David Eltis[137] criticizes Roberts' idea that firepower declined with the use of the arquebus in comparison to the longbow: he maintains that, on the contrary, firepower was greatly increased by the introduction of firearms. Eltis denies that firearms required little training, and indeed he shows how training *en masse* became the enabling factor for effectively combining pike and shot; he also criticizes the idea that cavalry became totally ineffective on the battlefield, although its declining importance in offensive role is duly acknowledged. The core of Eltis' argument rests on a different periodization of the military revolution: he argues that all the defining elements of radical change in warfare were present at the beginning of XVI century and that they were fully developed by Maurice of Nassau in the 1590s. With the establishment of standing armies, came a standardization of training and the emergence of the sergeant-major as the pillar of the new tactical model which combined pikemen, arquebusiers and cavalrymen. Finally, innovation in military architecture is regarded as a major cause of the decreased effectiveness of siege warfare. Yet, Eltis' argument differs from Parker's mainly because the former suggests that, even when the besieged could not rely on the benefits of the *trace italienne*, the defensive potential of carefully placed firearms could well compensate for this disadvantage. To summarize, Eltis indicates better firearms and tactical reforms as the leading causal factors of the military revolution, while doctrinal and organizational reforms represented the complementary steps of this phenomenon.

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[137] D. Eltis, The military revolution in sixteenth-century Europe, London: I. B. Tauris, 1998.

Clifford J. Rogers challenged not just the periodization proposed by Roberts and Parker in order to include the XIII century, but also claimed that the label “military revolution” simply ignored the evidence of *several* revolutions.[138] The "Infantry Revolution", the "Artillery Revolution", the "Artillery Fortress Revolution", and the revolution in administration (what Roberts called the "Military Revolution"), all combined into a major change in the history of warfare. Rogers' thesis draws from the biological theory of "punctuated equilibrium evolution", which is applied as a paradigm in order to analyse the success of the European way of war. This approach provides a theoretical framework accompanied by the ambition to fully embrace every major step of military change, which begins with a revolution followed by incremental changes and a period of evolution, followed by another revolutionary change. Thus, Rogers proposes a theoretical model which encompasses all the dimensions of strategy in a somewhat mechanical action-reaction logic: the primary cause of revolutionary change then appears indeterminate.

Finally, Jeremy Black[139] criticized the periodization proposed by Roberts and Parker, arguing that in the period 1560-1660 infantry weapons and tactics were not revolutionized in any European army: instead, these were quite similar, and battles were decided by troops number, experience and morale. He attributes the general inconclusiveness of military campaigns during those hundred years to human, logistical and financial deficiencies, in addition to the superiority of defense given by fortifications. Black then indicated 1660-1760 as a much more important time period for European warfare: he maintains that the increase of trained manpower and firepower of European states represented a major development which had been neglected by Roberts and Parker. Yet, he points out that the strategic implications of logistical difficulties were not overcome until the XVIII century, when technological advancements allowed for the rise of European

[138] Rogers, Clifford J. *The Military Revolutions of the Hundred Years' War* in “The Journal of Military History” 57, no. 2 (April 1993): 241-278.

[139] Black, A military revolution? Military Change and European Society, 1550-1800, Palgrave Macmillan, 1991.

military mastery. In conclusion, Black suggests that the combination of limited technological change and an increase of trained troops permitted the beginning of a process which was not completed until technological, financial and social constraints were progressively weakened.

The transition from medieval to modern warfare

According to Piero Pieri[140], European armies during the Renaissance were striving to achieve decisive victory in war, an ability they seemed to have lost during the Middle Ages when the factors capable of bringing military success were almost exclusively exogenous. Pitched battle was extremely rare: medieval military strategy was limited by the small size of armies (at most 15000 men). The limited number of troops, most of them cavalrymen, gave these armies significant tactical mobility in the event of a battle of encounter, but strategic mobility was greatly reduced by difficult terrain and the presence of fortifications. In these conditions, defence clearly dominated offence: a small army could not do much more than setting a siege around the enemy town, which was protected by high walls, and block any refurbishment and support coming from the outside (which typically proved to be particularly difficult). The best chance for the besieging army was that some non-military event (like internal unrest, or treason) intervened in its favour, so that enemy resistance would end without any perilous attempt at storming the stronghold. Since feudal armies were under duty for six months at the most, the beginning of winter meant also the end of any full-scale military activity. Therefore, the Middle Ages were characterized by a strategic stalemate: long wars of attrition were necessary to achieve strategic goals, while limited manpower and frequent defections denied military commanders any chance to maintain a siege for more than six months. The only available strategic alternative to siege warfare was the raid – or *chevauchée*[141] – which consisted in a

[140] Pieri, Piero. *Il Rinascimento e la crisi militare italiana*. Torino, Einaudi, 1952, pp. 205-207.
[141] C. Rogers, *The medieval legacy*, in Mortimer (ed.), *Early modern military history, 1450-1815*, Palgrave Macmillan, 2004.

mounted invasion of enemy territory. The principal aim of this strategy was to devastate the adversary's lands in order to either frustrate its will to resist or to force it to accept pitched battle, while an important secondary objective was to weaken the opponent's economy and political regime. Great battles were definitely rare in this strategic context, and while the attacker's favourite course of action was to engage the enemy on the open field, defenders could avoid pitched battles by using a defence–in–depth strategy due to the presence of fortifications. Armies during the XIV century were mainly composed by men-at-arms (mostly knights coming from the lower nobility), mounted infantry and simple infantry. An interesting fact is that there was no combined arms tactics: knights were indisputably the pivotal branch in battle, and the other arms did not have any independent role.[142] Moreover, discipline was an alien concept for medieval armies. The commander did not have the authority to impose a decision to engage the enemy in battle: the whole army had to agree on that dangerous choice.[143] We have seen how short-term military service greatly limited the ability of armies to achieve strategic goals: the institution in France of the *compagnies d'ordonnance* (1445)[144] addressed precisely this issue by creating a permanent military force paid directly by the King. These companies, though insufficient to conduct military campaigns on their own, represented the first cornerstone which standing armies were later built upon.

Gunfire, in the form of field artillery, was still not reliable enough in battle and its use could not have any decisive impact at the time.[145] Hence, it was the infantry which could and had to be improved through the development of tactical corps able to withstand cavalry attacks in pitched battle. An early example of this new type of infantry can be found in the armies of the Lombard League, but it was not until the beginning of the XV

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[142] H. Delbrück (trans. by W. J. Renfroe), *History of the Art of War*, 1990, p. 290.
[143] Ibid., p. 327.
[144] Parker, *The Cambridge History of Warfare*, Cambridge; New York: Cambridge University Press, 2005, p. 99.
[145] Rogers, Military Revolutions of the Hundred Years' War, p. 259.

century that pikemen began their march to replace cavalrymen as the primary force of European armies. In the words of Pieri: "[t]he fundamental characteristic of modern military warfare is given by the supremacy of infantry over cavalry, and the one infantry capable of achieving victory is that of the Swiss."[146] Swiss infantry reforms are properly deemed as a major change in early modern warfare. In fact, these reforms ensured much more than a valid defence against cavalry charge: Swiss pikemen, thanks to their strong discipline, were able to *advance* on the field and defeat cavalrymen.[147] Pikemen stood in large square formations (initially numbering 1500 to 2000 men, later on up to 6000); to avoid encirclement, the pike square did not fight alone in the battlefield: a regular Swiss army was usually composed of three squares. Thus, during the XV century a tactical innovation, combined with improved organization, generated an offensive infantry formation capable of achieving decisive victory in pitched battle. Before the end of the century, most Continental armies adopted the new model of infantry warfare, and the German *landksnechte* emerged as the most powerful rivals of the Swiss in Europe.

The impact of firearms on pitched battles

In addition to the difficulties due to their very success and subsequent diffusion in other European armies, at the outset of the XVI century the Swiss tactical model was threatened by the growing effectiveness of firearms. The introduction of hand-held firearms dated back to the mid-fifteenth century, but it was not until about 1500 that technical improvements enhanced their reliability and efficacy on the battlefield. As the use of firearms increased among European armies, pike squares became increasingly vulnerable: though still inaccurate (especially at long distance), arquebus and musket did great damage on mass formations of pikemen, as demonstrated by the Spanish *tercios* in the battles of Bicocca (1522) and

[146] Pieri, p. 234
[147] The Battle of Laupen (1339) is the first example of the Swiss' successful offensive use of pikemen against cavalry.

Pavia (1525).[148] Interestingly, the impact of firearms and artillery on pike formations had much to do with psychology in addition to the sheer number of casualties they caused. The crucial strength of the Swiss infantry model resided in the cohesion of the advancing pike-square: the terror caused by artillery and arquebus fire had precisely the effect of breaking up the adversary's ranks, leading to a disordered collapse of the square formation. Nonetheless, the use of pike-squares was by no means obsolete: in fact, it was the combination of pike and musket that became the “new orthodoxy” during the second half of the sixteenth century[149]. The persistent value of the pike was due to the threat posed by enemy cavalry to the arquebusiers in the open field, therefore the specific combination of forces was strongly influenced by the enemy's capabilities. Pikes and firearms could be deployed in different ways on the battlefield: one possibility was to include arquebusiers inside the square, behind the first line of pikes; another variant consisted in deploying groups of arquebusiers on the flanks of a central pike-square, so that the former could fire at distance and then retreat behind the latter before the clash with the enemy. Either way, this new system of combined arms tactics required a great emphasis on training *en masse*[150]: the spread all over Europe of military writings focusing on drill proves its growing importance for any successful implementation of the novel infantry model.

Along with tactical innovation came the introduction of a new military hierarchy, with the task of maintaining order among the ranks: the sergeant-major emerged as the central figure able to promote discipline

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[148] Eltis, The military revolution in sixteenth-century Europe, p. 17.

[149] ibid., p. 50-51.

[150] The impact of firearms on individual training is disputed among historians. While some authors suggest that firearms required less individual training, thus allowing for a more effective use of recruits on the battlefield (Roberts 1952, Parker 1988, Mortimer 2004), Eltis (1998) criticizes this view by citing the importance attributed by contemporary writers to the training in the use of arquebus and musket. The controversy may be better understood if divided into two main aspects: while individual training may have lost relative importance with the introduction of firearms (as opposed to the skills required by the bow), the significance of training *en masse* probably saw a sharp increase as the number of men on the battlefield grew, hence putting a premium on order, discipline and coordination.

within ever larger infantry formations.[151] The use of drums to maintain order, and the diffusion during the second half of the sixteenth century of a new military literature (which focused on practical issues) remarkably shows how the introduction of a new technology induced tactical innovation, which in turn led to new forms of organization. The cultural context of the Renaissance enabled the diffusion of drill manuals, tactical methods and tables[152] translated in most European countries.

As the accuracy of firearms improved due to technological advance, the proportion between pike and shot was reversed: pikemen were used to protect musketeers while they reloaded their firearms. An interesting example of tactical innovation is represented by the French army[153] during the Italian wars, which was largely based upon Swiss pikemen fighting in tight formation, as did the opposing Spanish forces. With the beginning of the Wars of Religion (1562-1598), lacking both the resources of taxation and the permanent Swiss and French units, French Protestants had to overcome huge problems of infantry organization and doctrinal adaptation in order to fight their *petit guerre* against the crown. This type of warfare required the use of small units acting independently. These small companies were deployed on the battlefield in regiments, forming a single line of squares ten or twelve ranks deep; the squares maintained intervals equal to the front of one square, which could be closed in case of attack from enemy cavalry. During the reign of Henri IV the French infantry adopted the battalion as its standard combat unit. Intervals between companies were suppressed, with the pikemen standing in the centre of the battalion, supported by musketeers on the flanks. On campaign, battalions normally consisted of about three hundred pikemen and one hundred musketeers, and

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[151] A detailed analysis of the sergeant-major's role, his alleged Roman origins and his required skills can be found in Eltis, p. 54-56.

[152] The most common at the time were Girolamo Cattaneo's *Tavole brevissime* (Brescia, 1567), cit. in Eltis, p. 61.

[153] This case is of particular interest because it shows how the initial doctrinal innovation was effectively achieved not by a centralized state, but by the Huguenot insurgency. J. Lynn, *Tactical evolution in the French army, 1560-1660*, in “French Historical Studies”, Vol. 14, No. 2 (Autumn, 1985), pp. 176-191.

they were designed to support each other in line or in a checkerboard formation. These innovations were developed at the end of the XVI century, hence it is reasonable to suggest that the French reforms autonomously created an infantry which closely resembled that of the forthcoming Dutch tactical innovations.

In order to maximize the effect of firepower against the enemy, Counts Maurice and William Lodewijk of Nassau devised a new tactical solution according to which musketeers had to be positioned on the battlefield in a series of long lines. Willem, governor of Friesland and commander of its troops, wrote a long letter on the issue to his cousin Count Maurice, general of the Dutch army, on 18 December 1594. Drawing from the *Tactica* of Aelian, written around the year 100 AD, Willem devised a way to imitate the Roman "countermarch" described in this classical treatise[154]. The technique consisted in instructing the first rank of musketeers to fire and then withdraw behind in order to reload, then the second rank advanced and fired its volley, and so on: continuous fire was initially achieved with ten lines of men, but constant developments steadily reduced their number. Furthermore, Maurice decreased the size of his tactical units while raising the number of officers and NCOs; finally, he modified the balance between pike and shot in each unit, favouring the latter. The introduction of "volley fire" was a major tactical innovation with multiple consequences: armies had to spread along thin and wide formations, with the result that more men were exposed to direct enemy fire. This in turn required both high morale and superior training *en masse*: the army of the Netherlands was then divided into small formations precisely to facilitate constant practice. Moreover, in 1599 Maurice of Nassau successfully began a process of weapons standardization which, combined with an illustrated drill manual (written by John of Nassau, Maurice's cousin), greatly enhanced the skills of his musketeers. The

[154] A detailed description of the origins of Maurice's reforms can be found in G. Parker, *The Limits to Revolutions in Military Affairs: Maurice of Nassau, the Battle of Nieuwpoort (1600), and the Legacy*, in "The Journal of Military History" 71 (April 2007), p. 331–372.

diffusion of these innovations was aided by the presence of foreign units in the army of the Dutch Republic, as well as by several books illustrating Maurice's drill. Nevertheless, the battles of Turnhout in 1597 and Nieuwpoort in 1600 showed that the Dutch had not exploited to their full extent the tactical advantages given by their creativity.[155]

At the outset of the Thirty Years' War in 1618, the only three standing armies in Western Europe were those of France, Spain, and the Dutch Republic.[156] When the fighting started, German Catholics and Protestants commenced to form armies from nothing, either by borrowing from Spain or Holland, or by contracting. The “military entrepreneurs” stipulated contracts with their respective princes, which mandated them to raise, supply, and lead infantry or cavalry regiments. It is a mistake to think of these men as mercenaries: they were not "free" to switch sides but rather served under the authority of a specific government. In theory, infantry units were equally divided between pike and shot. In fact, there was a great degree of variance in each circumstance, usually with a prevalence of the shot. Again in theory, the pikemen represented the *élite* troops, but many colonels modified these rules because of the declining effectiveness of pikes, while the role of musketeers and arquebusiers was most impressive in increasingly common actions like skirmishes and sieges. The pike battalion was placed in the middle, while two wings of musketeers (called "sleeves") stood on the flanks, their depth matching that of the battalion; three to five additional ranks of shot were positioned on front. The whole would comprise a solid block of men, the pike center surrounded on three sides by shot. The Spanish invented this formation (called *tercio*) in 1534[157], which was to be considered the ideal combination of arms until the late XVI century. The pike would oppose cavalry attacks and then engage enemy pike, while the shot produced a regular stream of fire; as soon as the

[155] Parker, cit., p. 23.
[156] W. P. Guthrie, Battles of the Thirty Years War: From White Mountain to Nordlingen, 1618-1635, Westport, Conn., Greenwood Publishing Group, 2002.
[157] Parker, *The Cambridge History of Warfare*, Cambridge; New York: Cambridge University Press, 2005, p. 151.

opponent was sufficiently weakened, the battle would be decided with push of pike and butt of musket. On the defence, firearms could withstand enemy advance, and withdraw behind the pikes in case of a cavalry charge. The Spanish *tercios*, although they began to appear obsolete in the 1590s[158], maintained significant value on the battlefield, as they did not require extensive training, compared to the Dutch formations. Maurice's countermarch maximized firepower while carefully preventing direct encounter where the solidity of the *tercio* could become a factor. The *tercios* were usually arranged in three separate echelons: the second line covered the spaces in the first, the third one did the same with the second; however, there was no systematic cooperation and mutual support. The Spanish cavalry, formed by heavy cuirassiers and lighter arquebusiers, was deployed on the flanks of the infantry formations, plus a reserve behind them. The standard tactics employed by the cavalry was the *caracole*[159] (a mounted fire attack without direct contact), which has received much criticism by later historians, but still had some efficacy. Finally, artillery was placed on a loose line in front of the army, and during battle there was no coordination of between the different guns and no battery organization.

The Swedish King Gustavus Adolphus' has been justly praised by most military historians, especially for his ability to amalgamate the finest aspects of contemporary methods of warfare into a coherent operational doctrine. He embraced the Dutch example of linear infantry formations, and then combined it with the Polish system of shock cavalry charges. Gustavus emphasized the "shock" dimension of battle, as opposed to attrition, and attempted to modify the new model according to his theories. Unlike Maurice, he did not reduce the use of pikemen: rather, he made sure that these cooperated with musketeers during the battle. Gustavus introduced the use of the offensive countermarch, with continuous fire now being maintained by six ranks of his well-trained musketeers. At close range, in order to maximize firepower even more, these six ranks could reduce to

[158] W. P. Guthrie, Battles of the Thirty Years War, p. 11.
[159] A detailed account of this tactic can be found in: W. P. Guthrie, cit., p. 12.

three by filling the spaces between the men ahead: once the musketeers had loaded their weapons, the first rank knelt, the second bent and all the three fired a simultaneous volley.[160] The king applied the shock principle to cavalry as well: the *caracole* gave way to the use of the sabre for the purpose of breaking enemy ranks, thus accelerating the pace of the battle in order to achieve decisive results. The same principles were employed in the use of field artillery: the first result of Gustavus' experimentations was the "leather gun," which proved to be totally ineffective because of its fragility and weak firepower. Its replacement was the regimental gun, which could be pulled by three men or one horse and permitted outstanding mobility. The impressive series of Swedish victories (Breitenfeld in 1631, Lützen in 1632, Wittstock in 1636, Breitenfeld II in 1642 and Jankov in 1645) had a major impact on other European armies which soon copied Gustavus Adolphus' model. After the King's death at Lützen, the "pre-revolutionary" Spanish *tercios* defeated the outnumbered Swedish army at Nördlingen (1634)[161], thus putting an end to the Swedish quest for dominance in Germany. Nonetheless, the tactical and organizational reforms mastered by Gustavus were by then widely imitated by all major European states.[162]

The impact of artillery on siege warfare

In the description of the transition from medieval to modern warfare, it has been stressed that artillery was clearly ineffective in bringing decisive result against fortifications: lack of supplies was the main reason for the eventual surrender of the besieged. However, in the 1420s, chronicles narrate of garrisons capitulating because the besiegers' guns rendered the stronghold indefensible. During the first thirty years of the XV century,

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[160] P. Paret, Makers of Modern Strategy From Machiavelli to the Nuclear Age. Oxford: Clarendon Press, 1990, p. 48.

[161] Delbrück considers Nördlingen as a meeting encounter rather than a pitched battle: it can then be argued that the full potential of the Swedish tactical model could not be expressed in that circumstance. Nonetheless, Spanish appalling numerical superiority put them in an extremely favorable situation. Delbrück, Hans and Walter J. Renfroe, *History of the Art of War,* University of Nebraska Press, 1990, p. 211.

[162] Archer et al., *World History of Warfare,* University of Nebraska Press, 2008, p. 299.

cannon design underwent most important advancements. These developments included innovations in the design and manufacture of the guns, in loading methods, and in powder chemical compound. The most relevant change was the lengthening of gun barrels, which increased the accuracy of the shot and its muzzle velocity, thus allowing also for an augmentation of range. Additional improvements were achieved from the 1450s to the 1470s, as the diffusion of the two-wheeled carriage, trunnions, and iron cannonballs; moreover, cheaper, more easily transportable bronze guns gradually replaced the bombards. The increasing efficacy of artillery fundamentally altered the strategic balance between offence and defence. The previous strategy based on the superiority of fortifications could not resist the power of the new guns, which apparently resulted in a remarkable increase in the frequency of battle.[163]

The introduction of siege artillery was behind a major development in early modern warfare, namely the spread in most of the European continent of a new kind of fortifications. In his treatise *De re aedificatoria* (written in the 1440s), the Italian architect Leon Battista Alberti, was the first to suggest the construction of walls following irregular lines, precisely to minimize the advantage of the attacker's artillery[164]. Fifty years later, the invasion by Charles VIII of Italy and his successful use of artillery to capture fortified cities sparked the development of thick, low bastions which offered a smaller target to the besieger's guns. The bastions had to be built at regular intervals to allow for flanking fire, thus eliminating the defenders' disadvantage of not being able to see the ground immediately below the walls. Further improvements were made to the bastion system, consisting in the creation of ditches and external fortifications (“ravelins”), in order to keep enemy guns at distance and protect the walls from mining.

The major limit of the *trace italienne* was its enormous cost: the fortification of seventeenth towns in the territory of the Republic of Siena,

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[163] C. Rogers, *The Military Revolutions of the Hundred Years War*, in “The Journal of Military History”, Vol. 57, No. 2 (April 1993), pp. 241-278.
[164] Parker, p. 8.

which began in 1553 and was never completed, resulted in the depletion of its financial resources and finally brought the annexation of Siena at the hand of Florence two years later. An alternative, cheaper solution was to dig the earth outside the town's medieval walls (thus creating a ditch), along the selected geometrical pattern; the resulting material was then used to build the walls, glacis and counterscarp. In addition to the issue of financial costs, the spread of strongholds created a new strategic dilemma: if an army was mobilized to storm an enemy fortification, the risk of losing the attacker's strongholds was highly increased simply because there was not enough manpower to pursue both efforts. The major military advantage of the new bastion system (in both stone and earth versions) resided neither in the physical obstacle it posed to the besieging army nor in the resistance of walls against cannon, but rather in the defender's ability to exploit interlocking fields of fire (thus minimizing blind spots), while at the same time the smallest possible target was exposed to enemy direct fire.[165] It was the combination of geometrical precision in the design of fortifications and accurately placed artillery that proved most successful for the besieged. The large earth-backed walls of modern fortresses provided a perfect position for defensive artillery to counter the attacker's guns and infantry. The impact of artillery on the patterns of siege warfare was far more significant than the bastion in itself, as demonstrated by the fact that siege operations began at great distances from strongholds because of the range of the besieger's cannon.[166]

Capturing such well-defended places usually required months, or even years: taking them by assault necessitated a costly effort both in terms of men and money. Rather, it was through starvation or treachery that a stronghold could be taken: the balance between offence and defence, after the introduction of artillery had favoured the former, was restored. Tactical innovation had limited impact, as the fundamental characteristics of siege

[165] Eltis, p. 80.
[166] J. Lynn, *The Trace Italienne and the Growth of Armies: The French Case*, in “The Journal of Military History”, Vol. 55, No. 3 (July 1991), pp. 297-330.

warfare were not altered by the military revolution: the besieger had to mass a huge amount of men in order to blockade the enemy, then assault or starve him much like two hundred years earlier. Nevertheless, as the XVII century came to a close, improvements in both fortresses and siege techniques led to a *decrease* in the forces required for a besieging army, in relation to the garrisons they attacked.[167]

As Martin Van Creveld suggests, "the principal effect of the advent of artillery and the concomitant advances in fortification was to make both the attack and the defense of fortresses much more complicated and expensive".[168] In fact, if Howard's description of the four elements of strategy is applied, the impact of guns on siege warfare was especially manifest in the logistical dimension[169]: the required increase of men and matériel (if and when it was compatible with financial capabilities) determined an ever greater importance of supply and tactical mobility. The point is that from a broader perspective, as far as siege warfare is concerned, technological change was a function of the balance between offence and defence, and should not be considered as a factor able to modify strategic realities.

Conclusions

This chapter began with a review of the major contributions to the military revolution debate. As we have seen, historians are still far from having reached consensus on the issue: in fact, the definition of the concept, the periodization, primary factors and the very revolutionary character of change in early modern European warfare are highly disputed. However, it is still possible to draw some conclusions, bearing in mind what has been said in the previous chapter, in order to assess if, and to what extent, the "revolutionary" label is useful for understanding the historical period

[167] This is interpreted by Lynn as a proof against Parker's causal relationship between the *trace italienne* and the growth of armies in the XVII century. See Lynn, cit.
[168] Van Creveld, *Technology and war*, p. 107.
[169] Howard maintains that strategy is best understood if divided in its main dimensions: operational, logistical, technological and social. Michael Howard, *The forgotten dimensions of strategy*, Foreign Affairs, 57:5 (Summer 1979), p. 975.

examined here.

A first general observation can be that all the innovations in warfare (technological, organizational, doctrinal) that have been described in the previous paragraphs did not inevitably result in strategic advantage. Clausewitz's evocative description of war as "a true chameleon that slightly adapts its characteristics to the given case"[170] properly illustrates this point: the inevitable influence of chance can intervene in so many different ways and at distinct levels of war that to believe in revolutionary change as a formula for certain victory is simply naïve. The non-linear relationship between change in warfare and military success has been signalled by various scholars[171], and *revolutionary* change in particular is a concept which needs detailed scrutiny in order to avoid oversimplification or reductionist fallacy.

European medieval warfare was trapped in a strategic stalemate in which the siege and the *chevauchée* represented the only practical alternatives for the commanders of that age. The lack of permanent and disciplined armies, together with technological and logistical restrictions, resulted in the failure to achieve long-term strategic results through the use of force. Hence, as the superiority of defence over offence was clear to military commanders, mercenary armies cautiously avoided any direct encounter with the enemy, with the result that pitched battle was almost invariably a rarity, while long and often inconclusive sieges were the norm. The first sign of the coming change in warfare was the emergence of the Swiss pikemen, which began to erode the primacy of cavalry in battle and soon became the most successful military force of Europe. It is evident that Swiss tactical inventions owed nothing to technological change: the crucial foundation of their powerful pike square model was an ingenious combination of drill and discipline. However, the introduction of Swiss pikemen in the context of the European tactical and organizational tradition

[170] Carl von Clausewitz, *On War*, cit. p. 89.
[171] On the issue of non-linearity, for the purpose of this study, the crucial work is Colin Gray, *Strategy for chaos*, cit.

indeed represented a critical turning point. Nowadays, the fact that discipline is a defining characteristic of any armed forces is unconditionally accepted, but this was an entirely alien concept to the men-at-arms of the XV century, and even to XVI century's Spanish *tercios*.[172] Therefore, the appalling success of this tactical, doctrinal and operational innovation must be viewed as an example of how a profound change in warfare can be achieved in complete absence of technological factors. Moreover, and most importantly, this innovation (no matter if it deserves the revolutionary label or not) was certainly conducive to strategic effectiveness.

The Swiss infantry model was soon emulated throughout the European continent, and began to decline (in its pure form) during the Italian Wars (1494-1529), when the introduction of firearms provoked a brief but substantial tactical discontinuity in favour of the offence, which seemed to guarantee strategic success for the innovators. The battles of Fornovo (1495) and Pavia (1525) mark the beginning and the end of this relatively short period of time during which the stalemate of siege warfare was replaced by furious pitched battles. In these thirty-one years, the role of firepower ceased to be an auxiliary one, and began to acquire a crucial importance.[173] Generally, the battles fought in this period were characterized by confusion and chance (Fornovo was in fact a cavalry battle[174]); nonetheless, in most of them the combination of pike and shot adopted by the Spanish in their infantry tactics allowed for decisive results against the pike square. The creation of the Spanish *tercio* in the 1530s (which was to become the most powerful infantry of Europe until the end of the XVI century), and its constant adaptation through the increase of the shot element, represented an important evolution of previous infantry formations. The growing importance of training *en masse* and the creation of a military hierarchy were further remarkable developments, but it would be wrong to suggest that these were direct results of a revolutionary impact

[172] M. Howard, *War in European history*, 1976, p. 56.
[173] Ibidem, p. 32.
[174] J. Black, *European Warfare, 1494-1660*. London: Routledge, 2002, p. 71.

of firearms on warfare. Rather, these advancements were driven by an ingenious adaptation of earlier practices, in which troop numbers and morale were largely decisive. In the technological dimension, the early innovators during the Italian Wars were the French, which extensively used siege-trains to attack fortifications. Yet, it is remarkable to note that no lasting political or territorial gain was achieved by the French monarchy: technological superiority clearly could not ensure strategic effectiveness.

It has been observed that technological innovation had a considerable impact on warfare, represented mainly by the introduction of the *trace italienne*, which was first developed in Italy and then adopted as the ideal model of fortification throughout northern Europe (especially in the Netherlands). The debate over the alleged direct relationship between the bastioned system and the increase of armies[175] has yet to reach a definite conclusion, and even if further historical research would be certainly worthwhile, it might not necessarily lead to a conclusive assessment of this hypothesis. Parker determinedly argued that the presence of this new type of fortifications was "the key variable" able to explain the impracticability of wars of manoeuvre since the second half of the XVI century, while mobility was still a viable strategic alternative wherever strongholds were not modernized.[176] This claim needs at least some qualification: during the Thirty Years War most German cities were actually not fortified after the Italian model; still, provided that defence was wisely prepared, their high medieval walls successfully protected them. To establish a direct causal relationship between the *trace italienne* and the increased frequency of pitched battle seems too simplistic at best. Nevertheless, the fact that both Gustavus and Tilly were keen to occupy every available stronghold[177] out of

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[175] G. Parker, *The military revolution*, p. 169-172.

[176] ibid., p. 24.

[177] Gustavus, at the outset of his invasion of Germany, chose the fortress complex of Stettin-Damm as his base of operations, then continued to spread his troops southward with great attention for the strength of the fortifications he could occupy (as Werben in 1631), see: W. P. Guthrie, *Battles of the Thirty Years War*, cit. p. 158; after Breitenfeld, Wallenstein put in place a strategy of erosion based on the occupation of strong places (as the Alte Veste in 1632), see: R. F. Weigley, *The Age of Battles: The Quest for Decisive Warfare from Breitenfeld to Waterloo*. Bloomington: Indiana University Press, 1991, p. 26.

their of their concern for defensive lines and logistical requirements, indicates that in a way the lack of an extended system of fortifications in the German theatre of operations was indeed a driving factor of their strategy.[178] However, Parker's interpretation should be received with caution by strategic studies scholars. Again, there is a high risk of establishing a mechanical relation between new technologies and strategic effectiveness, which can then be misused to suggest that the technological element (conceived as a manipulable variable at the service of military success) is the driving force of doctrinal and organizational change. In this perspective, reforms in doctrine and organization that follow the path opened by technology would be readily rewarded by military success. But the sings of profound change in warfare during the examined historical period can be identified not exclusively in terms of adaptations to technological innovation: the example of the Swiss reforms (based on purely tactical and organizational ability) should be viewed as emblematic in this respect.

Dutch and Swedish tactical and organizational reforms (which Roberts defines “revolutions” in tactics and strategy) were firmly rooted in the idea that drill, discipline and training could fundamentally enhance operational effectiveness in combat. At the strategic level, Maurice and Gustavus Adolphus were not worlds apart: in fact, they were subject to the same logistical limitations, and Gustavus’ inclination towards pitched battle depended more on the strategic imperative of acquiring territory for supplying his troops, than on a firm belief in decisive military action.[179] Thus, strategic realities were clearly paramount in the mind of the Swedish King, and in recognizing the success of his innovations we should view them in the broader context of Gustavus’ strategy.

Overall, the European way of war was profoundly influenced by the introduction of firearms, especially during of the Italian Wars. At the time, the effectiveness of siege artillery allowed for an increase in offensive

[178] W. P. Guthrie, Battles of the Thirty Years War, cit. p. 160.
[179] Paret, Craig, and Gilbert. *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*. Princeton, N.J.: Princeton University Press, 1986, p. 46.

power, thus provoking a shift from siege to pitched battle. Nonetheless, as soon as the defender learned to use cannon defensively, and then even more with the development of the *trace italienne*, the strategic balance shifted back to the previous stalemate. Thus, the “military revolution”, if interpreted not as the mere adaptation of armies to technology but as a profound discontinuity in strategic history, was certainly the product of numerous factors. As we have seen, deep changes occurred not only in the technological dimension, but in a wide range of contexts, and all of them ultimately contributed to this discontinuity. Among these elements, the one which had the most durable impact on the relationship between the soldier and the state, and which ultimately gave the latter the power to mobilize its resources to wage war on an ever larger scale, was discipline. As Max Weber's put it, "It was discipline and not gunpowder, which initiated the transformation of warfare.”[180]

[180] M. Weber, *Economy and Society: An Outline of Interpretive Sociology*. Berkeley: University of California Press, 1968, p. 1152.

CONCLUSIONS

During the 1990s, numerous scholars both in the U.S. defence establishment and in the academic community gave life to an intense debate on an allegedly imminent “revolution in military affairs”. Several RMA advocates deliberately employed the “revolutionary” label in order to portray what they saw as a transformation of the very nature of war, resulting from the advancements in ICT, sensors, precision-guided munitions and other new technologies. In the United States, the theoretical premises of the RMA school of thought had been elaborated by Andrew Marshall, director of the Office of Net Assessment (ONA), the Pentagon’s internal think-tank. Yet, Marshall’s ideas were not entirely new: he derived them from Soviet strategic thinkers such as Marshal Nikolai Ogarkov. Within the Soviet military establishment, the terms RMA and “military-technical revolution” (MTR) were introduced after the end of World War II in order to describe crucial military innovations such as the development of mechanized forces in the 1920s and the invention of nuclear ballistic missiles. The introduction of the AirLand Battle concept in the U.S. military strategy spurred a series of Soviet studies on the implications of a large-scale use of high-tech weapons supported by organizational and doctrinal innovation. Ogarkov’s basic argument was that the military which innovates first, gains a decisive superiority over the adversary. Within the bipolar international system of the Cold War, this assessment (if controversial) still possibly made sense because of the clarity of the strategic context. Marshall and his disciples at the ONA (among others, Andrew Krepinevich) transplanted Ogarkov’s ideas in the U.S., and when the Cold War came to an end these ideas were employed to claim that a technology-led RMA was imminent. In this, the RMA enthusiasts were certainly emboldened by the brilliant outcome of Operation Desert Storm. The ensuing debate had a controversial, yet still significant impact on the U.S. defence posture in the 1990s. The most vocal advocates of the RMA went as far as arguing that the “fog of war” would be lifted, and that the very nature of war would be

transformed. Moreover, these revolutionary predictions perfectly suited the contemporary "post-heroic warfare" attitude lucidly depicted by Edward Luttwak.

Nonetheless, with the end of the Cold War, the success of Desert Storm, and the beginning of what has been called "the unipolar moment"[181], the United States enjoyed a permissive international environment which, together with the advantage of uncontested primacy, had the significant disadvantage of what Eliot Cohen called "strategic obscurity".[182] Suitably enough, given the historical period analysed in this study, Cohen cautioned that

> "[f]uture technologies […] may create pockets of military capability that will allow very small states to hold off larger ones, much as companies of Swiss pikemen could stop armies sweeping through their mountain passes or a single, well-fortified castle could hold immensely larger forces at bay for months.[183]

Simply put, the point was (and still is) that technological innovation, for all its undeniable importance in warfare, is not a proxy for strategy, nor can replace it. Moreover, the United States had already bitterly learned this lesson in Vietnam, a period characterized by a cultural enthusiasm for "modern technology"[184] that from this perspective can be compared to that of the 1990s. Then, from this point of view, the RMA was more a revolution in expectations than in capabilities: not only the U.S. were free from the soviet nuclear threat, they could now use their formidable conventional military power to wage "just" wars (as the U.N. sanctioned Operation Desert Storm had just proved) with a sufficient certainty of military success and low casualty rates. Overall, this political and cultural context which characterized the 1990s should not be underestimated as a powerful factor that helped the RMA debate to flourish.

As we focus our attention on the RMA hypothesis from a theoretical

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[181] Krauthammer, Charles. "The Unipolar Moment." *Foreign Affairs* 70, no. 1 (1990): 23-33.
[182] Cohen, Eliot A. "A Revolution in Warfare." Cit. p. 53.
[183] Ibidem.
[184] Murray, Clausewitz Out, Computer In. cit.

point of view, it is inevitable to note how vague and ambiguous were the definitions offered by most of its proponents. An analysis of the most influential among these definitions clearly shows how the attempt at emphasizing the non-technological dimensions of revolutions in warfare (which was the rationale behind the RMA notion) ultimately failed, mainly because the implicit idea of anticipating and managing the alleged information-led RMA entails an inherently biased view of war. In all the definitions of RMA, technology is always the catalyst, to which the other dimensions of war must necessarily adapt. But when a vision of future innovation is pursued in the absence of a clear perception of strategic realities, it is bound to be substantially (if not necessarily entirely) contradicted by these realities. This fundamental flaw is distinctly evident when we look at the historical example that the RMA advocates often used to prove their predictions, namely the German Blitzkrieg. As Stephen Biddle noted, contrary to the opinions of these authors, the German doctrine immediately before World War II did not represent an entire overhaul of previous plans.[185] Rather, the Blitzkrieg was an incremental adaptation of the methods employed in the late years of the First World War; in fact, "operational thinking of the German army had changed surprisingly little since the First World War, indeed since the late nineteenth century. Nor, for that matter, had German strategic thinking changed. The Germans had always had a marked preference for short, decisive campaigns."[186] Moreover, it is far too easy to observe that Hitler's quest for absolute dominance of the European continent was strategically unsustainable, even after the indisputable operational success of the alleged Blitzkrieg RMA. This fact must be seen as a much needed reminder of how the mismatch between political ends and military means leads ultimately to inevitable failure. Overall, each of the definitions analysed in the previous chapters entails both a reification of the RMA concept that should be carefully

[185] Biddle,"The Past As Prologue: Assessing Theories of Future Warfare." p. 46.

[186] Harris, J.P. "The Myth of Blitzkrieg", *War in History* 2, no. 3 (1995): 335-352. p. 344. In his article, Harris proves that the very term *blitzkrieg* is an ex-post rationalization of German military doctrine, based almost entirely on the ideas of English-speaking authors.

avoided, and an assumption that military victory *must* follow revolutionary innovation that is simply untrue. The account given of two general approaches to the role of information in war (the first which sees information as a force-multiplier, and the more radical view of an emerging "information dimension" of war) that emerged during the RMA debate shows how poorly defined concepts were used to advance, at best, very contentious implications about the imminent revolution in warfare.

As noted earlier, the end of the Cold War represented the beginning of a period in which the U.S. military had no clear external threat to confront. This absence combined with three important factors that contributed to shape the American military posture in the 1990s: a large reduction of the defence budget, the "post-heroic" cultural context, and a tendency to intervene directly in humanitarian crises. These factors required the U.S. military to restrain the use of force as much as possible in order to avoid "collateral damage", thus the predictions of some RMA advocates about a future of "surgical" wars had indeed much appeal, especially for the political leadership. Nonetheless, the four defence reviews illustrated earlier prove that the official endorsement of the assumptions and implications of the RMA thesis was largely rhetorical, and it did not produce any substantial deviation from previous patterns of innovation. At the beginning of the XXI century, a new label used to promote a profound change in the U.S. armed forces appeared: "transformation". In 2002, Deputy Secretary of Defense Paul Wolfowitz, describing the Bush Administration's defence policies before the Senate Armed Services Committee, stated that "…our overall goal is to encourage a series of transformations that in combination can produce a revolutionary increase in our military capability and redefine how war is fought."[187] These words, pronounced about ten years after the beginning of the RMA debate in the U.S., certainly prove how pervasive the arguments in favour of an American RMA were in the political sphere. It might be useful to illustrate briefly one important episode that shows how

[187] Cit. in: *Military transformation a strategic approach.* Washington, DC: Director, Force Transformation, Office of the Secretary of Defense, 2003. p. 7.

the U.S. military leadership prepared for this future of transformation. In August 2002, the Army Times (a prominent defence-related weekly newspaper) reported on the harsh condemnation expressed by General Paul Van Riper on the conduct of a major military exercise (Millennium Challenge 2002). Van Riper, who had always been highly critical of concepts such as "effects-based operations" and "rapid, decisive operations"[188], was in charge of commanding the game's Opposing Force, and successfully defied the U.S. forces at every turn of the exercise. The article in the Army Times revealed that, according to Van Riper, the whole war game "was almost entirely scripted to ensure a [U.S. military] win."[189] This episode has been also recently mentioned by Andrew Krepinevich, one of the most vocal advocates of both the RMA and the "transformation". Krepinevich begins by quoting the criticism expressed by Van Riper at the time, then adding that the rigged exercise proved how "projecting power into an area of vital interest to the United States using traditional forces and operational concepts will become increasingly difficult".[190] Yet Krepinevich fails to mention that in Millennium Challenge 2002, the U.S. military was not testing "traditional forces and operational concepts". Quite the opposite was true: the purpose of the war game was to experiment the very "transformation" that Krepinevich advocated since the beginning of the RMA debate, and that was so successfully countered by Van Riper's "inconvenient" military skills.

It is now necessary to summarize the results of this study from a theoretical perspective. Although I have chosen not to attempt at developing a comprehensive theory of revolutionary change in warfare (an effort which I deem inevitably disputable at best), this study has hopefully achieved some significant conclusions.

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188 See: Van Riper and Scales. "Preparing for War in the 21st Century." *Parameters*, Autumn 1997. Available at: http://www.carlisle.army.mil/usawc/Parameters/97autumn/scales.htm

189 Naylor, Sean D. "War games rigged?" *Army Times*, August 16, 2002. Available at: http://www.armytimes.com/legacy/new/0-292925-1060102.php

190 Krepinevich, Andrew. "The Pentagon's Wasting Assets." *Foreign Affairs* 88, no. 4 (Agosto 2009): 18-33. p. 21.

Given the conceptual confusion around the issue of defining the RMA notion, I have adopted Colin Gray's definition of RMA as *a radical change in the character or conduct of war,* as its loose wording permits the inclusion of all relevant dimensions of innovation in warfare (and not only technology), and it also implies the recognition that the nature of war is fundamentally unalterable. Then, I have expressed my opinion that Clausewitz's definition of war as *an act of force to compel our enemy to do our will* has not been rendered obsolete by any technological innovation, and is still enormously valuable even after two centuries. I have also tried to clarify the distinction between war and *warfare*, which is *the instrument through which each political unit acts within the military dimension of politics*. Finally, I have proposed a slight amendment to classical definitions of strategy, which is *strategy is the art of the dialectics of wills that use or threaten the use of force for policy ends*.

After having reviewed in detail four influential theoretical frameworks on the RMA hypothesis, the main conclusions of this study can be summarized as follows:

1. The nature of strategy (and war) is both complex and permanent, and no fundamental change in the character of war can ever transform these two inherent characteristics.

2. For all its intrinsic complexity, strategy is susceptible to human intervention: it does possess an unpredictable dimension, but this fact does not prevent successful planning and execution.

3. The nature of strategy is multidimensional. Each of strategy's dimensions affects all the others; no dimension is hierarchically superior; in each historical period the relative impact of each dimension must be assessed within the broader context; the strategist can (at least potentially) manipulate these dimensions to maximize advantages and minimize disadvantages.

4. We can describe profound discontinuities in strategic history (RMAs) as those episodes of innovation that had a significant effect on the

ever-changing character of war. Nevertheless, the significance of these episodes rests on subjective considerations, not on real “facts”.

5. The political dimension is the first that we need to examine for understanding a particular period of military innovation. For maximizing the probability of strategic success, the advantages offered by an RMA have to be translated into politically defined goals, and these goals must be strategically viable.

6. RMAs are cases of “strategic behaviour”, no matter how consciously they are pursued in the specific circumstances. Moreover, since military effectiveness is a relational variable, the purpose of these episodes of strategic behaviour is not to achieve absolute dominance in all of war’s dimensions, but just to be superior to the adversary.

7. Since war is the “collision of two living forces”, any RMA generates in the adversary the will to find countermeasures, which it always successfully does.

These considerations are largely consistent with the dynamics observed in the study of the Early Modern “military revolution”. The fact that the historians involved in the debate on the “military revolution” thesis are still far from any consensus suggests the value of a subjective approach to revolutionary change in warfare. The RMA hypothesis, conceived as a theoretical tool, can be helpful in understanding the profound innovations in the character of war occurred in Europe during the Early Modern era. At the same time, for all their powerful impact, firearms did not alter the underlying nature of war nor the existing strategic realities. The Great Powers of Early Modern Europe continued to be trapped in a strategic stalemate: in the medieval age the alternatives at the operational level were the siege and the *chevauchée*; in the age of firearms and fortifications the siege remained the principal way of waging war. While this is true, strategy was certainly susceptible to human direction: Gustavus Adolphus was able to achieve an impressive degree of mobility during his invasion of Germany, and his talent will inspire Frederick the Great one century later.

Still, logistical needs greatly restrained Gustavus' strategic manoeuvre. From this point of view, it has been convincingly argued that the King's frequent resort to pitched battles depended more on the strategic imperative of acquiring territory for supplying his troops, than on a firm belief in decisive military action.

Numerous examples can be used to attest the multidimensional nature of strategy. Here I will remind just one of them: the rise of the Swiss pikemen as the most powerful infantry in late Medieval Europe. The Swiss' military innovation is an illuminating case in that it owed nothing to technological change: the success of the pike square on the battlefield derived rather from a clever combination of drill and discipline. Moreover, this innovation (no matter whether it deserves the revolutionary label or not) was certainly conducive to strategic effectiveness, and had a powerful influence on most of the European armies of the time.

Gustavus' successful attempt at combining the shock of cavalry charges with the firepower of his musketeers, in order to achieve rapid decisive victory on the battlefield, can be convincingly interpreted as an effort to find a tactical and organizational solution conducive to strategic success: in this sense, this episode can illustrate well the sense of defining RMAs as *strategic behaviour.*

The case of French initial superiority in the technological dimension at the outset of the Italian Wars (1494-1529), namely the extensive use of siege-trains against fortifications, is useful to illustrate how a mismatch between tactical advantage and strategic goals ultimately led to failure: at the end of the Italian invasion no lasting political or territorial gain was achieved by the French monarchy. Moreover, the countermeasures adopted by the Italian states (not only the *trace italienne*, but also the improvements in the defender's ability to exploit interlocking fields of fire even in defending medieval fortifications) shows how the advantages of an RMA can be offset relatively soon.

In concluding this study, it is necessary to suggest future paths of research that can be usefully pursued. A first possible option would be to

investigate thoroughly the reasons for which other countries have not followed the U.S. enthusiasm for the RMA thesis. This, as we have seen, is at least partly due to the technology-oriented American strategic culture, but there are certainly other factors at play, which are possibly related to geostrategic realities and interests. A second path of research would consist in a systematic study of the evolution (or revolution) in maritime warfare that resulted from the invention of firearms (in this case, cannon) and that certainly had a significant role in the rise of the European Great Powers since the XVI century.

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