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**Smashing the Myth:
The Gulf War and The Transformation of Armed Conflict**

BY:

JEFFREY B. A. CYR

A Thesis
Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements
For the Degree of

MASTER OF ARTS

Department of Political Studies
University of Manitoba
Winnipeg, Manitoba

August 30, 1999

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JEFFREY B. A. CYR

**A Thesis submitted to the Faculty of Graduate Studies of The University
of Manitoba in partial fulfillment of the requirements of the degree
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Jeffrey B. A. Cyr©1999

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Introduction

To a considerable extent the impact of the new weapons on strategy, on policy, indeed on survival, depends on our interpretation of their significance.¹

The study of war and peace has long been central to the field of international relations. The end of the Cold War has provided new impetus for understanding conflict and cooperation in a less predictable international environment. A central pivot in the post-Cold War history of international relations was the Gulf War between Iraq and the coalition forces led by the United States. The lopsided nature of the Gulf War led many commentators, journalists and political writers to hail the conflict as the hallmark of a new revolution in warfare.² As such, “high technology” warfare, as viewed during the war, was touted as the harbinger of a new normal mode of armed conflict that will irrevocably change the face of international society and inter-state relations. The importance of these predictions of the new nature of war can not be overestimated for its future impact upon the conduct of states and the organization, procurement and strategies of armed forces.

¹Kissinger, Henry A.. Nuclear Weapons and Foreign Policy. Harper & Brothers, New York. 1957. p. 7.

² For the proponents of these arguments see; Daniel Gouré, “Is There A Military Technical Revolution in America’s Future?” Washington Quarterly, Vol. 16, No. 4 (Autumn 1993); Andrew F. Krepinevich, “From Calvary to Computer: The Pattern of Military Revolutions”. National Interest, No. 37 (Fall 1994); Alvin and Heidi Toffler, War and Anti-War: Survival at the Dawn of the 21st Century. Boston: Little Brown and Co., 1993; Eric Arnett. “Welcome to Hyperwar”, The Bulletin of Atomic Scientists, vol.48, no. 7 (September 7, 1992); Richard Dunn III. From Gettysburg to the Gulf and Beyond: Coping with Revolutionary Technological Change in Land Warfare. Elliot Cohen, “A Revolution in Warfare”, Foreign Affairs, vol. 75 no.2 (March/April 1996); The Institute for National Strategic Studies, Washington, D.C. 1993; Arquilla, John. “The Strategic Implications of Information Dominance”. Strategic Review. Summer 1994.

International relations has, by and large, as an academic field defined itself around a core body of theory that focuses on questions of war and peace, or more specifically the nature of power relations between nations.³ Understanding the role of warfare as a state-making/state-destroying activity, as a tool of states, or as the negative effect of the failure of the “system” is fundamental to an understanding of the modern international system. In this context, it is difficult to ignore the forecasts of modern military strategists and writers who predict massive transformations in what society understands as a premier facet of international relations - war and its prevention/prosecution. The examination of armed conflict that follows is focussed on analysing the arguments surrounding revolutions in warfare and drawing some conclusions about the nature of the Gulf War and the future of armed conflict.

The recent body of literature covering the Gulf War and its purported revolutionary impact is noticeable for two important characteristics; the paucity of historical reference to how warfare changes, and the lack of an analytical framework by which to compare revolutions in warfare. In other words, there is a failure to define revolutions and to ascertain their component parts. As such, central to this analysis is a historical review of previous revolutions in warfare that have been identified in the wealth of strategic studies literature as moments of revolutionary upheaval in the conduct of armed conflict. To this end a historical analysis will shed light on

³ See, *inter alia*, the realist accounts of Hans Morgenthau, Politics Among Nations; E.H. Carr, The Twenty Years Crisis; or the structural realism of Kenneth Waltz, Theory of International Politics, 1979; and Joseph Grieco, “Anarchy and the Limits of Cooperation” in David Baldwin ed. Neorealism and Neoliberalism: The Contemporary Debate. New York, Columbia University Press, 1993; and Robert Gilpin War and Change in World Politics. New York, Cambridge University Press. 1981; even the liberal institutionalism of Robert Keohane, After Hegemony: Cooperation and Discord in the World Political Economy. Princeton, Princeton University Press, 1988.

certain aspects of changes in the nature of war. Most crucial is the recognition that there exists no common analytical framework for the study of revolutions in warfare, even though the literature provides many cases and arguments about revolutions in the past. While the following study ultimately moves towards analyzing the Gulf War, it concentrates on distinguishing change as a normal part of maturation in warfare and military organizations from change that dramatically overturns all previously held notions of war, both in its purpose, prosecution, and relationship to society.

While the fields of international relations and strategic studies offer multiple analysis on various revolutions in warfare, it is rarely contested that the most dramatic of all changes in warfare has been the introduction of nuclear weapons. The traditional ideas and concepts of warfare used over the preceding centuries have been overturned by nuclear weapons and the strategies associated with their use. Examination of the Gulf War, the future of warfare and the introduction of radical new technologies is in this way presaged by the nuclear revolution which offers unique insights into the nature of massive systemic change. The nuclear revolution holds a unique historical position of being an easily identifiable shift in the nature of warfare upon which many agree is revolutionary. It becomes increasingly central in terms of identifying the less tangible effects or cases of revolutions. It gives a certain sense of context and allows for the wealth of current literature to be exploited while laying the basic foundation for an analytical framework.

The nuclear revolution in the middle of the twentieth century is clearly the result of technology. However, technology is not the sole catalyst of revolutions in warfare. To argue so is to ignore severely the history of warfare and the great changes wrought over the centuries in the relationship of man to war. The Napoleonic revolution and the whirlwind changes present during

the two World Wars are cases in point that revolutionary technology does not equal a revolution in war. Indeed, even the nuclear revolution, while initially a result of technology, did not have its primary effect on military tactics and operations. The nuclear revolution is a strategic and moral redefinition of the purpose, value, ability and will to fight wars. As a paradigmatic shift of thought about war and its resultant effect upon international relations, it is the hallmark of a revolution in warfare. In the same manner as paradigms within the natural sciences, modes of warfare are subject to constant development, as well as to sudden upheavals which break completely from traditional methods of armed conflict and thinking about war.⁴

On Revolutions

A theory of the nature of change in international relations is noticeably absent in explaining the transformations wrought by, to and through changes in the conduct of armed conflict⁵. The

⁴The use of paradigms herein follows Kuhn's original analysis, which according to Kuhn can be understood in two ways; "On the one hand, it stands for the entire constellation of beliefs, values, techniques, and so on shared by the members of a given community. On the other, it denotes one sort of element in that constellation, the concrete puzzle-solutions which, employed as models or examples, can replace specific rules as a basis for the solution of the remaining puzzles of normal science" See, *inter alia*, Kuhn, Thomas. The Structure of Scientific Revolutions. (2nd Edition) University of Chicago Press, Chicago. 1970 p.175; Masterman, Margaret. "The Nature of a Paradigm" in Lakatos, Imre and Musgrave, Allan (eds). Criticism and The Growth of Knowledge. Cambridge University Press, Cambridge. 1970.

⁵In fact, a theory of change is noticeably absent from international relations in general - beyond those studies which directly involve warfare. For examples of major works which have neglected change as a principle component of theory see; Waltz, Kenneth. Theory of International Politics. Princeton; Princeton University Press, 1979; Buzan, Barry. People, States & Fear. Boulder; Lynne Rienner, 1991. Baldwin, David A. (Ed). Neorealism and Neoliberalism. New York; Columbia University Press, 1993; for an excellent overview see Dougherty, James and Pfaltzgraff, Robert. Contending Theories of International Relations: A Comprehensive Survey. (3rd Edition) New York; Harper & Row Publishing, 1990.

following examination aims to create a basic analytical framework for reviewing future changes to armed conflict and at uncovering the nature of change in warfare. In order to establish such a framework three primary concepts or component parts of paradigms are used as drawn from the paradigm debate within the philosophy of science. Thomas Kuhn's notion of a paradigm contains three primary components — "world view", sociology and constructs.⁶ Each component has utility to understand change, evolutionary and revolutionary, in the nature of warfare through past revolutions.

The starting point of any examination of revolution in warfare must be concerned with what exactly is being transformed. The literature indicates that the nuclear revolution overturned organizations, ideas, theories, and the general conduct of normal activity in military and political organizations. The occurrence of the nuclear revolution and its surrounding body of thought is analogous to the introduction of a new paradigm.⁷

Many events that have occurred throughout the modern history of warfare have started in a revolutionary fashion with the potential of upsetting the paradigm, but have failed to do so.⁸ In the following pages several military revolutions will be examined under the scrutiny of the concepts already applied to the nuclear experience. The object is to clarify the framework for analyzing the Persian Gulf War and the introduction of radical new technologies to see if a revolution is at hand. In particular, the analysis demonstrates that technological innovation is

⁶See op. cit. Masterman. The debate over paradigms is far from resolved within the philosophy of science and although much debate continues the conceptual breakdown is beneficial in understanding the various components interacting within a revolution in warfare.

⁸Take, for example, the introduction of air power and its many visionary expectations.

neither a necessary nor sufficient cause of military revolutions; a view that runs contrary to the general one within the field, as argued by Barry Buzan, in linking all 20th century military transformations to an unprecedented pace of technological development. “The new norm of technological change meant that the conditions of military strategy were doomed to permanent upheaval.”⁹

Surveying military revolutions under the analytical framework developed herein leads to a different conclusion. The twentieth century saw the continuation of the Napoleonic paradigm in W.W.I with the genesis of a new paradigm characterized by radical changes in strategy, political innovations and technological improvements in W.W.II. Finally, the eclipsing of the ‘W.W.II’ innovations by the birth of a full fledged new paradigm of nuclear warfare, represents a dramatic and violent break from the old institutions. As such, Buzan’s argument does not seem entirely wrong, but rather imprisoned by the confines of one century and wrapped in the technological tidal wave caused by the nuclear revolution. While one of the first aspects of revolutions to be revealed is the fallacy of technological determinism in all revolutions, the second aspect of revolutions to emerge will be the structural violence associated with revolutionary upheaval. This combines with a natural phenomenon of revolutions, in that they occur over a relatively short period of time of approximately a generation. The compression of time is an important element of revolution and distinguishes revolution from a slow, constant, and much less chaotic process of development.¹⁰

⁹Buzan. p. 19

¹⁰ Kuhn often asserted that revolutionary ideas usually require that the older generation of paradigm holders die off before the new theories may become dominant.

A revolution in warfare can be identified by five principal elements of change, each being necessary for full transformation, and each of which appear to remain constant over time. These elements are neither exhaustive nor exclusive and as the analysis will indicate the relationship between them is significant to the instigation of revolution. A revolution is first identified by crisis — or, more accurately, heralded by crisis. The crisis need not be military or technological in origin and, as historical evidence indicates, it is often political and social upheaval that forms the crisis, such as the dissolution of the Weimar Republic or the turmoil of the French Revolution. As indicated above, another important element of revolution is that the crisis and following revolution occur within a relatively compressed time frame, the second principal element. The third and fundamental component underlying a revolution is the alteration of relationship of war to society. The relationship is fundamental because it determines the parameters for the political use of armed force and the military means deemed acceptable to society at large. Warfare is, in this sense, a reflection of the society from which it emerges. As the relationship between war and society changes, it brings about the fourth element of a revolution in warfare, a change in the demands made of military organizations. The interaction between newly altered ideas about the purpose of war and the changing organization of military structures produces the specific strategic technical changes in the strategies, technology and weapons of warfare.

The foundation for this analytical framework begins with a historical survey of military revolutions in the modern era. Conspicuous in this regard are four purported revolutions: the Nuclear revolution, the 17th century revolution in warfare, the Napoleonic military revolution, and the industrial/inter-war revolution. The introduction of nuclear weapons will be the first event to be distinguished as a revolution; probably one without equal in its speed and level of structural

violence.¹¹ Albeit the Nuclear revolution is unique in this regard, it will be shown to run a historically familiar course, and will become a reference point for the subsequent analysis. To this end it is necessary to turn to the nuclear revolution and the crisis which spawned an entire new field of academic study.

¹¹Structural violence means large scale upheaval in a variety of areas, including, inter alia, military organization, fundamental reformulation of the purpose of war, changes in training patterns of soldiers, changes in strategic theory, tactics and operations and in the economics of warfare. In sum, it is the destruction of the previous order by the overthrow of a entire system of warfare with significant consequences to the relationship of war to society.

CHAPTER 1

THE NUCLEAR REVOLUTION

Revolutions do not exist without crisis and nowhere was this more evident than in the birth of nuclear warfare in August of 1945. The two atomic bombs exploded on Hiroshima and Nagasaki represented a fundamental crisis in world history. As Winston Churchill commented in 1955; "...the entire foundation of human affairs was revolutionized, and mankind placed in a situation both measureless and laden with doom."¹ Many who experienced the initial phase of the nuclear revolution believed it would result in the complete abandonment of all historical tradition and certainly military tradition. To such an extent did this neurosis over nuclear weapons dominate national and international attention that many believed it would alter the existence of the anarchical

¹cited in Jervis, Robert. The Meaning of the Nuclear Revolution. Cornell University Press, Ithaca. 1989. p.7. For first impressions of nuclear weapons see also Brodie, Bernard. The Absolute Weapon. Harcourt, Brace and Company, New York. 1945. Some organizations and military arms took several years to accept the impact of nuclear weapons on their traditional methods of warfare - the USAF is one notable example.

international society.² This never came to fruition. Nonetheless nuclear weapons have had a revolutionary impact upon strategy, thought processes, and conduct in the international arena.

The technological crisis induced by the development of nuclear weapons has an important history, short though it may be, that relates in a very specific manner to the development of strategy and theory that is truly representative of the revolution. A strikingly similar crisis erupted after World War I when airplanes, especially bombers, were expected to alter fundamentally the course of history. Many inter-war air power theorists saw the introduction of bomb carrying airplanes as having dramatic significance for the future of warfare and the state. The most celebrated of these theorists, Giulio Douhet, reflected upon these changes in the following manner:

To have command of the air means to be in a position to wield offensive power so great it defies human imagination. It means to be able to cut an enemy's army and navy off from their bases of operation and nullify their chances of winning the war. It means complete protection of one's country, ... and peace of mind to live and work in safety. In short, it means to be in a position to win.³

The culmination of air power as the decisive tool of warfare did not materialize as Douhet had anticipated during the strategic bombing campaigns of W.W.II. In fact, the overall impact of air power was rather disappointing given the huge losses incurred and the large economic output required to sustain a relatively ineffective machine of war. The full potential of air-power was only to be realized under a revolution in bomb technology (physics and chemistry) that yielded the first atomic weapon. Ironically, this development simultaneously realized the fullest potential of air

²see Mandelbaum, Michael. The Nuclear Revolution. Cambridge University Press, Cambridge. 1981. p. 5-11

³Douhet, Giulio. The Command of the Air. Coward-McCann, Inc., New York. 1921. p.23

power. War through the air meant total victory, and also contained the seeds of its own obsolescence.

From the explosion of the first two atomic weapons in 1945 to the development of the Hydrogen bomb (thermonuclear weapons) between 1952 and 1954 no dramatic reconstruction of military affairs or international politics occurred. Notwithstanding that the destructive capability of atomic weapons was so astounding to observers of the day, it did not immediately change the utility of war in the international system. The damage inflicted upon Hiroshima by one A-bomb it was estimated would have taken the full payload of 730 B-29 bombers.⁴ While effective air defense systems may have been capable of an average ten percent kill or disable ratio against attacking bombers, a fifty percent hit ratio would have been miraculous, and the hundred percent needed to nullify atomic weapons would have been, and still is, impossible. The crisis of the nuclear revolution began with the recognition that an effective defense against nuclear weapons was close to impossible. The crisis of the revolution can best be expressed by President Truman, in the period of American nuclear monopoly, when he asked "Wouldn't it be wonderful...if we could take our atomic stockpile and dump it into the sea?"⁵

Nuclear weapons have had a certain self-propelling momentum that followed the initial explosion of the A-bomb; a 'technological imperative' that is a force in its own right. The technology linked to nuclear weapons was soon to outstrip traditional mechanisms for interaction among states and the prosecution of war in the international system. The era of the American

⁴Brodie, Bernard. The Absolute Weapon. Harcourt, Brace and Company, New York. 1945

⁵Jervis. p. 2

nuclear monopoly required little adjustment on behalf of military organizations in the international system. Nuclear weapons were viewed as another weapon of war, albeit of far larger destructive capability. Acquisition of nuclear technology by the Soviet Union, as demonstrated in its nuclear tests in 1949, and the development of thermonuclear weapons in the 1950's aggravated the crisis brought on by the atomic bomb to the point where a revolution was unavoidable. The changes caused by the fusion bomb were not just in order of magnitude in destruction but of a much more subtle nature, as Bernard Brodie notes "Thermonuclear weapons have, however, forced home some conclusions that were insufficiently absorbed. The revolution is now unambiguous and unchallengeable."⁶ Of course, technology was not to be limited to just the increase in destructive capacity. Further developments in delivery systems, from bomber capacity and range improvements to long range and highly accurate missiles, solidified the revolutionary nature of nuclear weapons.

This begs the question as to why nuclear weapons became revolutionary and where the greatest points of transformation occurred in international relations and military affairs. There can be no doubt that the nature, amount and quality of military force before and after 1945 are at extreme ends of a spectrum. Not only did military affairs change drastically, but the human condition itself was also put in jeopardy. There, in turn, resulted in changes of thinking about war, military strategy, and the conduct of international politics itself.

⁶Brodie, Bernard. From Crossbow to H-Bomb. 2nd Ed. Indiana University Press, Bloomington. 1973 p.264

Change and Transformation

What is new about this world with nuclear weapons (or, to be more precise, mutual second strike capability, where neither side can launch a first strike that is successful enough to prevent retaliation from the other) **is not overkill, but mutual kill...**⁷

This comment by Robert Jervis reflects the psychological dilemma that is caused by nuclear weapons. The dilemma is two-fold; once a situation of nuclear parity had emerged, defense from nuclear attack did not exist in any traditional sense. In fact, defense relied on vulnerability to nuclear attack, which meant that through the condition of assured destruction, no power/state would have any incentive to attack (they were, as such, *deterred*). A defense that rested primarily on vulnerability was an understandably difficult concept for political leaders and military organizations to come to terms with. The psychological dilemma caused by *deterrence* strategies was exacerbated by the desire and/or need of both superpowers to use force in conventional conflicts. The problems of even small military engagements escalating into full-scale nuclear war became a central concern of political leaders, military planners, and academics. In this manner, many began to question the utility of war in the existing geo-strategic/geo-political environment. This is the impetus by which change and transformation occurred after the introduction of nuclear weapons.

Clausewitz outlined the nature of war under a variety of terms, on both a strategic level and a political level. Of the latter he said: "We see, therefore that war is not merely an act of policy but a true political instrument, a continuation of political intercourse, carried on with other means."⁸

⁷Jervis. p.5

⁸Von Clausewitz, Carl. On War. Howard and Paret Eds. Princeton University Press,

Clausewitz identified war as it had always been throughout recorded history and only more refined with the inception of the nation-state. War was useful. Specifically, it served the aims of those who controlled military force, usually political elites. Thermonuclear weapons not only made war morally unacceptable due to the huge loss of human life and the destruction of the battlezone, but also with assured second-strike capabilities it made war suicidal - at least the type of war Clausewitz spoke of.

War in the nuclear age presented the problem of its own utility for a variety of reasons. First, the destructive capacity of the weapons is so large that capturing the territory would have no benefit to the winner for nothing of traditional value would be left. Second, war was no longer between professional soldiers but involved the entire populations of nations - willingly or not. Third, assured second-strike capability meant that each side would suffer unacceptable damage and no clear winner would appear, if 'winning' in such a situation is at all possible. From a cost/benefit analysis, nuclear weapons have unimaginable costs and little benefits. However, nuclear weapons did have utility in a completely revolutionary way.

Historically, mutual vulnerability did not exist and so armies could prosecute war on a grand scale, even total war, knowing that whomever the stronger side was would win.⁹ The victor, as well as the loser, would pay a price, and sometimes a significant price, but this would not stop the parties from going to war. The victor, even in massive wars, was better off than the loser. Introduce nuclear weapons to the battlefield and all military or political advantage that could have

Princeton. 1976 p.87. Book I, Chapter I, Sec. 24

⁹op. cit. Jervis p.6

previously been seen to have emerged from war disappears. Bernard Brodie captured the essence of this change at the dawn of the nuclear era "Thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them. It can have almost no other useful purpose."¹⁰ Approximately a decade after Brodie's observations, finding methods to fight conventional warfare under the umbrella of nuclear weapons had been achieved through variations on the original deterrence premise. Deterrence still held, however. Policies were put in place that would categorize levels of conflict with the utmost being the use of nuclear weapons. Limited war and the escalation ladder are terms familiar to this period that embodied these changes and highlighted the adaptation of military and political thinkers to the nuclear revolution.

Michael Mandelbaum and Robert Jervis agree on certain aspects of the nature of the nuclear revolution and its impact upon international politics.¹¹ Both attribute the military revolution to nuclear weapons, while each ascribes to a different methodology in discerning the degree of change.¹² Regardless, it is obvious at this point, that nuclear weapon technology represents a revolution in destructive capability. Strategically, with the irrelevance of all out-war and the development of strategic studies and theorizing about the particular uses of military force

¹⁰Brodie, Bernard. The Absolute Weapon. p.76

¹¹see Michael Mandelbaum, The Nuclear Revolution pp. 8-14 and Robert Jervis, The Meaning of the Nuclear Revolution pp. 23-45

¹² The difference between the two authors lies in where they see change occurring, and the weight they ascribe to it. Mandelbaum looks at the military technology and its direct impact upon the structure of the system (anarchical state system). Jervis's area of emphasis is the psychological impact of nuclear weapons and the revolutionary nature of the logic used to support their use.

under the nuclear condition, a revolution is also apparent. However, it is more difficult, to establish the effect of the nuclear revolution upon politics.

The Hidden Aspects of Revolution

Michael Mandelbaum asserts that nuclear weapons have not changed the international state system, and he downplays the political consequences of the nuclear revolution:

The influence of nuclear weapons is thus apparent at three levels: the level of the system as a whole, where these weapons have prompted efforts at reconstruction in order to make war impossible, or at least unlikely; the level of the state, where both the United States and the Soviet Union have attempted to strengthen themselves; and the level of the individual, at which Americans (as well as Soviet citizens and others) must bear the psychological and political burden of the threat of annihilation.¹³

In a strange fashion, the bipolarity of the Cold War may have institutionally solidified the mechanisms of the system.¹⁴ The nuclear revolution, however, did cause political change and what may be characterized as truly dramatic revolutionary change. Identifying the political consequences of the nuclear revolution as 'influences' understates the breadth and depth of the revolution. This results from Mandelbaum's privileging the anarchical state system as the sole measure of political impact. Nonetheless, the important aspect of Mandelbaum's statement is what it does say about the depth of the revolution. The first level of influence, the efforts to make war impossible, indicates a change in the thinking about warfare and about politics that is profound.

¹³ibid. p.13, 8

¹⁴Richard Rosecrance describes the state of the system as "complete bipolarity". See Rosecrance Richard N.. The Dispersion of Nuclear Weapons. Columbia University Press, New York. 1964 p. 313 and for further discussion of the impact of possible multipolarity on the system see the introduction and Rosecrance, Richard N. The Future of the International Strategic System. Chandler Publishing Company, San Francisco. 1972.

It would be difficult, if not impossible, to find a similar scenario in history in which a single innovation caused entire countries to realign their value systems with regards to a fundamental behavioral relationship. Additionally, at the level of the individual there has been a psychological and political threat of annihilation that is unmatched in human history. The idea that no safe homeland exists and that the civilian population is equally as vulnerable as the military has significant consequences in the way people on an individual level think and act.

Jervis is not far behind in acknowledging the hidden aspects of the nuclear revolution as laying within the realm of politics and the human understanding of warfare and states where this has occurred, "Nevertheless, they [aspects of the revolution] indicate that nuclear weapons have indeed drastically altered the relationships between force and statecraft."¹⁵ In a different manner, Jervis sets out to identify those areas and ways in which the nuclear revolution can be identified. He indicates four areas to examine in order to evaluate the theory of nuclear revolution. First, if one assumes that military victory is not possible, a conclusion mutual vulnerability logic leads to, then it follows that wars among great powers would not occur. Jervis goes on to state that "While all other historically important causes of war can still yield Soviet-American tension and even limited violence, they cannot lead directly to total war, as they could in the past."¹⁶

Second, the nuclear revolution and mutual vulnerability should lead to preservation of the status quo. Although, there may be other factors involved in the maintenance of the status

¹⁵op cit. Jervis p. 23 (my emphasis)

¹⁶ibid. p.24

quo" in many cases these developments reinforce effects of nuclear weapons."¹⁷ Third, crises should not be frequent and those crises that occur will be at the impetus of local actors. Finally, and extremely important to the continuing relevance of military force, links between military power and political objectives should be tenuous at best. If it were possible to document significant political payoff as a direct result of increased nuclear options, then a case against the nuclear revolution could be made. Jervis concludes his detailed analysis of these factors as follows;

The implications of mutual second-strike capability are many and far-reaching. If nuclear weapons have had the influence that the nuclear revolution theory indicates they should have, then there will be peace between the superpowers, crisis will be rare, neither side will be eager to press bargaining advantages to the limit, the status quo will be relatively easy to maintain, and political outcomes will not be closely related to either the nuclear or conventional balance. Although the evidence is ambiguous, it generally confirms these propositions.¹⁸

Written at the end of the 1950's Henry Kissinger's treatise, Nuclear Weapons and Foreign Policy, offers another interpretation of the evidence regarding nuclear revolution. Essentially Kissinger follows a similar pattern in admitting to the revolutionary nature of the weapons while proposing to follow a different path in order to achieve his goal of creating a stable policy for the United States. Kissinger summarizes the problem facing America and its new revolutionary weapons. "Our effort to assess the meaning of the new technology (nuclear weapons) has been difficult, however, because our history makes us more comfortable with technology than with doctrine and because such strategic doctrine as we had developed has been made irrelevant by the power and speed of the new weapons."¹⁹

¹⁷ibid. p.28

¹⁸ibid. p.45

¹⁹Kissinger, Henry. Nuclear Weapons and Foreign Policy. Harper & Brothers, New

The qualities of the new weapons outstripped strategic thinking and political analysis of how to use them in event of aggression, or for political expedience. Indeed, it even handicapped the ability of governments to use conventional weapons successfully. Kissinger was from a school of thought known as “warfighting” that believed that the only way to assure credibility in a nuclear relationship was to prepare to fight limited wars. The destructive powers of modern weapons made a reliance on all out-war psychologically unpalatable. To this end he declares: “As long as nuclear war is considered by analogy to conventional war, strategy will be stymied by the incomensurability between the power of the new weapons and the rigidity of traditional tactics.”²⁰ The upending of the traditional in light of the new technology is one of the key indicators of the revolution in warfare brought on by nuclear technology.

Without debating the interpretation of evidence on the nuclear revolution as presented by Jervis, Mandelbaum and Kissinger, the impact of the revolution is increasingly evident. There always exists reactionary forces to any revolution and while the nuclear revolution is seemingly undeniable, it is no exception. The central focus of reactionary efforts seems to be to rationalize nuclear weapons in a conventional sense, with traditional thought patterns and institutions.²¹ Upon reflection it is clear that this "conventionalization" only responds to certain narrow aspects of the nuclear revolution. What has caused many of the reactionary opinions

York. 1957 p. 22

²⁰ *ibid.* p. 179

²¹ This reaction is what Hans Morgenthau has referred to as "conventionalization". For details see Jervis p. 15-18. For further elucidation of the concept see "The Fallacy of Thinking Conventionally About Nuclear Weapons" in Carlton and Shaerf eds., Arms Control and Technical Innovation. Wiley, New York. 1976 pp. 256-64

against the nuclear revolution has been an unwarranted focus on the lack of total war between the two superpowers.²² Arguments put forward in this light are merely debating if nuclear weapons are responsible for "the long peace" after WWII., such as argued by Mueller. Viewing the nuclear revolution in such a narrow scheme ignores a variety of other important changes that resulted from the revolution. In rebuttal of Mueller's argument concerning the lack of total war during the post-WWII period, Jervis argues that Mueller is guilty of "conventionalization", and misses the political affect of nuclear weapons by focusing on the frequency of war.²³ Nonetheless, Mueller's counter-revolutionary argument is relevant to the historical development of the nuclear debate as a whole; however, it is a mere aside in discussing the nature of military revolution. Creating a framework for revolution requires the establishment of focal points of change and transformation. As Mandelbaum, Jervis, Kissinger, Brodie and, inadvertently, Mueller indicate, the character of revolution is neither strictly a military revolution, nor entirely a political one.

The Framework of Revolution

When nuclear weapons were introduced into the international system and in the succeeding decades they imparted significant change across a variety of levels. It is necessary and important to establish the boundaries over which change occurs. Once the nuclear revolution is

²²Mueller, John "The Irrelevance of Nuclear Weapons", International Security. Fall 1988. (Vol. 13, No. 2)

²³Jervis, Robert. "The Political Effects of Nuclear Weapons", International Security. Fall 1988. (Vol. 13, No. 2)

recognized and understood to be truly revolutionary then its nature and qualities can be applied to analyze the 17th century, the Napoleonic and the military-industrial "revolutions". It is then possible to extrapolate from the qualities and character of revolution and contribute predictive measures for the analysis of arguments concerning the purported current revolution. Three central characteristics of change can be identified to encapsulate the span of revolution. Revolutions alter the relationship of war to society, they alter military organizational demands, and they produce specific strategic/ technical changes (technology and the weapons of war).

The premier quality of revolution as portrayed by the nuclear revolution is an abstract yet fundamental alteration in the basic relationship of warfare to the societies that prosecute war. The understanding of war as a tool of policy, as enunciated by Clausewitz's famous dictum, is dramatically overturned by nuclear weapons. This principle had been characteristic of the conduct of states, nation-states and city-states since the era of Thucydides, if not earlier. This crucial shift in world view about the utility of force thereby institutes a transformation in thinking about war. If war previously equalled the clash of organized force for political goals, the elimination of any attainable goal therefore eliminates that aspect of war. This is the central dilemma which the academic child of the nuclear revolution, strategic studies, attempted to answer. The attempt to develop strategies by which nuclear weapons could be employed in traditional ways, failed because of the fear of escalation and the logical failures of such notions as limited nuclear war. In regards to strategic conceptualization of nuclear weapons, Lawrence Freedman noted that in the early years, none of the traditional process of thinking opened up "avenues [that]

appeared promising then there would have to be a virtual revolution in thinking to match the revolution in technology."²⁴ Indeed, this is exactly what occurred.

The alteration of the relationship between war and society is essentially about political thinking and the relation between what human beings perceive as important and how conduct in the international arena, personal lives, and thinking about war has changed. Certain subtle indicators in the history of mankind are available to understand how dramatic the change in world view became in the wake of nuclear weapons. The rebirth of ideas on collective security and world government are initial attempts to deal with the changing relevance of war, and indicates that a restructuring and rethinking was occurring. Simpler shifts are perhaps better indicators, such as the transformation of War Departments and Ministers of War to Defense Departments and their related ministerial titles. The history of the nuclear revolution briefly presented above should indicate that from the time of Bernard Brodie's initial ideas in 1945 to the extremely complex deterrence formulations there emerged a transformed view of the world and the frailty of the human condition.²⁵ While the existence of this changed relationship between war and the people that prosecute it is at times abstract from the conduct of war, it is nevertheless extremely useful to understanding revolutions. As a clear example, few would have trouble in acknowledging a change in thinking and attitudes about war resulting from the nuclear revolution.

²⁴Freedman, Lawrence. "The First Two Generations of Nuclear Strategists" in Paret, Peter ed., The Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton. 1986.. p.761

²⁵This comes from Brodie's initial views in The Absolute Weapon.

Invariably linked to the changes brought on by revolutions to the relationship between war and society is the second aspect of revolution; the change in the demands upon military organizational structure. The sociology of revolution is found in the conduct, strategy and relations among those groups that comprise the body of revolution. These are the practitioners, military leaders, statesmen, and governmental groups, and to a certain extent the population at large, as well as their interaction. Strategy and tactics after the nuclear revolution changed dramatically and true evidence of the impact of nuclear weapons can be seen here. Strategically, the defense has in many ways been greatly overshadowed by the offense and attempts to allay fears of the defense resulted in the abortive attempts to develop Anti-Ballistic Missiles and the failed Strategic Defense Initiative.²⁶ Brodie noted that the further development of missile technology married to nuclear warheads placed a reliance on ensuring a retaliatory force capability. Defense, thus, became equated to having an offensive capability; a notion that is particularly alien to the traditional idea of warfare and strategy.

The second aspect of alteration to military organizational demands also produces change in the purpose and structure of institutions, as well as the creation of new ones. Not only did the purpose and nature of the social institution of war transform, additionally, there was the development of new institutions designed to reduce or manage the likelihood of war escalating to a direct nuclear exchange were formed. For example, the North Atlantic Treaty Organization (NATO) emerged for a variety of reasons not the least of all to manage the bipolar relationship in Europe. Peacekeeping also served as a new institution to manage conflict beyond the immediate

²⁶In fact, the central argument the sociological component of nuclear revolution elicits is *no* defence.

reach of the superpowers, again partly to quell the possibility of escalation in nuclear conflict. Ultimately new institutions sought to safeguard the superpowers and other potential nuclear states from the instability of nuclear weapons through arms control and disarmament.

The pace of change in technology and industrial flexibility needed to ensure a stable nuclear relationship also involved significant change in the industrial/scientific base. While the basic foundations of a "defense-industrial" complex were developed in the mid 1800's, further structured during the inter-war period and became fully functional during World War II, the elaborate and highly structured character of the complex linked to rapidly advancing technology only became apparent some years after the nuclear revolution.²⁷ The "arms race" has to a great degree shifted even more radically from the industrial complex to the laboratory where the greater portion of arms technology racing occurs. As such, much of the energy of strategic studies has been to evaluate, if not participate in, procurement debates and decisions, and research and design initiatives.²⁸

Classical military educational institutions also began to deal with the unorthodox nature of nuclear warfare and the purpose of the military overall. The institution of the military formed completely new divisions that were designed to cope with the nuclear requirements of armed force, such as Strategic Air Command and Strategic Bomber and Missile Wings.²⁹ Even

²⁷McNeill, William H. The Pursuit of Power. The University of Chicago Press, Chicago. 1982. p. 223-361

²⁸Buzan, Barry. An Introduction to Strategic Studies: Military Technology & International Relations. St. Martin's Press, New York. 1987. p.159-160

²⁹Similar sociological changes can be seen in militaries besides the United States. For example, the U.S.S.R., French, British, Chinese, Indian and Israeli military structures.

NORAD evolved from defense against bombers to a primary role of early warning and attack characterization designed to ensure the retaliatory ability of U.S. ICBMs and bombers.

Changes in thinking about war and changes in the organizational demands of war are obviously intimately related and large scale organizational transformation owes its impetus from changes in thinking and world perceptions. While they are important aspects of revolution, the changed organizational demands and thinking of about war do not comprise the totality of revolutionary change. The third aspect of change is that of the specific strategic/technical changes to war (technologies of war), something initially thought to be within the changing organizational demands but sufficiently distinct to require separate analysis. The technical and strategic changes are those direct developments relating to the invention of nuclear weapons. First and foremost, this is represented by the unprecedented rate of technological growth, innovation and adoption by militaries, pseudo-military groups and civilian industry. Not only have the physical artefacts of technology multiplied but so has the defense departments' willingness to accept new and sometimes alternative technology. Not only is technological change a direct result of the nuclear revolution and its technologically driven nature, but also this technological upheaval causes great strategic problems for military institutions attempting to define strategy that is continually being undermined by new technology.³⁰ The most brazen example of a revolutionary technical change is the development of the atomic bomb and its thermonuclear cousin.

Although, admittedly to a lesser extent.

³⁰op. cit.. p. 94-113. The arms dynamic is a separate topic by itself and not within the scope of this discussion for an overview see Barry Buzan's discussion of the *action-reaction, technological imperative and domestic structure models* in the identified pages.

The two other identifiable areas that are directly effected by a revolution in the technical/strategic components of warfare are strategy and theory. The incredible variety of deterrence theories that emerged later in the revolution, as well as arms race theories and limited war theories, are striking examples of transformations. For all intents and purposes the nature of base level war-fighting theory changed greatly from that of the first half of the century. Not so much in tactics but in the purpose of tactics and the overriding concern combined with cutting edge technology. A more drastic change can be seen a level above tactics with strategy and theory. The theory of deterrence that was relatively simple in its initial conception soon required a body of professionals to interpret and create the more complex and politically useful variants and options. The grand strategy of relating economics, politics and warfare became an increasingly difficult task under mutual assured destruction and required new tools for war and new tools for conducting warfare. Technical/strategic components, therefore, are the physical and theoretical objects used to conduct warfare and are intrinsically related to the revolution of nuclear weapons.

In light of the analysis of the nuclear revolution, the key components of revolutions are evident. As in the in the instance of the introduction of nuclear weapons, revolutions are heralded by crisis and second are compressed in time within the approximate period of a generation. It is also evident that revolutions produce specific strategic / technical changes in technology and the weapons of war. Clearly military organizations can not avoid the effects of revolutions and have at times themselves been the catalyst of change; indeed this fourth component of organizational transformation is crucial to the course of revolutions. The final component of a revolution is that it alters the relationship of war to society. It changes the reasons wars are fought, the political and moral lengths society goes to in order to prosecute organized conflict and how

society at large views war. As outlined these areas represent distinct senses of revolutionary impact by which a revolution can be measured and determined to function as a truly dramatic transformation. It has by no means been asserted that these areas are mutually exclusive;—admittedly they are not. Interdependence among them is necessary for a ‘true’ transformation indicative of revolution. The main focal point of a revolution may begin in one specific area, such as that of technology with nuclear weapons. However, if it is significant enough it will quickly be felt across the spectrum to the point where societal attitudes and thought patterns change. These are the qualities that must be present in order to be designated as revolutionary.

CHAPTER 2

THE 17th CENTURY AND NAPOLEONIC REVOLUTIONS

The catalyst of major change in the 20th century was the introduction of atomic technology and its related socio-political affects upon international society writ large. Equally remarkable are several other momentous changes in the nature of warfare during the modern era. Two sets of transformations in particular have gained the title of military revolutions; the 17th Century and the French Revolution/Napoleonic periods. The centuries preceding the French Revolution contained a variety of significant changes in society and military power that resemble a revolution. “The military revolution of early modern Europe” is how Geoffrey Parker, its most well known exponent, outlines the multitude of changes in warfare that culminate approximately in the mid-seventeenth century.¹ The French Revolution represents one of the most dramatic periods of transformation in European history. Additionally, the Revolutionary and Napoleonic wars were to become a hallmark of one of the greatest changes in the relationship between men and armed conflict.

While the nuclear revolution provides a basis for creating a framework for understanding the nature and meaning of revolution, historical precedence are equally important and further enhances the analytical tools identified from the nuclear experience. To this end, the 17th century revolution will be challenged and exposed as merely a product of evolutionary advancement. The large period of time and the lack of structural violence stand out as prominent,

¹Parker, Geoffrey. pp. 1-5

yet not exclusive factors, in this conclusion. The purpose of such an expose is, on the one hand, to show the progress of normal evolution in military and international affairs and consequently highlight the other method of change — revolution.² On the other hand, such an analysis is useful in establishing the relevance of the analytical model drawn from the nuclear revolution. Additionally, it also leads to the identification of several trends in the nature of war over the centuries that is of concern and importance to analysis of the future of warfare.

Following a study of the changes that occurred in the nature of armed conflict in early modern Europe, it is useful to focus upon the explosive events surrounding the Napoleonic revolution in warfare. The fundamental shifts in the nature of conflict that sprang from the Revolutionary and Napoleonic wars are important for refining the analytical framework. Most importantly, the Napoleonic revolution indicates that technology is neither a necessary nor sufficient condition for military revolution. Nuclear weapons as outlined are merely the instruments, a revolutionary technology, that begins the transformations that become the ‘true’ revolution.³ The Napoleonic revolution is a result of momentous changes in the organization and structure of military organizations, not technology, that spread across the spectrum of human development incorporating the other aspects of revolutionary change; how society views war and technology.

²see Kuhn, Thomas. The Structure of Scientific Revolutions. University of Chicago Press, Chicago. 1972 for a similar pattern of occurrence in science called the progress of normal science.

³see Margaret Masterman’s elucidation of Kuhn’s theory of revolutions for further discussion on the nature of constructs or artefacts in science. The use of the term here is intentionally similar in order to set out the parallels between the disciplines.

Armed Force in the 17th Century

The first historical revolution identified in the literature near the dawn of the modern era occurs during the 17th century. As Gunther Rothenburg introduces it: "The concept of a military 'revolution' in Europe during the early modern era has come to be generally accepted. There is, however, disagreement about the exact time frame of this development."⁴ This statement naturally begs the question of how to exactly identify the revolution so harkened to by historians. The lack of agreement on the issue of time frame for the revolution, not by itself a denunciation, indicates a lack of consensus on the qualities of revolutionary change that developed. Nevertheless, the general qualities of this revolution have been explored by several prominent authors, notably, Geoffrey Parker, William H. McNeill, and the aforementioned Gunther Rothenberg. The initial intellectual contribution in identifying the revolution, however, belongs to a few papers and lectures by Michael Roberts.⁵

To draw some boundaries to the time frame of this event, the majority of the authors conclude that the body of the revolution lies between 1560 and 1660. However, many also say that the nature of military mutations that occurred culminated at the mid-point of the 18th century (1760's) with the final developments of the professional army. Certain problems become apparent at this juncture, that will resurface throughout the discussion, concerning the

⁴Rothenburg, Gunther. "Maurice of Nassau, Gustavus Adolphus, Raimondo Montecuccoli, and the "Military Revolution" of the Seventeenth Century", in Peter Paret ed. The Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton. 1986. p.32

⁵see Parker, Geoffrey. The Military Revolution: Military Innovation Rise of the West 1500-1800. Cambridge University Press, Cambridge. 1988. Introduction - pp. 1-5

differentiation between a revolution that occurs over a century and incremental evolutionary change. Albeit that this problem exists, there are four changes in the art of warfare that the main body of literature distinguishes as being pivotal. These appear in no particular sequence, and are a dramatic change in tactics, growth in army size, strategy, and the impact of war upon society.⁶ Military historians and strategists agree on these changes, and many see the professionalization of armies or the changes in the structure and institutionalization of the nation-state as being the ultimate indicator of revolution.⁷

There is little question that unprecedented change took place in the composition, supply and destructiveness of armies in this period. A gradual transformation occurred throughout Western Europe with the impetus of change coming from the Low Countries. The Renaissance that spread across Europe found avid disciples in the leading innovators and intellectuals. Foremost amongst these was Justus Lipsius a "neo-Stoic, philosopher, polyhistorian, and philologist...who had direct influence on Maurice of Nassau."⁸ Lipsius emphasized the classic texts, philosophy and organization of the Roman Empire. His influence on his one-time student Prince Maurice of the House of Orange-Nassau is significant because Maurice was a university educated young man, with a background in mathematics and the classics, who became by the age of 21 Admiral-General of the United Netherlands. Faced with the dilemma of dealing with the Spaniards in the Low

⁶ibid. p. 1-2

⁷McNeill. pp. 117, 131-133, 142; Jeremy Black, European Warfare, 1600-1815. pp. 8-9.

⁸Rothenburg, op cit., p. 35

Countries, Maurice would turn to the classics for inspiration.⁹ The position of Maurice and his cousin William in the hierarchy of control in the Netherlands gave ample opportunity for the philosophical underpinnings of Maurice's university years to come through. "War", Lipsius argued "was not an act of uncontrolled violence, but rather the orderly application of force ... in the interest of the state."¹⁰ These ideas were prevalent when the two princes of the House of Orange-Nassau, Maurice and William, shaped the definitive innovation of the period with the creation of the new model army for the Low Countries.

At roughly the same time, the widespread adoption of gunpowder not only necessitated a change in the structure of the armies for battle, but also altered the organization, supply and financing of armies.¹¹ The introduction of swift moving firing lines for muskets necessitated heavy discipline and drill for the army, that changed the structure of the army as institution to a professional long-serving force. The key to the ability of Maurice and William to accomplish this rested on the Netherlands' economic wealth from external trade. Indeed, the ability to pay forces year round was the first step in being able to require forces to drill and to dig as required in siege work. Externally, drill was the fundamental 'innovation' of military reforms, and internally, discipline was the key to overall military improvement.¹² The economic prosperity and

⁹McNeill, William H.. The Pursuit of Power. The University of Chicago Press, Chicago. 1982. p. 128

¹⁰Rothenburg, p. 35

¹¹ibid. pp. 133-136

¹²Drill was only an innovation in so far as it was rediscovered by Maurice in his education in the classics.

resultant monetary flexibility of the Netherlands, however, was severely isolated and didn't spread beyond the Netherlands. As a result the changes occurring in the Netherlands were slow to spread across Europe. The great countries of Europe, Spain, France, and the German Kingdoms took quite some time in imitating the practices of the Dutch. England took much longer not suffering from a need to prosecute constantly land war such that the changes of drill and discipline reached the island much later. Gustavus Adolphus and the Swedish reforms mimicked the Dutch but came years later.¹³

The changes Maurice of Nassau and his relatives were to make to the Dutch system of warfare were not only isolated but were largely built on an inherited system. As German historian Hans Delbrück notes: "Indeed, as compared with Machiavelli, they (Maurice & William) had the advantage of neither being required nor wishing to create a new military system but simply of developing further a system they inherited"¹⁴ The two princes did not, as indicative of revolution, overturn the existing order to create a different organization of warfare. They merely enhanced and innovated upon what already existed. The same may be said of the so-called revolutionary impact of gunpowder and firearms upon the battlefield.

Gunpowder had existed in Europe centuries before even its partial implementation in military organizations. Long periods of evolution were required before any successful tactical application could be found on the battlefield. While it represented a basic and fundamental

¹³The reforms begun by Gustavus Adolphus were quick to disappear after his death and the Swedes rapidly fell back on the style of warfare of the 15th century, within a generation however they had begun to spread to other countries, see McNeill p.134.

¹⁴Delbrück, Hans. History of the Art of War: Within the Framework of Political History - Volume IV - The Modern Era. Greenwood Press, London. 1929 (1985 ed.)p.157

transformation of warfare in turning men-at-arms to soldiers this took nearly five centuries of evolution. Much of the delay in developing gunpowder-based warfare was due to the slow pace of technological developments and refinements needed to employ effectively gunpowder weaponry. Additionally, there was both a substantial expense in muskets, firearms and cannons as well as an institutional rigidity against large scale change. Beginning in the 1320s with the first writings on cannons the final exploitation of modern rifles and field artillery were not made until the late 18th century and early 19th century.¹⁵ The drill systems initiated by Prince Maurice of Orange-Nassau and further developed by his cousin William were a direct response to a real need to find control on the battlefield with larger and larger amounts of firearms entering military practice. McNeill, Van Creveld, and others note that the continued pace of development in gunpowder, firearms and drill practice in military organizations from 1500-1750 allowed Europeans to outstrip the rest of the world in military power.¹⁶ This did not constitute a revolution on the continent or anywhere else because the basic principles that had outlined warfare in the previous centuries were still the accepted norms of military practice. While warfare was changing in small gradual steps, the utility of war, who it was fought for and by whom it was fought had not yet changed.

The changes that did occur in the intervening centuries before Napoleon was centered upon the relationship of armies to society with the introduction of the long-serving

¹⁵Van Creveld, Martin. Technology and War: From 2000 B.C. to the Present. The Free Press, New York. 1991 pp.85-86

¹⁶McNeill p.143, Van Creveld p.97

professional soldier. As mentioned above, this advance took some time before it may be called universal, and it climaxed with the outset of the Revolutionary Wars. Other notable advances in siege warfare and the art of siege craft are also heralded as being a substantial part of the early modern revolution. The catalyst of the revolution in siege warfare was the French invasion of the Italian Peninsula in 1494-95 under Charles VIII.¹⁷ Siege warfare had long been a protracted business of attacking fortified towns and castles, fighting skirmishes and attempting to starve out the inhabitants which often as not ended in stalemate. The introduction of mobile artillery temporarily changed this as the French soon gained dominance in ability to end successfully sieges as displayed in Normandy and Aquitaine in the 1440s and 50s. The changes to the art of siege craft were so great that Henry Guerlac labels them as revolution in their own right during the 15th century: "The art or science of military architecture suffered a violent revolution in the century following the Italian Wars of Machiavelli's time."¹⁸ Not only did siege warfare change, but a related change came to pass in the fortification of castles and towns across Europe, starting in Italy. Bastions and the art of fortifications for the most part eliminated the early gains made in siege craft. So much so that the purported value these developments had to the revolution were all but nullified.

The development of the indecisive battle, with the dominance of siege warfare in the Renaissance period, was separated from the focal point of the revolution, professional armies,

¹⁷Parker, p.9

¹⁸Guerlac, Henry. "Vauban: The Impact of Science Upon War" in Peter Paret ed. The Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton. 1986. p.69

by almost two centuries.¹⁹ Geoffrey Parker argues that the military revolution includes the technological climax of siege weapons and the switch to infantry/field based warfare. Yet he states: "Gradually, the musketeer became master of the battlefield and drove off most other military specialists."²⁰ It is important to recognize that this gradual change is devoid of a transformation in how societies viewed warfare and happened over a long period of time as a result of other important societal changes. Again, the substance of warfare during the pinnacle of siege craft and fortification does not change the relationship of war to society and therefore it is not representative of revolutionary change. What the siege based warfare of the 15th and 16th century had achieved was immobility in both the span of time for successful battle and movement of troops for battle.

The tactical changes to military forces on the battlefield and their subsequent effect on the structure of the military as an institution were reflective of larger shifts in European society. Parker indicates that the gradual transformations that occurred across a spectrum of governmental agencies in the period from the late fourteen hundreds until the mid-17th century were caused by the 'revolution' in armed force.²¹ In turn, Michael Howard sees these shifts as follows;

The growing capacity of European governments to control, or at least to tap, the wealth of the community, and from it to create mechanisms - bureaucracies, fiscal systems, armed forces - which enabled them yet to further extend their control over the community, is one of the central developments of the historical era, ...²²

¹⁹Parker, p.16

²⁰ibid, p.17.

²¹op cit, p.2

²²Howard, Michael. War in European History. Oxford University Press, Oxford. 1976.

The technology of gunpowder had existed for nearly six centuries before ascending to prominence on the battlefield. Society, however, had made changes in organization, administration, and control of armed force so that the state could take advantage of, and further develop, the force requirements for maximum possible effectiveness with firearms. As such, organizationally there were undoubted innovations in the command and control of military organizations. Significant among these was a general increase in army size and the prevailing use of taxation on a larger and larger scale to support the military efforts of nations. Howard notes that it was the Bourbons of France that pioneered the blueprint for organizational and state transformation that had been provided under Gustavus.²³ The Bourbons would only achieve this military improvement by the end of the 17th century, while Gustavus had died in 1631 and had inherited much of his system from the Low Countries years earlier. As suggested above, the changes that were occurring in the art of war, specifically widespread firearm adoption, had been occurring across Europe for centuries and were not to be fully realized until the Napoleonic Revolution.²⁴ Again, this was an evolutionary process with the most significant feature being the gradual dominance of the state over the means of force. Whereas one talked of combat previously as a melee, one could now safely speak of wars.

Michael Howard and William H. McNeill do not describe the period of the change in the seventeenth century as revolutionary. Indeed, both authors ignore the terminology in favor

²³ibid, p.62

²⁴Although firearms were common throughout Europe leading up to the Napoleonic era, the state's resources, military infrastructure, training and strategy required to make them an effective tool was not fully evolved until the period of the Napoleonic Wars.

of a wider more informative breakdown of the aforementioned changes into, respectively; "Wars of the Merchants/Wars of the Professionals" and "Advances in Europe's Art of War".²⁵ As opposed to Parker, both Howard and McNeill acknowledge that the spectrum of changes are too varied, unrelated and occur over too long a period of time to be 'revolutionary'. The nature of changes in the art of war in the 17th century represent evolutionary steps in a centuries long developmental process. The idea of a revolution involves some compression of time in which the dramatic culmination of a force or forces is introduced into history; an element of compression which is certainly not evident across the changes that compose the 17th century so-called revolution.

In addition, the necessary elements of revolutionary change, technical/ strategic innovations that significantly alter the weapons of war, military organizational demands, and most important, changes in the relationship of war to society are non-existent or had little affect on the development of warfare. To be more specific, the certain technological changes that did occur over this period had effect only in a specific few cases and noticeably not enough to cause a widespread restructuring of armies. The structure of military organizations had been undergoing a process of evolutionary development to accept the widespread use of firearms for nearly four generations, but the technology of firearms had yet to develop to the point where a whole scale revamping of military organization and training would be necessary. Admittedly, Sweden and the Netherlands had begun institutional reorganization but this process was limited to these two

²⁵see Howard, Michael. War in European History. Oxford University Press, Oxford. 1976. p.122 and McNeill William H.. The Pursuit of Power. The University of Chicago Press, Chicago. 1982 p.117.

countries and soon after the demise of Gustavus or the House of Orange, the military organizations reverted to previous organizational structures and methods of combat.

The limited degree of change in technology and organizational structure was reflected in the absolute lack of change in how society perceived warfare and its use. As such, the use and conduct of warfare during the period described as the 17th century revolution is almost imperceptible to that of previous periods. Structural violence, the second revolutionary quality beside time compression, which denotes the turmoil and upheaval associated with institutional change, the displacement of classes of people and the new relationships between military organization and warfare and society, was almost omnipresent in the overthrow of the establishment during the nuclear revolution, is by all accounts lacking during the changes of the 17th century. Many of the dominant figures in the military continued in their roles, participated in the introduction of new technology, and were replaced only by evolution or by the advent of a true revolution, such as Napoleon's.

Western Europe was the heartland of innovations in early modern Europe and was to be the setting for the introduction of the first revolution of the modern era. The technological innovations that were being grappled with under the *ancien régime* were the foundations of the Napoleonic system of warfare. The introduction of drill, widespread dominant use of the musket, somewhat mobile artillery, and greater governmental control of the means of war are all examples of the changes that developed over three centuries of warfare in Europe. Siege craft also climaxed in this same period but was rendered impotent by the explosive changes to strategy employed by Napoleon shortly thereafter. Van Creveld refutes the whole notion of a revolution in siege craft technology as being significant to the period in terms of the application of force or to the onset of

the Napoleonic Revolution “Such martial [cannon] displays notwithstanding, warfare continued to be dominated as much by humdrum nonmilitary technology as by spectacular fortresses and cannon. Ultimately, it was developments in non-military technology that accounted for the revolution in strategy usually associated with the name of Napoleon Bonaparte.”²⁶

The armies of early modern Europe went through many unquestionable changes to their structure and technology. Revolutions, however, constitute a reformulation of values, ideas, methodologies, thought patterns, and most importantly relationships between the nature of war and the society that prosecutes it. The composition of modern armies owes much to the technological and military innovations of this period and yet in crucial aspects the nature of warfare less than one hundred years later is strikingly different. It becomes apparent that the foundation of the 17th century revolution as outlined by its advocates is questionable. The introduction of firearms and the adoption of drill are related, necessary and yet distant innovations. Drill was the catalyst for army professionalization which was infantile and localized at first and later without significant affect on the basic nature of war. Combined with the evolution of governments, this lead to the ability to field larger armies but with little strategic consequence. Clausewitz condemned the armies and leaders of this very shortcoming by saying they had little strategy at all and that armies had become an end in their own right causing the removal of the principle element of war: violence.

The length of time between the refinement of firearms, application of drill, creation of long-standing forces, and evolution of state machinery is too widespread to resemble a

²⁶Van Creveld, Technology and War. p. 109

revolution. Siege craft and fortifications played a role in war even after 1814 but with little effect and long removed from their historical climax. Armies drilled in the European method, Keegan notes, did significantly well only against armies of extremely more traditional cultures such as that of the Indians.²⁷ The violent and dramatic qualities inherent in revolutions are absent in the changes in warfare of early modern Europe. The relationship of war to society changed little except to involve more individuals and push the financial and bureaucratic limits of governments of the day. The military technological innovations of two centuries served only to solidify the political borders of ancien régime. In 1792 these borders were broken and the foundation of Europe was shaken to the ground by the onset of the Napoleonic Revolution in warfare.

The Napoleonic Revolution

After all, the weaponry used in Frederick's time differed only slightly from that used in Napoleon's, and to us it is remarkable that very significant changes in practice could occur despite insignificant changes in arms, not to mention transportation or communication.²⁸

Not only were the dramatic systemic transformations to the nature and conduct in the art of war under Napoleon startling to Clausewitz and drove him to analyze the character of warfare, but they also are still equally important to understanding the way in which warfare transforms. A true revolution in warfare should undermine the foundations of strategy, the overall conduct of battle and most importantly the relationship of war to society. The changes culminating

²⁷Keegan, John. A History of Warfare. Vintage Books, Toronto. 1993. p.346-47

²⁸Brodie, Bernard. "The Continuing Relevance of *On War*" in On War. Carl Von Clausewitz. Paret and Howard eds. Princeton University Press, Princeton. 1976. p.55

in the 17th century represented fundamental shifts in the conduct of battle, but did not change the relationship of war to society. The undercurrent of change that fostered much of the new developments in government, and in warfare in the 17th century, climaxed during the French Revolution and the entrance of Napoleon. The explosion of the French revolution and the accompanied life it infused into a decaying government bureaucracy and officer corps allowed the innovations of the 17th century to be fully realized. It was the social-political changes of the French Revolution which allowed for a full-scale military revolution of such magnitude, and in many aspects these transformations resemble the introduction of nuclear weapons in 1945.²⁹

The dramatic alterations in warfare of the Napoleonic era that caused the military revolution have a distinct dyadic nature. The first and most often studied aspect of this revolution is Napoleon and his contributions as commander, emperor and strategist to the art of war. The second component of the revolution is the larger shift in the social and political construction of France, which allowed the innovations in tactics, technology, and organization of the previous era to be combined and focused.³⁰ It is this second component which is necessary for the revolution to be fully realized. Napoleon changed tactics and grand strategy (the constructs of a military revolution) and the social forces in France changed military organization and conceptions of war of that era and for many generations to follow, which combine to form the three principle elements of a revolution in warfare.

²⁹Paret, Peter. Understanding War. Princeton University Press, Princeton. 1992. p. 78

³⁰ibid. p.75

There are certain qualities of Napoleon which allowed for the timely combination and manipulation of historical forces in order to create the empire. Napoleon, even as a young officer, understood the relationship between foreign policy and war, and the amount of resources needed to be mobilized and the manner in which this should be done.³¹ While Napoleon possessed great strategic vision and genius in the conduct of battle, his inborn talent, as Hans Delbrück suggests, were those of a statesman;³² an unusually aggressive, sometimes warlike, but incredibly adroit statesman. What Napoleon accomplished was to remove war from its place in foreign policy as an emergency measure (a last resort) to a central tool of foreign policy. In essence, he changed the relationship of war to society, the third essential component of a revolution in warfare. Of course, this is not to undermine the 'genius' of Napoleon as a commander. Clausewitz, foremost among commentators of the Napoleonic era, generally accepts the notion of Napoleon's genius and sees his qualities of evaluation and decisiveness as being prized by all military commanders.³³ Napoleonic warfare and the mass mobilization of forces on a complex battlefield required competent leadership of which Napoleon was an extraordinary example. Napoleon's personality and will power were essential to French victories and can not be overlooked.

³¹Paret, Peter. "Napoleon and the Revolution in War" in Peter Paret ed. The Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton. 1986. p.129

³²Delbrück, Hans. History of the Art of War: Within the Framework of Political History: The Modern Era. Volume IV. Translated by Walter J. Renfroe, Jr. Greenwood Press, Westport, Connecticut. 1985. pp.430-435

³³Von Clausewitz, Carl. On War. Howard and Paret eds. Princeton University Press, Princeton. 1976. p.111-112

Although Napoleon is credited with being a 'genius' militarily and diplomatically, the essential nature of the revolution lies in the complex political changes within France that he took advantage of. The first of these innovations was the *levée en masse*; mass conscription on a scale not previously seen. Military institutions in the previous centuries focused first on the use of more innocuous forms of conscription which existed under feudal and monarchical society and then primarily on mercenaries, which was an often self-defeating methodology, and later on paid volunteer and professional forces. Mass conscription under any other political circumstances except that of the revolution may have proved equally disastrous for any of the monarchies of the ancien régime. As such, they were unwillingly to tempt fate by opening up society for political activism.³⁴ The *levée en masse* solved a two-fold problem for the revolutionary governments. First, it diffused a growing overpopulation problem in an economically uncertain era. Second, it focused the radicalism of the terror outwards allowing the consolidation and organization of the new government.³⁵ Later this would allow Napoleon to field very large armies and to have replaceable reserves which he often used for the decisive battle maneuver; a key to his strategy.

³⁴After the initial victories of Napoleon and the growing power of the French state, many nations tried to reform their military organizations mimicking the French system. Prussia's failure at military reforms, especially an army of the people, are notable. The truth was that reform movements were very traditional in their goals. As Charles J. Esdaile points out "In so far as 'the people' were to play a role at all, it was to be through the extension of traditional means of conscription that bore no relation to Nation-in-Arms, the prospect that they might be armed en masse, or, still worse, that they might take up arms on their own account stirring fear in the breasts even of the more radical reformers." Esdaile, Charles J.. The Wars of Napoleon. Longman Group Ltd., London. 1995 pp. 215-216

³⁵op.cit., McNeill. pp.192-197

Intimately linked to the *levée en masse* was the patriotic fervor and radicalism of French conscript armies. This huge violent esprit de corps that developed in revolutionary armies and combined with the revolutionary doctrine espoused during the terror changed war from mere combat to a struggle for survival. After the Revolution had dealt with the immediate enemies at home, the focus turned towards those who had supported the old regime and were still a possible threat. The doctrine of the revolution was externalized upon France's neighbors, of which there were few, if any, exceptions. No longer indeterminate, battles were no longer tempered by rules, and military objectives had completely transformed, as pronounced by Lazare Carnot; "'We must exterminate', he urged; 'exterminate to the bitter end!'"³⁶ The amount of operational leverage this gave the revolutionary generals and later Napoleon was immeasurable.

Structurally, however, the revolution had added welcome, if unforeseen, consequences on the nature of the army which was to forever change military organizations and the access of the privileged class to their former position. Changes to military organizational structures and demands are, of course, the second key element of a revolution in warfare. Under the pressure of war and invasion, the election of officers was abolished (1794), as were the military disciplinary councils(1795).³⁷ A certain 'openness to talents' policy prevailed which had the benefit of attracting talented civilians and former regular non-commissioned officers who had ability and now the chance to show it. The abandonment of noble military positions was to transform military organizations in Europe for some time, which, in combination with other

³⁶as cited in op. cit. Howard. p. 81

³⁷Keegan, John. A History of Warfare. Vintage Books, Toronto. 1993 p.350

revolutionary innovations, would help create a primitive general staff. The nature of the officer corps was revolutionized beyond recognition and the loyalty and ability of these officers to lead increased correspondingly. To a degree, this affected the lower ranks and their knowledge that the status of those above them was largely due to talent and not birth. The openness of officer positions, made readily available by the exodus of nobles during the revolution, would be enhanced by the growing rate of promotion available over the twenty years of continuous imperial warfare.

Obviously, the ability of the government to conscript soldiers paralleled their ability to conscript resources for the war effort. While the government tried to impose control over grain prices and artillery production among other things, on the whole, production rested on individual efforts guided by the spirit of the revolution, and tempered by one's own best interest.³⁸ Transportation, industry, bread production, arms, ammunition and uniform manufacture were all nationalized as well as human resources such as scientists. Innovations such as this were to become the norm over modern Europe during the next century, and gave Napoleon much of his flexibility.

Many have put forward the notion that Napoleon could have conducted his battles only in such a grandiose fashion because an agricultural revolution had occurred in North Western Europe allowing the maintenance and movement of such large forces.³⁹ Increasingly as the revolutionary armies moved outside French borders the responsibility for food provisions was the bane of foreign nations. Radical reformation of the bureaucracy was the necessary element to allow

³⁸op. cit. McNeill

³⁹A notion that in light of recent literature seems increasingly plausible.

the ever growing revolutionary armies, 650,000 by 1793, to be fed. It is not that Paris gave such specific control over men and resources in comparison to modern standards but that revolutionary fervor combined with innovation provided a fairly efficient machinery. A revolution in government, more specifically bureaucracy, was a hallmark of revolutionary France, but was to be refined by Napoleon and put to more specific and reliable use.

As with the nuclear revolution, there were clear implications for strategy and tactics in the Napoleonic revolution in warfare. While some of these innovations had been present and discussed by commanders in various armies before Napoleon, they were only put to effective use under his guidance, Michael Howard sets these out as follows;

Of these innovations one can pick out four: the articulation of armies into autonomous divisions which, since they could move along several roads simultaneously, gave greater speed and flexibility to military movement; the employment of free-moving, free-firing skirmishers- 'light' infantry or rifleman; a more flexible use of artillery on the battlefield to gain a superiority of fire at a given point; and the use of the column of attack instead of the line... a change from l'ordre mince to l'ordre profonde.⁴⁰

It is perhaps the most undervalued contribution of Napoleon to the evolution of the modern military system that he instigated a complete change in army structure. Unlike the reformation of the officer corps this consisted of a purely Napoleonic concept - the division of the army into permanent strategic units. Van Creveld points out that the poor communications and large numbers led the field commanders to devise new organizational forms.⁴¹ Contrary to popular opinion the revolutionary armies also underwent transformations in training and doctrine of which

⁴⁰op. cit., Howard. p.76

⁴¹Van Creveld, Martin. Technology and War: From 2000 B.C. to the Present. The Free Press, New York. 1991. p.121

there was a significant amount. As Van Creveld adds “the effect on strategy was revolutionary, indeed explosive.”⁴² The movement of the army in columns of self-contained and controlled entities that were often 48 hours from headquarters increased the effectiveness of the army greatly. Crucial in this respect is that it expanded the theatre of operations from a typical 5—10 km maneuver area to where a distance of 50—100 km or more became routine.⁴³ In the end, the organizational change allowed Napoleon to bring more force to bear simultaneously and to increase the strategic possibilities of his generals exponentially.

The single technological innovation of the previous paradigm in warfare that proved decisive for the Napoleonic armies was artillery. Under De Gribeauval artillery was further revolutionized by introducing the principle of interchangeable parts, improving accuracy of fire, and increasing the mobility of guns through weight reduction.⁴⁴ The French artillery theorist and Napoleon’s mentor Du Teil further completed the revolution in artillery by proposing artillery strategy based on principles of siege warfare. Central to this was the concentration of firepower upon a single spot creating a breach in the wall or a break in the line of troops. The practice of the concentration of force upon a single decisive point was to be foremost among Napoleon’s strategic ideals. The first successful use of De Gribeauval’s innovation came in the revolutionary wars (1792) under Carnot where the Prussians were scared off the battlefield by the extreme range and relative

⁴²ibid.

⁴³ibid. p.122

⁴⁴Palmer, R.R. “Frederick the Great, Guibert, Bülow: From Dynastic to National War” in Paret, Ed. The Maker of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton. 1986. p.105

accuracy of cannon at Valmy. By 1815 this technological advantage would be lost, but the strategic use by Napoleon and his generals in the intervening years often proved decisive and heralded a revolutionary exploitation of firepower.

Strategy under Napoleon was composed of more than innovations brought on by the political revolution and the adjustments made ad hoc by generals and committees alike. Napoleon had very specific strategic formulations that made possible his many military successes. As noted earlier the first and foremost of these was his use of war as a primary tool of foreign policy. Napoleon's personality and his undaunting ambition led him to utilize all the energies which the revolution released for the pursuit of war. The recognition that the synergetic qualities of revolutionary forces allowed him to create the tools and strengths he needed is perhaps his greatest personal asset. As he manipulated foreign policy and the ideals of the revolution towards his personal ambition of the French Empire, he succeeded in transforming the basic relationship of war to society. War became a situation of survival for each state involved, and for France it became an effort requiring the entire participation of the nation including its people and resources. War was on the path to becoming total and these changes to technology and strategy comprise the first required element of a revolution in warfare.

Whether the effort by Napoleon to make war total or not was conscious, it was the most visible aspect of the new paradigm and what Clausewitz's famous dictum of "...war is an extension of policy by other means" seeks to encapsulate. Readily observable are other strategic inventions at the hands of Napoleon and his armies which contribute greatly to the overthrow of the old 'normal' method of war. Central to his strategic insight was the belief, as mentioned above,

of a concentration of forces at a single decisive point, preferably the weakest point in the line. From here, once the line was smashed reinforcements could pour through and demoralize, confuse and destroy the enemy. Several other facets of Napoleonic strategy underlie this basic principle. The first is moral, of which Napoleon said that the spiritual factors made up for a three to one advantage over the physical. It was something that Arthur Wellesley, the Duke of Wellington, believed intimately of Napoleon's personal presence at any position on the battlefield and therefore tried to avoid a head on collision with that part of his force.⁴⁵

The second critical aspect of Napoleonic strategy, the transformation of artillery on the battlefield, is intimately linked to the first. Under the tutelage and ideals of Du Teil, Napoleon created the 'grand battery' of more than forty cannons and sometimes, as at Waterloo, nearly one hundred.⁴⁶ The use of cannons in a highly mobile fashion to create a breach in the battle line was a highly revolutionary strategic application of firepower. Also, he combined the regular cannon with each division of the Grande Armée, giving each separate unit the same mobility and firepower. Since at the time of the Napoleonic Wars, the French were the leaders in technology and use of cannon, the advantage was significant and fit remarkably well into Napoleon's personal strategic vision.

The cloud of confusion and panic wrought by the cannonade of the Grande Armée was matched by the revolutionary use of light infantry and skirmishers. While the use of

⁴⁵for a more thorough discussion of Wellington compared to Napoleon see John Keegan's "Wellington: The Anti-Hero" in The Mask of Command. Penguin Books, New York. 1987.

⁴⁶ibid. p.97

skirmishers had been present in a very minute amount in the years preceding the revolution, Napoleon completely altered their potential for use in warfare, and created a precedent which was not to be easily co-opted by the Prussian, British or Russian forces. Small-scale skirmishing in woods and villages on the fringes of the main force required independent and quick-witted thinking, as well as initiative. This was not easily produced in the soldier who was use to 'fixed lines of battle' and the watchful eye of his commander. The use of these irregular troops had consequential effects on many armies for, although it would not decide the battle, it would consume the energies of the enemy and it noticeably increased the cloud of confusion surrounding the battlefield. Peter Paret notes that it would have required a paradigmatic shift in the structure of foreign armies if they were to try to adopt this innovation, "Not surprisingly, it was difficult for observers to reach an accurate appraisal of skirmishing, if its adoption by their own forces would require fundamental changes in their system of recruiting, in the relationship between officers and men, and in the recasting of tactical doctrine —to say nothing of its impact on society."⁴⁷

The speed of the skirmishers were a key to their successful implementation. However, speed was to be a much more crucial character of Napoleon's armies in general. The most significant element of speed in the French army was in that of march. Often the French soldiers moved at more than double the accustomed rate of travel.⁴⁸ This was fundamental to Napoleon's envelopment of the Austrian army at Ulm in 1805.⁴⁹ Here he managed to move

⁴⁷Paret, Peter. Understanding War. Princeton University Press, Princeton. 1992. p.79

⁴⁸McNeill, p.198

⁴⁹Paret, "Napoleon and the Revolution in War", p.123

176,000 soldiers of the Grand Armée from the Channel coast on August 23 to Ulm on October 19. The movement of this vast army had no parallel in earlier wars and was to lead to the ascendance of France as the dominant power of continental Europe. Speed of march was to be crucial on many other occasions and was made feasible by the revolution in organization and the ability of the armies to draw supplies from the country they occupied. The strategy of outflanking an opponent made possible by the rate of movement of the Grand Armée was not a novel concept and in fact was part of the military doctrine of the coalition armies. However, what Napoleon did on a regular basis proved much more difficult for other generals since a frontal attack was much easier to control and offered less risk. The difference here is psychological and illuminates more of Napoleon's brilliant military character.

While speed of movement in outflanking manoeuvres was pivotal to Napoleonic strategy this was made entirely possible by dispersion. Seemingly this is a contradictory notion, but under Napoleon the army was subdivided into self-contained units already created for battle, garrisoned these units across Europe, and brought them together at the crucial point. The key here is that the dispersion was as wide so that it was impossible to tell where Napoleon intended to strike. This was only made possible by the unlimited decentralization offered by the organization into sub-units. Such was the case before the battle of Ulm where the main forces were in Northern France, with the rest along the Channel, in Hanover, and the Netherlands, and brought together with perfect timing to converge on the Austrian army.⁵⁰ The revolutionary innovation was

⁵⁰Howard, p.84

the dispersal of forces but the genius of command was their coordination since no technology existed that could accurately cope with these demands.

Strategy under Napoleon had a variety of aspects many of which are interconnected and contributed as parts to the entire machinery of war. Tactical and strategic considerations underwent dramatic transformation resulting in a change in other European armies, albeit somewhat slow and reluctantly.⁵¹ Many did not wish to undertake a *levée en masse*, especially the monarchies, as they believed it threatened the very fabric of their regimes.

As in the nuclear revolution, one clear guide to estimating a revolution in warfare, was its recognition by contemporaries. This appeared in both Clausewitz and Jomini, two of the most revered writers of military history, who accurately predicted the immense impact of Napoleonic warfare upon the rest of history. As succinctly described by Peter Paret; "...but the upheaval in war that occurred in the 1790s — both in its techniques and its goals — was sufficiently severe and far-reaching to deserve the name revolution...". More importantly, he concludes; "The military world was challenged to query its assumptions and institutions, to rethink its methods."⁵²

Evaluating the Revolution

The introduction of Napoleonic warfare in the international arena, or at least in Europe, was to change many of the basic foundations of the ancien régime to create a new

⁵¹The main exception to this was the British army which was isolated and did not feel the same impetus to reform strategy during the Napoleonic era.

⁵²Paret, Understanding War , p.77

paradigm of warfare that was to last for more than a century. At its basic level, the changes dealt with battlefield structures such as the use of skirmishers, tactical innovations, new uses of artillery and the speed of warfare. These changes, in part, resulted from the long evolution in warfare over the preceding centuries that included the modernization of armies and the widespread use of firearms in wholly new ways. The contribution of the 17th century evolution of war must be distinguished as a process of 'normal' development. The evolution took place over extremely long periods of time, where developments were, at best, minimally related and tended not to radically alter the nature of armed combat for some time. Of course, the technologies of war that Napoleon took to the battlefield were little different than that of Gustavus Adolphus or Frederick the Great; nevertheless, the basic character of war was transformed. Clausewitz indicated that he thought Napoleon had fixed the technical imperfections of the innovations that had up until this point been limited in their abilities.⁵³ Certainly this was the case, but the revolution was much deeper and its true effects would not be seen until the following generations.

The nuclear revolution provides useful clues to the revolutionary shift in the Napoleonic era. The revolution in war brought on by Napoleon was initiated by changes in the organization of war and the state and in a completely altered relationship between war and European society and the utility of war within this new context. The body of literature surrounding the political revolution in France and the release of forces of nationalism is large and needs not be analyzed here.⁵⁴ However, where the literature sees the impact of the revolution in politics it

⁵³Clausewitz, Carl Von. On War. Bk. 8, ch.3b, p. 592

⁵⁴See Brown, Howard G. War, Revolution, and the Bureaucratic State. Clarendon Press,

neglects the impact upon war, both in the immediate future and in the strategic blunders of W.W. I.. The leaders of the Revolutionary Wars, and especially Napoleon, harnessed the dynamic of the revolution into the war effort and became so successful that this style of warfare had to be dealt with by other nations, otherwise, they faced continued French hegemony.

The first catalyst of organizational change during the revolution was the break-up of the ancien régime and the elimination of noble class positions which allowed for conscription under a nationalistic banner.⁵⁵ Conscription created significantly larger armies and therefore contributed greatly to Napoleon's success and became a mainstay of modern nations, at least until now. Second, Napoleon reformed the structure of warfare by recreating the structure of the military, organizing it on different principles, and allowing for promotion through ability. In this fashion he gave back independence of thought and action to a larger and larger amount of generals and junior officers, which grew in importance due to the newly extended distance of maneuver. This had the added effect of making not only war for the empire, but also war for the survival of each person and of France.

Combined with tactical innovations the basic character of war was altered in terms of its level of destruction and who it was for. Essentially, it was at this juncture in history that war became a tool of the state instead of a tool of the sovereign. It may not have been such a

Oxford. 1995; Carlyle, Thomas. The French Revolution: A History. The Modern Library, New York. 1934; Baker, Keith-Michael. (ed) The French Revolution and the Creation of Modern Political Culture. New York, 1987. Skocpol, Theda. States and Social Revolutions: A Comparative Analysis of France, Russia and China. Cambridge University Press, Cambridge. 1979; Tilley, Charles. The Formation of Nation States in Western Europe. ,New York. 1975

⁵⁵op cit., p.78

revolutionary concept if France had remained a Republic within the bounds of the traditional power arrangement of Europe. Napoleonic France, however, not only became dominant, but threatened the very existence of the European system. If one looks at the Nuclear Revolution two other similar concepts come strikingly to the fore: the lethality of war and the expansion of the battlefield. As the revolution in warfare overturned thinking about the nature and purpose of war across Europe and the organization of warfare on the continent, the related affects upon the institution of war were that its potential for destruction increased significantly as the battlefield expanded well beyond traditional limits. In the future, warfare would generally require the full mobilization of the states' resources and more importantly at least the tacit approval of the people.

In comparison the changes that occurred in the two centuries of evolution leading to the Napoleonic era seem to pale and lack many of the areas of change that are inherent in revolutions. Technology and elements of military structural change are present, but revolutions also require a fundamental change in the relationship of war to society and in organization of and for war. In addition, revolutions show structural violence and occur over a relatively compressed timeframe. While it is possible to easily identify all these concepts in the Napoleonic Revolution it can not be done in the context of the 17th century.

CHAPTER 3

THE SYSTEMS REVOLUTION

The Napoleonic and the Nuclear Revolutions are readily discernible breaks in the historical development of warfare. These events mark significant alterations in the relationship of war to society and how war would be prosecuted in the future. It sets them apart as both violent and dramatic revolutionary shifts in the thinking and conduct of armed conflict. W.W.I is often seen in a similar light, as a decisive event in the historical development of warfare. However, while World War I was significant in its intensity and loss of life, it was more an example of the inappropriate marriage of Napoleonic strategy to post-industrial revolution society than of any revolution in the nature of warfare. In the three decades following W.W.I , a combination of different events and developments would lead to a revolution in warfare being realized on exactly the same battlefields as World War I. The political upheaval sparked by the defeat of Germany in 1918 and the resultant weak and ineffectual Weimar Republic, renewed militaristic nationalism across Europe, and certain technological developments and military innovations lead to the development of “Blitzkrieg” warfare and the Systems Revolution. As the Nuclear Revolution and the Napoleonic Revolution were to alter ultimately the basic relationship of war to society, so too

did the Systems Revolution, at least until the full development of nuclear weapons technology after 1945.

The Systems Revolution encompasses a variety of changes in the conduct of armed conflict and the changing nature of the relationship between new forms of war and the society from which it emerged. The term Systems Revolution is used to encapsulate the large scale integration of formerly disparate elements of war into increasingly coherent and complex forms of organization. Initiated by new technologies of mobility and new platforms of war, such as the tank, aircraft carrier, fast and large capacity bomber aircraft, long distance submarines, and innovations in electronics & communications (the two-way radio, radar, sonar), the Systems Revolution caused the overall expansion of the battlefield. Indeed, another component of the Systems Revolution was the emergence of scientists and technologists of war whose sole responsibility was focused upon the furtherance of new inventions for the prosecution of war. The complexity of mechanized warfare, its coordination amongst like machines and across the various arms of the military, required innovation within the officer corps of groups devoted solely to the management of the mechanized fighting units, and not their operation. From the perspective of military organizations, the Systems Revolution heralded the ability to coordinate massive troop movements, supply movements and actual combat across a wider physical space, and at an increased speed. Additionally, this era introduces the first large scale coordination of army, air force and navy in a single offensive force instead of three separate arms conducting separate, if related, operations.¹

¹By 1942 this would include the tactical/strategic innovation of the *large* scale use and integration of marines into the armed forces and the introduction of amphibious assault as a primary tactic of armed conflict. The United Kingdom had a similar development path of its amphibious forces.

Beyond the apparent transformations of military organizations, the Systems Revolution created a parallel increase in the level of management of the state economy and an exponential increase in the ability of the state to extract resources for war. The increase in levels of production that had already taken place under the long and subtle influence of the Industrial Revolution during the preceding century increased in pace and intensity during WWI and was at an all time high by 1938, (Table #1).

Table #1: Annual Indices of Manufacturing Production, 1913-1938²

(1913=100)

	<i>World</i>	<i>U.S.</i>	<i>Germany</i>	<i>U.K</i>	<i>France</i>	<i>USSR</i>	<i>Italy</i>	<i>Japan</i>
1913	100	100	100	100	100	100	100	100
1920	93.2	122.2	59	92.6	70.4	12.8	95.2	176
1921	81.1	98	74.7	55.1	61.4	23.3	98.4	167.1
1922	99.5	125.8	81.8	73.5	87.8	28.9	108.1	197.9
1923	104.5	141.4	55.4	79.1	95.2	35.4	119.3	206.4
1924	111	133.2	81.8	87.8	117.9	47.5	140.7	223.3
1925	12.07	148	94.9	86.3	114.3	70.2	156.8	221.8
1926	126.5	156.1	90.9	78.8	129.8	100.3	162.8	264.9
1927	134.5	154.5	122.1	96	115.6	114.5	161.2	270
1928	141.8	162.8	118.3	95.1	134.4	143.5	175.2	300.2
1929	153.3	180.8	117.3	100.3	142.7	181.4	181	324
1930	137.5	148	101.6	91.3	139.9	235.5	164	294.9
1931	122.5	121.6	85.1	82.4	122.6	293.9	145.1	288.1
1932	108.4	93.7	70.2	82.5	105.4	326.1	123.3	309.1
1933	121.7	111.8	79.4	83.3	119.8	363.2	133.2	360.7
1934	136.4	121.6	101.8	100.2	11.4	437	134.7	413.5
1935	154.5	140.3	116.7	107.9	109.1	533.7	162.2	457.8
1936	178.1	171	127.5	119.1	116.3	693.3	169.2	483.9
1937	195.8	185.8	138.1	127.8	123.8	772.2	194.5	551
1938	182.7	143	149.3	117.6	114.6	857.3	195.2	552

As warfare reflects the societies from which it emerges, the inter-war period and the early years of World War II were to reflect the increased capacity of nations economically to wage war.

The last and perhaps most important characteristic of the Systems Revolution that emerges by the end of World War II is the internationalization of conflict. Internationalization has two component parts; the ability of national governments to project substantial military power beyond traditional continental confines, and a transformation in relationship between warfare and society within many countries. This sea change in international relations was highly evident in the emerging great powers of the United States and the Soviet Union. For the Soviet Union the prosecution of international warfare for the Communist cause was part and parcel of its underlying philosophy and acted as an external focal point to distract from internal problems. Both countries realized that their geo-strategic interests were now global in scope.³ While these interests may have existed in both countries for some time, the Systems Revolution and its related technological changes provided a means to this end.

World War I and the Inter-War Years

The industrial revolution of the preceding hundred years had led to an enormous leap in the technological capacity as well as the productive capacity of most, if not all, of the nations of Europe and North America. As John Keegan points out: "For the truth of twentieth-century European civilization was that the world it dominated was pregnant with war. The

²League of Nations. World Economic Survey. Geneva, 1945, Table III. Cited in Kennedy, Paul. The Rise and Fall of the Great Powers. Random House, New York. 1987 p.299

³For a discussion of the emerging international focus of these two powers see John Lewis Gaddis Strategies of Containment. Oxford University Press, Oxford. 1982. pp.3-24 and Paul Kennedy The Rise and Fall of the Great Powers. Random House, New York. 1987. pp.369-374

enormous wealth, energy, and population increase released by Europe's industrial revolution in the nineteenth century had transformed the world."⁴ The Franco-Prussian War of 1870-71 was the first European conflict to show the effectiveness of mass produced small arms. In North America, the U.S. Civil War was a bloody example of the effectiveness of mass produced small arms, but was largely ignored in Europe. Shortly thereafter, most armies found themselves caught within a whirlwind of rapidly evolving small arms and artillery technology. Ignored by military and civilian planners in Europe, the American Civil War was the largest conflict to take place under the auspices of mass industrialization. As the American Civil War demonstrated, the introduction of new arms technology not only changed tactics, but also placed an increasing weight upon the industrial resources of a nation. It was in pre-W.W.I conflicts such as the Franco-Prussian War and the American Civil War where the technology of mobility became a serious strategic concern along with armaments. While limited in initial use, the railway proved to be the single most important factor leading to the expansion of conflict until the emergence of the airplane and aircraft carrier.

In addition, the policy of conscription was to take hold with a vengeance in post-Napoleonic Europe and by the turn of the century all major armies were conscript based. This ensured that they had a substantial foundation of trained professionals from which to draw on and to train new conscripts. What unconsciously occurred in the process of mass conscription was the binding of military service with individual liberty; an idea initially developed during the French Revolutionary Wars which increasingly gained substance during the decades preceding W.W.I.

⁴Keegan, John. The Second World War. Viking Penguin, New York. 1989. p.12

It meant that the relationship of warfare/military organizations to society became more complex and intense as it “bound” the individual citizen soldier to the state. As such the status of the military organizations in pre-W.W.I society and the influence of military elites on political leaders grew in unison with the expansion of military organizations. The eagerness of young men to join the war effort in W.W.I pays homage to the status of the military and to the unquestioned belief that any war would be a short decisive conflict in the strategic tradition of Napoleonic Warfare. “Men gladly went to war in August 1914 in the more urbanized parts of Europe. Almost everyone assumed fighting would last only a few weeks. In anticipation of decisive battles, martial enthusiasm bordering on madness surged through German, French and British public consciousness.”⁵

The technological developments in railways, communications and to a certain extent armaments were to allow the now substantially larger and better resourced forces to move on a scale never seen before. Yet, it was apparent that the integration of new technologies in W.W.I was anything but a seamless process. The adjustment time available to reconsider tactics and strategy in light of new technology was too short to avoid massive disruptions in the conduct of war. Armaments and artillery, especially machine guns, used in W.W.I created a real increase in the cost of human life and correspondingly in the resource demand on the state. From 1914-1918 no side in the war had a substantial technological advantage over the other and the evidence

⁵McNeill, William H.. The Pursuit of Power. p.307

seems to indicate that what was decisive in the end was the larger productive capacity of the Allied powers.⁶

In essence, W.W.I was a perfect example of the expansion of war that was precipitated by the Napoleonic revolution a hundred years earlier. In France alone between 1914 and 1918 some ten million men were to be put through the military machine, not to mention the millions of Germany, England and Russia.⁷ As Table #2 indicates the 30 years prior to W.W.I saw the number of active military personnel nearly double for all major powers. By 1918, expenditures and number of personnel had exceeded that of any other conflict, and noticeably had exceeded both by several orders of magnitude (see Table #3).

Table #2: Military and Naval Personnel of the Powers, 1880-1914⁸

	<i>1880</i>	<i>1890</i>	<i>1900</i>	<i>1910</i>	<i>1914</i>
<i>Russia</i>	791000	677000	1162000	1285000	1352000
<i>France</i>	543000	542000	715000	769000	910000
<i>Germany</i>	426000	504000	524000	694000	891000
<i>Britain</i>	367000	420000	624000	571000	532000
<i>Austria-Hungary</i>	246000	346000	385000	425000	444000
<i>Italy</i>	216000	284000	255000	322000	345000
<i>Japan</i>	71000	84000	234000	271000	306000
<i>United States</i>	34000	39000	96000	127000	164000

⁵Kennedy. pp. 273-274

⁷Keegan. p.24. For an extensive study of the demographics of World War I see William McNeill - The Pursuit of Power.

Table #3: War Expenditure and Total Mobilized Forces, 1914-1919⁹

	War Expenditure at 1913 Prices (billions of dollars)	Total Mobilized Forces (millions)
British Empire	23	9.5
France	9.3	8.2
Russia	5.4	13
Italy	3.2	5.6
United States	17.1	3.8
Other Allies	-0.3	2.6
Total Allies	<u>57.7</u>	<u>40.7</u>
Germany	19.9	13.25
Austria-Hungary	4.7	9
Bulgaria, Turkey	0.1	2.85
Total Central Powers	<u>24.7</u>	<u>25.1</u>

The Napoleonic experience also left a heritage in strategy that was to prove ultimately disastrous for all sides in the conflict; a strategy commonly known as the 'Ideology of the Offensive'.¹⁰ Most military historians blame military leaders in W.W.I with failure to understand fully the fact that the new technologies significantly favoured the defense over the offense and is seen as the root cause of the stalemate of W. W. I.¹¹ In general, political and military planners had a certain obedience to a 'Schlieffen Plan' mentality, that rested upon quick decisive offensive action. Under the changed grand strategic environment of W.W.I, the search for the elusive 'breakthrough' that was so beneficial to Napoleon eroded the strategic flexibility of the military

⁸Kennedy. p.203

⁹ Ibid. p.274

¹⁰Van Evera, Stephen. "The Cult of the Offensive and the Origins of the First World War" in Military Strategy and the Origins of the First World War. eds. Steven E. Miller, Sean M. Lynn-Jones and Stephen Van Evera. Princeton University Press, Princeton. 1991. pp.59-108

¹¹Shimshoni, Jonathan. "Technology, Military Advantage and World War I" in Military Strategy and the Origins of the First World War. eds. Steven Miller, Sean Lynn-Jones and Stephen Van Evera. Princeton University Press, Princeton. 1991. pp.134-136

to respond to a technologically altered environment. In sum, the W.W. I. era saw the initial stages of the expansion of the state's capacity to prosecute war, the increased industrial capacity to better arm and supply men, and the growing ability to transport men. The problem which arose is that there was no shift in strategic thinking to deal with these changes. In other words, it did not contain a revolutionary change in either conceptions of war or military organization.

While many countries exuded a deep and widespread reaction against militarism in the inter-war years, this was by no means universal. There were many who emerged from the stable world of the military to one of chaos, defeat, and revolution. Although civil strife had seemed imminent in Europe before WWI, the disillusion after 1918 was exceedingly profound and led many, especially former military personnel, towards radical political views. Nationalist organizations began to appear with increasingly militant political ideologies. For many militaristic nationalist organizations, warfare was seen as an active instrument of policy and in many cases a means of self-justification. The ideas that spawned the pre-war nationalism in Europe were not altogether removed from the French Revolutionary ideals which energized the conscripts of Napoleon's Armies. However, the militaristic nationalism of post-war Europe was entirely opposite to those ideals and was founded on obedience, dominance and often racial supremacy, while simultaneously being much more radical and fervent.

This outburst of militarism, which took various forms under banners such as fascism and communism, was one of the essential catalysts of the Systems Revolution. It created a mind set and political environment amenable to radical change. The mind set that accompanied these beliefs made them particularly open to new technologies; technologies which focussed on

small specialized groups, i.e. airmen, tank crews, storm troops.¹² The technology that emerged in the post-war years was easily accepted and quickly integrated into the regimes of this nature. Hitler and Guderian stand out as examples of leaders driven towards technology by their ideology.

As was true with the Napoleonic Revolution in warfare, the Systems Revolution would be accompanied by political upheaval in Germany and to some extent in Italy and Japan. Not only did the incorporation of new technologies redefine warfare, but the incorporation of new ideologies would redefine grand strategy and the ultimate goals of warfare. The reshaping of war began in the last years of W.W. I when Ludendorff and Hindenburg took over the Supreme Command of the German General Staff.¹³ The Command altered the basic function of warfare within Germany by raising it to a new level of total war where the focus was two fold; one, to maximize the use and effectiveness of weapons, and two, to harness the social dynamics of the nation for the war effort. The former was primarily an operational concern and the latter was a grand strategy one. The end of W.W.I saw the loss of the 'military art' in favour of an effort to rationalize war as industry would rationalize production, with the focus becoming the optimal use of weapons instead of the specific principles of strategy. As Michael Geyer notes, "**Material** won out over **Geist** as the contemporary debate put it - or more precisely: technical and instrumental rationality replaced the remnants of a holistic approach to the conduct of war."¹⁴ What Ludendorff

¹²ibid. P.120

¹³Geyer, Michael. "German Strategy in the Age of Machine Warfare", 1914-1945 in Makers of Modern Strategy: From Machiavelli to the Nuclear Age , Peter Paret ed. Princeton University Press, Princeton. 1989. P. 542

¹⁴ibid. p. 541

and Hindenburg had started at the end of the war was to remain undeveloped during the inter-war years in both Germany and the allied nations until Hitler began to reinvigorate Germany under National Socialism.

The revolution that was sparked by developments in W.W.I was not realized until the National Socialists took power. Hitler was aggressive in his technological outlook and heavily influenced by the leading German military 'technocrats', such as Major [later General] Heinz Guderian and General Oswald Lutz in the *Wehrmacht*, General Walther Wever in the *Luftwaffe*, and on a smaller scale by Admiral Raeder in the *Navy*. The desire to match his vision of conquest with military capability was met by predictions and examples displayed by the forward thinking German generals who emphasized above all else technological might. In terms of political and monetary resource allocation, Hitler was a major force in the creation of Panzer and Luftwaffe divisions.¹⁵ The synthesis of military technocrats and National Socialist ideology created a powerful catalyst in determining the new directions of war. In this vein, the dynamic of Nazi ideology in Germany was crucial in pushing the strategic and technological limits of warfare and in pushing the boundaries of politics in the international arena. In the same fashion in which the nuclear revolution and the Napoleonic revolution were heralded by crisis, so to did the build up of arms across Europe and the eruption of conflict in 1939 herald the latest revolution.

The other great powers of the time (France, Britain, Italy, Russia, U.S., and Japan) were not removed from the Systems Revolution, although the core of revolutionary activity on

¹⁴Addington, Larry. The Patterns of War Since the Eighteenth Century. 2nd Edition. Indiana University Press, Bloomington. 1994 pp.179-180, 196; Van Creveld, Martin. Technology and War: From 2000 B.C. to the Present. The Free Press, New York, 1991. p.76

land occurred in Germany. The British and French in the 1920s had far greater mechanized forces and had been in the process of restructuring their militaries during these early stages.¹⁶ However, the financial constraints of the depression years and the stalwart refusal of top military and political leaders to accept the new technology and organizational patterns necessary to use the new weapons had created, by the 1930s, a military disadvantage. They also suffered from a common modern technological phenomenon of modernization; that is, they modernized too early and were quickly burdened with outdated equipment.¹⁷ The late introduction of the Americans into the war effort and their previous isolationism ensured that when they began to produce they were at the forefront of emerging technologies. This was particularly evident in the Battle for the Pacific. Naturally, it was in this arena where the new technologies of naval war revolutionized conflict under American and Japanese influence. The nature of technology would also ensure that any technological advantage enjoyed by one side would eventually dissipate given enough time. As such the revolution could not be contained to either Germany or the U.S. during or after W.W.II.

Technology and Systems

While the sociological changes of Nazi Germany were a crucial catalyst in the development of the revolution, it was technology that provided the essential components of change. By the turn of the century new technologies had already proved their worth convincingly in previous conflicts. In particular, the 1870 Franco-Prussian War was essential in ensuring the

¹⁶ See Kennedy. pp. 310-320 for more detail

¹⁷McNeill. pp. 356-357; Van Creveld pp.224-232.

supremacy of railways as a primary tool of war.¹⁸ What Van Creveld argues, however, is that it was not so much the superiority of technology that ensured the Prussian victory, since the French had better rails and numerically greater rolling stock. Rather, the Prussians were so much better in utilizing the railway and telegraph and in their organization that they literally won the conflict before it began.¹⁹ The emphasis on management of railways and communications as the key organizational element of the Franco-Prussian War would foreshadow one of the main elements of the Systems Revolution: organizational/management reconstruction and innovation on a world wide scale. Nevertheless, the Prussians had many untoward experiences with rail before the Franco-Prussian War and trial and error provided the necessary learning element.

Railways played a significant role only insofar as they could be coordinated with an ever growing logistical infrastructure of men and raw materials. During W.W.I it was apparent that technology had turned war into a question of economic considerations and industrial mobilization and from technology begot technological innovation. In this fashion the widespread use of rail transformed the telegraph. From the very first instance the electric telegraph was used; all countries applying this technology used it to coordinate the railways. It later developed that no commander in the field could be far away from a telegraph in case of surprise attack, or for messages from the home base. Before W.W.II and the technological addition of the two-way radio by the Germans, the telegraph supplied an elementary level of intra-connectedness among military

¹⁸Van Creveld, Technology and War, p.159

¹⁹ibid.

organizations. It was under the auspices of this new technology and a multiplicity of other recent innovations that war would be forever changed.

Although railways were to allow a great increase in the ability of the state to move men to the front lines, movement from the rail head to the trenches themselves was still reliant on muscle power and horse drawn carriage. This would naturally set a ceiling on the complexity and size of operations that any army could carry out.²⁰ It was in W.W.II with the introduction of the gasoline powered engine that all existing notions of troop movement were radically reformed.²¹ It is important to note the significance of the automobile to the Nationalist Socialist Party, and Hitler in particular, as being much more than merely a technology, but a symbol of the success of Nazism. The Volkswagen and the Autobahn were showpieces of the Third Reich.²² Beyond the symbolic value, the motorized army transformed tactical warfare in a fashion similar to the introduction of Napoleonic columns in the 19th century. Motorization consisted of a variety of instruments, with the most visible being the offensive arm of the Wehrmacht: the Panzers, personnel carriers, armoured vehicles and the like. Second, motorization also consisted of the logistical support and supply vehicle, the truck, which proved to be invaluable in the continuous restocking of parts, fuel, and ammunition. While the Panzers were accredited with being the

²⁰McNeill. p.335

¹⁹Albeit that gasoline powered engines were transforming war permanently, during their introduction in W.W.II it was only a small percentage of forces that were motorized. Indeed, the large part of the *Wehrmacht* were unmotorized or semi-motorized. However, in operational terms this small percentage had a crucial role in increasing depth and distance of penetration.

²²Van Creveld, Martin. Supplying War. Cambridge University Press, Cambridge, 1977. p.142

symbol of Blitzkrieg, it was the supply of these divisions at unprecedented levels that would eventually determine the depth of operational action. However, while limited motorized supply was ample in the early stages of the war, near the end of the conflict when the German military and state were overstretched, insufficient supply was a significant factor in the failure of the war effort.

Blitzkrieg, as a method of warfare, and the revolutionary use of armoured vehicles in W.W.II, deserves careful examination, because it is indicative of the nature of the revolution. At the beginning of W.W.II, it was only the Germans who had successfully created armoured divisions, had them properly organized, and had integrated them with other components of the military.²³ Tanks, armoured vehicles and the related motorized artillery were not the sole purview of the Germans. In fact, the French and British had equal or greater numbers of weapons and had experimented with them over a longer period of time.²⁴ The congeniality of Hitler to the new technology combined with a reinvigorated 'free thinking' officer corps was crucial in utilizing the new weaponry in a revolutionary manner. Additionally, it required the revolutionary implementation of secondary technology, the two way radio in each tank, which enabled a tactical advantage to be exploited. A Blitzkrieg campaign had a particular pattern, that Van Creveld summarizes;

A typical Blitzkrieg campaign opened with a devastating blow against the enemy's airfields, aimed at gaining superiority in the air. Simultaneously, troops would be brought in by transport aircraft, or glider, or dropped by parachute in order to seize objectives in the enemy's rear and hold them

²¹Many of the forward thinking German military officers, especially Guderian, obtained substantial portions of their ideas from French, British and Italian military visionaries who in the 1920s and early 1930s were at the forefront of military planning. Colonel Charles De Gaulle in particular was well read, but so to was British Captain B. H. Liddell Hart and British General J. F. C. Fuller.

²²Van Creveld. Technology and War. p.178

until ground forces arrived. On land, heavy attacks by massed artillery and infantry would tear open the front at selected points, or else the attacks would be launched by the armour itself. Once a gap had been opened the armoured divisions would pour through. Still preceded by the air force acting as flying artillery and also in the interdiction role,... the armoured divisions would take the line of least resistance much as water flows down a slope.²⁵

The purpose was to move with speed to cut off segments of enemy forces in the rear and to demoralize the army so as to create panic and defeat. These tactics are not so dissimilar to that of Napoleon at Austerlitz, but the addition of motorized infantry, supply columns, and two way radios allowed the infantry and the armoured divisions to proceed with unmatched speed to the rear of enemy lines, be constantly re-supplied (at least initially re-supplied), and remain in constant communication with command. The revolutionary use of tanks, mobile artillery units, and motorized infantry allowed for the brief domination of Blitzkrieg warfare on the battle field until Germany could no longer keep pace with the total war it had created. Regardless as to why Blitzkrieg would eventually fail, despite its successes in the Polish Campaign, the French Campaign and the Summer and Spring Offensives of 1941 and 1942 respectively in Russia, the style of warfare that emerged by this point was to transform war.

The core of the new style of warfare, according to John Keegan, was a combination of revolutionary offensive weapons, the warrior ethos, and Hitler's Clausewitzian philosophy of integrating political ends with military means.²⁶ Although the weapons of the Wehrmacht were undoubtedly revolutionary to the arms industry, they were only a component of the Systems Revolution, albeit a necessary one. The warrior ethos argument underestimates the quality of the

²⁵ibid p.179

²⁶Keegan, John. A History of Warfare. Vintage Books Canada Ltd., Toronto. 1993.

German General Staff, the skill of W.W.I veteran officers, the new officers fear of failure and willingness to take risks, and Hitler's influence in determining the direction of all three components. The warrior ethos was a propaganda tool of Nazism for the general public, but the officers of the Wehrmacht and Luftwaffe were suffused with the humiliation of W.W.I, an emerging pan-European militancy, a Führer-encouraged commitment to technology and perhaps above all else the fear of military failure. Inasmuch as Hitler was a Clausewitzian by nature, it is probable to assume that the ingenuity and daring associated with the Third Reich's high command is largely attributable to Hitler's belief in his own destiny and the dynamic this unleashed in the officer corps, than of any conscious marriage of politics to the military.²⁷ Indeed, it is likely that, as Hitler, Napoleon did not see a distinction between politics and war. War was not only a tool of politics as Clausewitzian principles suggest but an integral part of it. War was not the last resort of politics as Clausewitz suggests but war became the principal method of politics in the international arena. It is this blurring of political/military lines that leads to one of the basic characters of the Systems Revolution; a new total warfare greater than even W.W.I.

As the nomenclature indicates, a Systems Revolution is about the violent metamorphosis of traditional 'piecemeal' warfare based on component parts being integrated in a style of warfare that produced a unified exponentially more powerful form of armed conflict. As such, the land warfare prosecuted by Germany is crucial to the instigation of the revolution and

p.372

²⁷Earle, Edward Meade. "Hitler: The Nazi Concept of War" in Makers of Modern Strategy: Military Thought from Machiavelli to Hitler, Edward Meade Earl ed.. Princeton University Press, Princeton. 1966. p.504-506

the Panzers, railways, trucks, telegraph, two-way radios, and mobile artillery transformed land based conflict. Nonetheless, it was in the expansion of the battlefield through air warfare and sea warfare that the revolution was to be realized in its totality.

Expansion of the Battlefield in the Air

... no longer can the battlefield be limited to the actual combatants. On the contrary, the battlefield will be limited only by the boundaries of the nations at war, and all of their citizens will become combatants, since all will be exposed to the aerial offensives of the enemy. There will be no distinction any longer between soldiers and civilians. The defences on land and sea will no longer serve to protect the country behind them.²⁸

In Giulio Douhet's prophetic statement, he recognized that air power was to forever change the face of conflict, even before the ability to conduct war in such a fashion existed. However, he failed to realize that the incessant progress of technology would assure that defensive systems would eventually hold air-power in check as merely a dominant arm of the military, not the weapon which would negate all other types of warfare. Douhet's projection that all citizens would become combatants did not become reality for quite some time, until roughly the end of W.W.II, and it was only when the full weight of the American Army Air Corp and the British RAF had finally achieved air superiority did bombing arguably have the impact on the enemy homeland that the prophets of air power had foretold. The assumptions made by air power theorists and proponents of air power before W.W.II proved to be, if not false, at least greatly over-stated. The development of radar-interception, anti-aircraft batteries and eventually fighter interceptors

²⁸Douhet, Giulio. The Command of the Air. Coward-McCann, Inc., New York. 1942.
p.10

ensured that daylight bomber attacks could be executed only with a very high, and, for the RAF, unacceptable price.²⁹

The first significant application of strategic bombing occurred over Germany at the later stages of W.W.II by the allied forces. To a lesser degree, London was also a testing ground of strategic bombing attacks by the German Luftwaffe in 1940-41. While the Luftwaffe had some success in the early years of the war in causing panic, the air campaigns did not break the spirit of the enemy as predicted. The allied attacks were of a much more substantial size and yet the evidence shows that they fell significantly short of predictions. Even when the technology finally presented itself, with long-range fighter escorts and night-site bombing capabilities, and much damage was inflicted in Germany, the German people still carried on in obedience to the government, and notably economic production was not considerably affected. Table 4 below is a good indicator of the continued ability to produce in Germany and also shows the disproportionate productive capacity the Allies.

²⁹Howard, Michael. War In European History. Oxford University Press, London. 1976.
p.130

Table #4: Aircraft Production of the Powers, 1939-1945³⁰

	1939	1940	1941	1942	1943	1944	1945
<i>United States</i>	5856	12804	26277	47836	85898	96318	49761
<i>USSR</i>	10382	10565	15735	25436	34900	40300	20900
<i>Britain</i>	7940	15049	20094	23672	26263	26461	12070
<i>British Commonwealth</i>	250	1100	2600	4575	4700	4575	2075
<i>TOTAL ALLIES</i>	<u>24178</u>	<u>39518</u>	<u>64706</u>	<u>101519</u>	<u>151761</u>	<u>167654</u>	<u>84806</u>
<i>Germany</i>	8295	10247	11776	15409	24807	39807	7540
<i>Japan</i>	4467	4768	5088	8861	16693	28180	11066
<i>Italy</i>	1800	1800	2400	2400	1600	-	-
<i>TOTAL AXIS</i>	<u>14652</u>	<u>16815</u>	<u>19264</u>	<u>26670</u>	<u>43100</u>	<u>67987</u>	<u>18606</u>

Strategic bombing was not entirely useless and anyone seeing the destruction in post-war Germany and Japan would be quick to agree that strategic bombing was an additional and powerful offensive arm of the military. The sheer numbers required to make strategic bombing effective and the vast mechanical and logistical infrastructure required to run this new service forced the creation of systems around which all the above could be coordinated. The development of radar technology in 1939 which gave speed, distance and eventually exact location required the setting up of a central planning rooms where the information could be passed and decisions made by teams of experts.³¹ In order to exploit the potential of radar, it had to be integrated with all other systems, including air fleets and their own specialized ground control radar, and other distant radar stations.³² The whole effect of air war in this realm was to develop systems of increasing complexity which only tended to multiply as other specialized aircraft, beyond the bomber, came into use.

³⁰League of Nations. World Economic Survey. Geneva, 1945, Table III. Cited in Kennedy, Paul. The Rise and Fall of the Great Powers. Random House, New York. 1987 p.299

³¹Van Creveld. Technology and War. p.192

³²ibid.

The revolutionary impact of the aircraft was not limited to strategic bombing. In the first instance, air power was used effectively in coordination with the Blitzkrieg of the Panzers and motorized units. The Luftwaffe was the first to see the potential of aircraft in tactical and operational roles and perfected air-to-ground cooperation.³³ The advantage in this realm of air war was not negated so much as equalled by 1942. The Allies demonstrated they too could master tactical close-air support as seen in the African campaigns. It was the combination of two revolutionary systems, that of the Blitzkrieg land warfare system and the close-air support and flying artillery system of the Luftwaffe that created an even more complex system than had originally been envisioned.

As the deliberate invention of new offensive and defensive technologies continued unabated during the war, the application of systems to manage and control them became necessarily more complex.³⁴ Air warfare had additional, if unwelcome, effects on the civilian populations of countries and the future of warfare. As Douhet had theorized, air power had the potential of making the civilian a 'soldier'. Although Douhet over dramatized this aspect of air war, to a degree he was correct. There is an important distinction between the civilian as a collateral target and the actual target. Initially, it was believed by Hitler and those in the West alike that air power could demoralize a population so as to cease active support of the government. By the end of the war, it was clear that this did not occur and that the principle contribution of air power in

³³The fact that the Luftwaffe was so successful has a lot to do with the fact that its officer corps was drawn substantially from ex-Wermacht officers.

³⁴As Van Creveld points out "To beat one technological system, it is necessary to direct against it another either much more powerful or much more flexible. "Technology and War.

bringing Germany to its knees were attacks on railroads crippling the transportation capacity of the nation, and the drain on resources from the land war to air defence of Germany itself. The crisis of the Systems Revolution in Europe, W.W.II, would be decided by the attack of one technological system against another.

The full realization of strategic bombing and air power had the revolutionary effect of expanding the battlefield beyond the normal two-dimensional battlefield common in Napoleonic times and W.W.I to a third dimension. Although airplanes were used in W.W.I, the technological sophistication of the planes and the nature of military strategy at the time only permitted them to be used in scouting or very light attack roles. This does not approach the quantity, or quality necessary to be effective as was evident twenty years later. In W.W.II airplanes could bypass traditional restrictions on the mobility of ground forces and directly threaten the long supply 'tails' without which armoured and motorized columns could not exist. It then became a question of whether to attack the home front directly, a part of the home front, the civilian population, the military infrastructure, the industrial capability or symbols of national pride.³⁵ The realization that the economic management of the war economy stood as the greatest obstacle to the submission of the state determined that all components of national industry were valuable targets in air combat. As the speed and flexibility of the German Panzer divisions were to expand war beyond the front lines to threaten the rear of the enemy, air power was to expand simultaneously war into the economy: the heart of the war machine in the twentieth century.

p.195

³⁵Howard. War in European History. p. 128-129

War became more total in this era than had ever been possible before and the continuous threat by air power was to contribute to a conflict more profound and more absolute. Not only was the military at risk, so too was the entire belief system and physical survival of every individual threatened, and to which there was no compromise. In this vein, the introduction of air power had expanded warfare into a new battlefield in the air, as well as substantially increasing the lethality of armed conflict, destroying previous notions of strategy and opening up a Pandora's box of moral issues regarding warfare.

Expansion of Warfare on the Seas

The importance of navies and ocean based warfare had grown dramatically since Europe had colonized both the Far East and the Americas from the 1500's onwards. During the industrial revolution, naval warfare and shipping underwent a fairly substantial change with the introduction of coal-based steam engines and the final abandonment of rigging, mast and sail. By W.W.I the petroleum based engine was beginning to replace coal, because of its ability to give increased distance and power. The British, being the first to make the switch over en masse, discovered that they were in fact sacrificing grand strategic flexibility, due to the high cost of petroleum, for tactical flexibility.

The cost of naval warfare lent a significant weight to the expansion of managed war economies that are a principal characteristic of the Systems Revolution. However, W.W.I vindicated the cost of oil burning ships and the new technologies of submarine warfare that had moved from merely a coastal protection system to a new offensive technology. While W.W.I was

in many cases strategically still a traditional sea conflict, by the end of the war there was a growing understanding that the constant introduction of new technologies was changing strategy.³⁶ Traditional naval strategy was similar to that of Jomini with his focus on the decisive battle and lines of “communication”. Although W.W.I was focused more on the sheer firepower of the battleship than on mobility and flexibility, the inter-war years would signify a revolution in naval warfare that matched that of land and air warfare.

The revolution on sea was based around two developments leading to the overall systematization of navies and the extension of military power. The first was the introduction of the aircraft carrier and the second consisted of the widespread use of new communications technologies. The battle of the Pacific is the most telling showcase of the power of aircraft carrier technology. On the opposite side of the war, it was the widespread development of submarine warfare in the Atlantic with its related technological innovations that focused the communications revolution and the remaking of naval strategy. A contemporary American military writer noted, when speaking of the future of military change that; “Military-technical revolutions are well documented in history. Two examples can be drawn from W.W.II: ..., U.S. operations in the Pacific using aircraft carriers and amphibious landings.”³⁷ While aircraft carriers were undoubtedly new technological developments in the remaking of sea warfare, the changes that occurred in the Atlantic were in large part due to new tactical developments and organizational capability.

³⁶Crowl, Philip A.. “Alfred Thayer Mahan: The Naval Historian” in Makers of Modern Strategy: From Machiavelli to the Nuclear Age, Peter Paret ed.. Princeton University Press, Princeton. 1986. p.472-475

³⁷Gouré, Dan. “Is There a Military-Technical Revolution in America’s Future?” in The Washington Quarterly Volume 16, #4 p.175

Although the above author accurately highlights amphibious landings as being significant in W.W.II, there was in fact very little new technology being employed for sea borne invasions in W.W.II as compared to W.W.I.³⁸ Notably, there were only slight improvements in technology, such as the highly-maneuverable flat-bottomed boat for troop and equipment transport. However, it was the coordination of naval based air fleets with the landing force that allowed disruption of the enemy defences behind the beach front.³⁹ “When the counteroffensive through the central Pacific began in late 1943, the two powerful American battle fleets covering the Gilberts invasion were themselves protected by four fast-carrier task forces (twelve carriers) with overwhelming control of the air.”⁴⁰ Adding the air component and increased communication ability laid the foundation for sea borne invasions of an unprecedented scale. The addition of air-power to naval warfare was essential to the remaking of sea borne invasions and while the Americans would perfect this to a fine art by 1945, it was aircraft carriers that would revolutionize naval warfare.

The introduction of the first aircraft carrier, a converted cruiser, was completed in 1921 at the behest of the Royal Navy. Its initial introduction into the world of battleships was a result of political limitations on the size of battleships and their weaponry.⁴¹ Although being fairly

³⁸The innovations that sparked the successful widespread use of amphibious assault occurred in the area of doctrine. The Japanese and Americans made significant advances just prior to W.W.II. The Americans especially remade marine doctrine with the *Tentative Manual for Landing Operations*, which prepared the Corps during the inter-war years, but more specifically integrated its component parts and the Corps in general into the larger military apparatus. See Addington, p.184.

³⁹Van Creveld. Technology and War. p.215

⁴⁰Kennedy. p.348

⁴¹Addington. pp.173-175. The Washington Naval Treaty of 1922 limited both individual

unstable and defenceless at the outset, by the late 1930's they were lethal weapons in the hands of the right organizations. Radar and its resultant growth of technological infrastructure on land, was repeated at sea as navies began to realize their utility for target acquisition, range finding and fire control. During W.W.II some traditional battleship duels did take place but, by and large, it became apparent by 1941 that aircraft carriers had changed naval warfare and naval strategy irrevocably. The dramatic decrease of ship-to-ship duels belying the first effects of air-power at sea was due largely to the fact that aircraft reconnaissance spotted and engaged naval groups and ships long before ship born radars could. This effectively took the control of the battle away from the visual sight of the commander/admiral where it had been for centuries and demanded the development of sophisticated communication technologies. Aircraft guaranteed the rethinking of traditional naval strategy and in turn determined that sea warfare would be able to project power far beyond the traditional scope of navies.

It was two powers extraneous to the struggle for continental Europe, Japan and the United States, that helped push the expansion of naval war beyond all previous limits, in terms of geography and in the remaking of strategy. The United States used carrier based aircraft to expand into the 'Southern Resources Area' held by Japan at a pace unseen in naval warfare, and although Japan had tactical success in the first six months after Pearl Harbour, their strategy of defence failed to assess America's industrial power and well-defined military and strategic infrastructure.⁴²

battleship size and overall displacement levels for entire navies.

⁴²Clayton James, D.. "American and Japanese Strategies in the Pacific War" in The Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton. 1986. p. 707

Yamamoto, the leading Japanese naval strategist, had warned that the fleet Japan had assembled in the Pacific could run wild for six months to a year before American oil supplies and industrial output would cap their ability to move.⁴³ This combined with successful American naval operations against Japan's shipping routes ensured eventual military-industrial domination by the U.S. during the conflict. While overall American material supply was crucial to winning the War of the Pacific, it was the production of some 21 aircraft carriers by 1942 and the ability of the American military organization to extend their power through sea-based aircraft that would ensure Japan's defeat. Regardless of the use of atomic weapons on Japan, the war had in all strategic senses been won by aircraft carriers and amphibious assault.

The battle for the Pacific was a conflict of such size and complexity, that it forced the reorganization of the military into complex systems for the control, maintenance and supply of aircraft carriers and accompanying fleets. The battle for ocean supremacy in the Atlantic was to parallel these trends towards systemization, as new technologies required greater infrastructure and logistical support. By 1939 it was apparent that a dominant weapon in the future of naval warfare in the Atlantic was the U-boat/submarine: developed and widely used as a coastal weapon by all competing sides in WW I. Although initially a coastal 'wait for the enemy' weapon, the submarine revolutionized naval warfare, not due to a technological innovation, but to a tactical innovation. In the same manner that the flexibility and manoeuvrability of Panzers and close-air support redefined land warfare, it was the release of German submarines from their coastal confines, utilizing their stealth and manoeuvrability, which made them a debilitating weapon. The

⁴³Keegan. A History of Warfare. p.375

increase in distance, the remaking of tactics in W.W.II allowed for the submarine to become part of the strategic core of the navy which had not been the case in W.W.I. Locating convoys and radio-communication with headquarters allowed a so-called “wolf-pack” to assemble and attack. This remade naval strategy and even revised the convoy tactic of previous centuries. The notion that Germany, a traditional continental power, could threaten trade routes in the Gulf of St. Lawrence goes far in exposing the leap in the expansion of the battlefield and warfare during the Systems Revolution. In sum, the expansion of warfare in the air was matched with the expansion of war underwater in a new lethal and coordinated fashion. As with the aircraft carrier, the submarine remained a pivotal instrument of a state’s naval power and contributed to the expansion of spheres of influence in the post-war decades.

The Systems Revolution

The introduction of the conscription of men and resources by France in the Revolutionary Wars was to herald the outbreak of armed conflict that involved the whole of society, and that, by 1945, would not only involve soldiers, but industrial workers, and the whole of civilian society and their economies. However, as with the development of air-war, the need for the participation of the of large groups of soldiers in each area of war was being replaced by specialization and the turn towards elite units. The Systems Revolution forced the application of small highly specialized and integrated groups of professionals; air-craft crews, submarine crews, anti-submarine crews, and the like, to war. As Michael Howard notes war was becoming a contest of small groups of fighting professionals, manning complex vessels and increasingly dependent on “the ingenuity of those even smaller groups of scientists, technologists, and cryptographers

responsible for developing their weapons and communications systems.”⁴⁴ The development of complex systems required for the management of sea warfare was not an isolated incident. It was buoyed by radical developments in communications technologies. Land-based warfare was integrating at a similar speed, and naturally the infantile art of air warfare provides a dramatic example of the global nature of the Systems Revolution. Michael Howard goes on to say: “An identical pattern of conflict between small groups of highly trained fighting men manipulating complex weapons systems, of competing technologists, and of commanders exercising control at very long distance, was to emerge with the development of war in the air.”⁴⁵ The introduction of revolutionary technologies in land, air and sea warfare, combined with tactical innovation in the field and organizational restructuring at home, focussed the energies of W.W.II societies, their economies and technological innovators leading to a Kuhnian-esque revolutionary crisis and eventual shift in the normal pattern of warfare.

The conscious abandonment of most if not all restraints was paralleled by the wider war aims adopted by the belligerents in total war. Limited dynastic aims had given way to sweeping territorial aggrandisement and the total destruction of states and people.⁴⁶

Traditionally, war had been limited by the immediate financial, natural and demographic resources of a nation, but developments in the inter-war period and the additions of the Systems Revolution pushed warfare beyond all known boundaries. Warfare on land, sea and in the air was transformed by new technologies: the bulk of which greatly increased mobility and

⁴⁴Howard. War in European History. p.127

⁴⁵ibid.

⁴⁶Becket, Ian. “Total War”, from Warfare in the Twentieth Century: Theory and Practice, ed. Colin McInnes and G.D. Sheffield (Unwin Hyman, 1988) in War, ed. Lawrence

firepower. The combined effect was to allow for the inclusion of a greater part of the civil population both as a necessary addendum to the war industry of a nation, but also as the prime target of 'moral' wars, especially in the strategic bombing campaigns. The civilian population was also targeted in a different way, for not only was warfare systematized, but so too was genocide and the wholesale destruction of peoples and nations. As such, the first and perhaps most emotionally enduring aspect of the Systems Revolution hints at the greater consequence of this transformation: the overall expansion of warfare.

Each area of warfare contributed to its overall expansion in lethality, scope, economic and human cost, and in the dramatic extension of military operations on an unprecedented global scale. Under the auspices of air power, warfare was expanded into an altogether new territory which greatly increased the potential of war and destroyed previous notions of the invulnerability of the homefront. Similarly, close-air support and motorized land warfare increased the speed and depth of land based assaults, while radically altering the potential geographic spread of land warfare in a relatively compressed time frame. The introduction of the aircraft carrier and the submarine forever changed sea warfare by questioning all previous notions of strategy and by allowing a great increase in the ability of the nation to project power far from the homefront. By the end of W.W.II, warfare had broken out of the continental confines, which had been its primary characteristic since the Napoleonic era. Under these catalysts the way society viewed the purpose of war, its political utility, began to shift with the collapse of traditional confines of warfare.

Freedman. Oxford University Press, Oxford. 1994

All the technological developments and tactical innovations which lead to the expansion of the battlefield and of the resources necessary to conduct total war could only be sufficiently coordinated by a sub-revolution in communications. Radar, other detection and intervention devices, and the two-way radio took centre stage in leading the various innovations of the inter-war and W.W.II period towards integration. As vehicles and vessels grew in their numbers and complexity, so to did the infrastructure necessary to control them, and in time the infrastructure was manipulated in order to coordinate the different methods of warfare. Michael Howard indicated that by W.W.II the communications within the military were so essential to the outcome of warfare and so specialized a field, that it was beginning to constitute a fourth dimension in warfare.⁴⁷ The integration of the different arms of military organizations into coordinated battlefield action is a significant feature of the Systems Revolution and while first seen in the air/Panzer attacks of the German Blitzkrieg, they would become second nature to military organizations by the end of W.W.II and into the post-1945 period. The changes wrought by new methods of communication and the need for new patterns of organization exemplifies the larger changes necessitated in the structure of the institutions of war in this period. As with the Napoleonic and Nuclear Revolutions, the sociology of warfare was being transformed.

The foundations of the Systems Revolution, that is, its primary constructs, are underpinned by a rarely examined facet of the revolution. Since 1830, the pace of technological change had been steadily increasing. By 1939, this pace had reached a fevered pitch. In the era preceding the Systems Revolution, the lack of large scale technological change had in large part

⁴⁷Howard. War in European History. p.127

determined the mostly stable nature of military organization up to this period. While change was not alien to pre-20th century militaries, the characteristics of technology had been radically transformed in the inter-war period. Martin Van Creveld labels this anomaly as the 'invention of invention'. Where invention had previously been erratic and accidental, it became continuous and directed.

After W.W.I what took hold was a race for innovation in armaments. This technological competition has formed the basis of much of military policy since 1945. What sets out the period of W.W.II is that invention was no longer accidental, but directed towards the needs of the belligerent, such as in the Wermacht's purposeful attempts, including both successes and failures, in the development of the V1 and V2 rocket in the short period between 1939 and 1944. Second, is that invention stood as an almost immediate platform for further invention, as the Manhattan Project exemplified. Of course the military was not the sole, or even major contributor to the technological innovation of the inter-war period. However, military organizations possessed excellent infrastructure capabilities and a plethora of technological resources, including capital, that were central to the furtherance of inventions. As technology progressed and became institutionalized, ideas about war itself began to transform. It was not man wielding machine as before, but man managing complex individual machines and larger systems of machines. Indeed, the technology of the revolution, the technologies, theories, and doctrines were under constant transformation, which contributed significantly to the changes in military organization and views on warfare.

The changes of the inter-war period and W.W.II possessed all the required elements of a revolution in warfare. A massive increase in technological innovation, the weapons

of war and changes to tactics constitute the specific tactical/technical changes necessary for a revolution combined with radical political upheaval this innovation led to the transformation of military organizations and strategy. The reconstruction of the basic elements of strategy and tactics reveal a deeper system-wide philosophical change brought on by the expansion of conflict. Military organizations began to change rapidly during the Systems Revolution and would continue to develop under the pressure of a new sociological outlook on the nature and character of war. Long held principles of armed combat were quickly falling by the wayside as war prosecuted in the Systems Revolution fashion was realized to be both completely revolutionary and prohibitively destructive to both sides. It is unquestionable that the demands on military organizations had been altered. New training requirements, strategic innovations, massively complex weapons systems and the development of the soldier-technologist ensured that new infrastructures were needed to manage the variety and size of continually changing systems.

The final consequence of revolutionary change in the prosecution of war was a shift in the relations of war to society in many, if not all, states touched by the conflict. Since the power projection ability of the new non-European super-powers was significantly extended, the possibility of inter-continental warfare had greatly increased. As such, traditional regional conflicts and concerns became part of the geo-strategic/political interests of the international community. As post-W.W.II society demonstrated, it was a community that was becoming increasingly interconnected through the technologies born of the revolution: international air travel, international radio communication and rapid ocean travel. In the same manner in which Revolutionary France challenged the existence of the European state system from 1792-1815 under the Napoleonic Revolution in warfare, Nazi Germany again challenge the European state system

under the Systems Revolution. In 1945 the Systems Revolution, still in its infancy, was overshadowed by the umbrella of the Nuclear Revolution and while the latter dominated politics and grand strategy, it was the former which directed the methodology of warfare in the second half of the twentieth century.

CHAPTER 4

RECONSIDERING REVOLUTIONS

The use of armed force in international society and the nature of the relationship between technology and war have provoked thought and debate for over a century. Nowhere is this relationship more pronounced than in the current era of uncertainty surrounding the chaotic international environment and the important questions of military utility therein. Rapid technological change dominated by computer automation, the communications revolution, and artificial intelligence have transformed previous notions of a technological ‘ceiling’ in the conduct of war. Indeed, technology may prove to outpace traditional military institutions and the capacity of leadership to apply military force, as well as call into question the applicability of traditional strategies and tactics.

Beyond the recognition of ongoing changes to how battles are fought and supported, there are larger questions regarding the future utility of armed force and the nature of war that need to be examined. As such it is necessary to examine the Gulf War and the claims made about its revolutionary impact upon the world. At this point is clear that revolutions have five distinct and necessary components and there at least two characteristics generally associated with revolutionary change. These components are that revolutions are heralded by crisis, usually occur over a compressed period of time that approximates a generation, produce specific technical/strategic changes to the weapons of war, alter military organizational demands and

structures and ultimately alter the relationship of war to society. This forms the framework used in the following analysis. As these components are explored so too are some of the characteristics found generally to surround revolutions in warfare throughout history. First, the fact that there is usually a high degree of structural violence surrounding the institutions and professions of war.¹ Second, the relationship between the expansion of the battlefield, increased lethality and the dispersion of soldiers on the field requires study as these elements change in response to the increased pace of technological change. Technology, strategy, military organization, as well as the conduct of states during the Gulf War compose the body of analysis of this era of warfare. What remains to be discovered is whether a revolution in warfare has emerged under these perceived changes to organized armed conflict.

Warfare has expanded its area of effect exponentially since the introduction of mechanization, air power, and nuclear weapons. Professional-to-professional wars, which were the hallmark of the 18th century, slowly faded as the dominant mode of war. Increased technology called for the inclusion of the entire state in the war effort, which necessitated the transformation of the state and its resources into military targets. Technology is not a unitary actor on this front. It merely underscores (or precedes) social and political transformations. While strikingly apparent in the recent 1990-91 Gulf War conflict, claims of revolution have circulated since the Vietnam War.² Often, however, ideas of the next "revolution" in warfare have been put forward with little

¹See pp. 38, 54 above

²Van Creveld, Martin. Technology and War. Free Press, New York. 1989

or no analysis of the changing nature of conflicts and the necessary, if not forthcoming, alterations to strategy.

At the heart of change in strategy and conflict is the integration of technology in military institutions and the ability to apply technological innovations across the spectrum of activity that comprise a modern war effort. Here may lie the key to understanding the necessity of the process of technological innovation and integration: the modern military machine. The complexity of military organization, logistics, support and supply and eventual conduct of battle has increased by an order of magnitude that exceeds any seen in previous years. Labeling technology as the principal unit introducing change in the military must be tempered with the knowledge that changing trends in warfare reflect the social institutions prosecuting war.³ The ability of these social institutions to accept, incorporate and use technology to innovate in warfare determines the overall quality of the 'revolution', if it is to occur at all. It is obvious that technology does not operate in a vacuum, and yet it is equally evident that technology has been the sole catalyst of many large transformations in the conduct and understanding of war.

Many authors, including Richard Dunn III and most vocally Heidi and Alvin Toffler, believe that the next revolution is here.⁴ While these authors have successfully outlined the possibilities for a revolution, an analysis of the process of revolution is glaringly absent. In

³Rosen, Stephen Peter. "New Ways of War: Understanding Military Innovation". International Security. Summer 1988 (Vol. 13, No. 1). p.166

⁴see Richard Dunn III. From Gettysburg to the Gulf and Beyond: Coping with Revolutionary Technological Change in Land Warfare. The Institute for National Strategic Studies, Washington, D.C. 1993 and Alvin and Heidi Toffler, War and Anti-War. Little, Brown and Company, Boston. 1993

order to pursue a line of reasoning that attempts to uncover the process, an elaboration of several of the key components of the modern military establishment and the use of armed force is crucial. History provides numerous examples of the integration of radically new technology onto existing military structures with both negative and positive results.⁵ The experiences and formulation of these attempts provide a theoretical and historical backbone to an examination of future changes.

A view of historical changes in the use and adaptation of technology is significant to understanding traditional aspects of military force. The impact of technology upon the nature of war was recognized early on, as Christopher Bellamy points out: "Jomini clearly appreciated by this time that technological change could fundamentally alter the nature of warfare, and even that warfare could become so terrible that it would have to be outlawed by international agreement."⁶ In contrast, Clausewitz' interpretation of technology as a factor in warfare is extremely limited. According to Clausewitz, technology was not significant in the conduct of war because any radical development would not remain in the sole possession of the innovator.⁷ Nonetheless, due to the cost and technological infrastructure of modern weapons systems, combined with the training necessary to use them, the wholesale adoption of new technology by all nations is unlikely.

⁵Such as in the period surrounding the War of 1859, where Austrian troops had been equipped with new, breech-loading rifles, yet the French attacked in columns and easily broke the enemy lines. The problem was that the Austrians did not understand, or were not properly instructed in the aiming techniques of the new rifles and fired at extreme range, with little effect, usually over the head of the charging French infantry. See McNeill pp.244-246

⁶Bellamy, Christopher. The Evolution of Modern Land Warfare. Routledge, London. 1990 p.34

⁷Clausewitz, Von Carl. On War. Book V, Chapter 3

At the core of the new revolution lies the recent experience of the Gulf War, which has been heralded as representative of the new age of warfare. Indeed, it appears at first glance to support the predictions of war visionaries such as the Tofflers. However, as Luttwack and others have noted, the Gulf War was unique in many senses and one should guard against learning specific and/or general lessons from it.⁸ It was the situational elements of the entire war scenario, such as geography, target location, command structure and political will that made the war a special case. The flat desert terrain dominant in Kuwait and Iraq were so accommodating to the type of air and land campaign waged by the coalition forces, that it alone made the war unique and that it is unlikely a similar battle arena will present itself again. Additionally, the authoritarian command structure combined with a politically unstable environment allowed for the clear adaptation of new technologies to a form of warfare known as control warfare. American and coalition technology with an emphasis on precision strikes is particularly adept at attacking the nervous system of this type of opponent, and is effective only in as much as viable 'nervous system' targets exist. Naturally, in a guerrilla warfare scenario it is unlikely that such tactics would have any benefit at all. While the situational elements of the Gulf War were unique, what Luttwack has failed to address is the organizational, strategic and political ramifications of the integration and increased capability of several key components of warfare. It is the conjuncture of lethality, mobility, battlefield expansion, precision warfare, and information dominance that has led to the potential alteration of the nature of warfare.

⁸Luttwack, Edward. "The Gulf War in Its Purely Military Dimension" in War and Its Consequences: Lessons from the Persian Gulf Conflict. John O'Loughlin, Tom Mayer and Edward Greenburg eds. Harper Collins College Publishers, New York. 1994. p. 35

Military Revolutions

Thomas Kuhn contributed greatly to scientific understanding with his observation and clarification of the two distinct processes of change in the natural sciences. In his insightful book, The Structure of Scientific Revolutions, the first, foremost and dominant method of change in the scientific community is ‘**normal science**’.⁹ The second, more dramatic and rare form of change is ‘**revolution**’.¹⁰ While Kuhn's conception of revolution has been appropriated by many to explain change in the social sciences, they conversely fail to appreciate the conduct of normal science. In the evolution of military institutions and warfare, change is a constant. It is unusual that elements of change correspond with one another to contribute to a revolution. While the occurrence is rare, three distinct revolutions in warfare dominate modern military history. In the previous chapters a theoretical and practical foundation was built describing change and transformation in warfare. The Nuclear Revolution provided a platform for launching such an examination as it corresponds closely, almost obviously, to a Kuhnian notion of revolution. The Napoleonic Revolution in warfare adds a necessary example of a non-technologically oriented transformation, as it was the forces of societal change that dominated this era. The last chapter outlined the conditions of the Systems Revolution, a previously unrecognized transformation in warfare that radically altered the course of future conflict, even while nuclear weapons were

⁹Kuhn, Thomas. The Structure of Scientific Revolutions. 2nd Ed. University of Chicago Press, 1970. p.23

¹⁰ibid. p.49

attaining a grand strategic and political climax. Successful interpretation of future military revolutions rests on understanding the ebb and flow of historical change. As such, it is useful to restate the prominent features of the previous revolutions.

Clausewitz and Jomini stand out as the most literate and penetrating observers of the first revolution of the modern era: Napoleonic warfare. Peter Paret outlines the nature of the revolution:

The French Revolution coincided with a revolution in war that had been under way through the last decades of the monarchy. Soon the two meshed. Profound changes in military institutions and practice, some already firmly established under the Old Regime, others still tentative and experimental, were adopted by the revolution, and developed further. By infusing them with its dynamic, and linking them with its frequently violent domestic and foreign policies, the Revolution expanded the scope of these innovations.¹¹

Napoleon was blessed with a unique time frame in history where he could be both political and military leader controlling all of the states resources for the war effort and making war the prominent tool of foreign policy. In addition, the advances in Eighteenth Century warfare were capitalized upon by innovations in the technology of organization. Napoleon continued the fragmentation of the army into self-sufficient commands, but with much stricter central control. Coupled with the dynamic of the revolutionary spirit and Napoleon's own personality, the resources of France in Napoleon's service proved for a time to be ultimately superior to any in Europe.¹² The combination of Napoleon's strategic

¹¹Paret, Peter. "Napoleon and the Revolution in War" in Peter Paret ed., Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton, New Jersey. 1986. p.124

¹²At least that the was the case until the Russian campaigns.

boldness, greatly enhanced organization and planning capability, perfection of technological trends and the complete resources of a revolutionary France created the revolution in warfare. As the French Revolution was to forever transform politics, so too did the Revolutionary and Napoleonic Wars alter the basic character of war, in both conduct and impact.

It was not until W.W.II that the course of war was altered from that set during the age of Napoleonic warfare. Again, the intersection of separate developments in various fields (sometimes completely unrelated to the prosecution of war) linked together to complete a transformation that may have only now reached its apex. Two separate revolutions in communications technology and in weapons technology catapulted warfare from beyond its traditional parameters and stressed the limits of traditional strategy. At the heart of the communications revolution was the electric telegraph and two-way radio which gave instantaneous communication between commanders in the field and kept them in direct contact with political leaders at the home base.¹³ The effect of this was two-fold, to increase the ability to control and efficiently coordinate a larger military machine both tactically and strategically over a larger surface area; and to bring the peoples of Europe into a closer relationship with the military, that was necessary in light of the continually increasing demands on the states' resources. Although the electric telegraph had existed before the two world wars, it was not put to such widespread tactical and strategic use. The introduction of the two-way radio not only allowed for tactical innovation, but continued the coordination of newer technologies, essential to the remaking of strategy.

¹³Howard, Michael. War in European History. Oxford University Press, London. 1976. pp. 98-99

By the turn of the 19th century, advancements in weaponry, especially rifles and artillery, constituted the next great technological transformation of warfare. While the Prussian breech-loader and French steam engine innovations highlight this era of fluctuation in warfare, other developments in railroads and the emergence of semi-autonomous mass production contributed to the overall creation of a new system of warfare. The emergence of these technological innovations occurred over a wide span of time from the middle 19th century to the beginning of W.W.I, when mechanization rapidly expanded to include huge changes in mobility with the early tank and airplane.

As technology began an ever rapid upward spiral in complexity, similarly momentous innovations were occurring in Prussia. Michael Howard sums up the essence of this change, "This [the Prussian] General Staff was perhaps the great military innovation of the 19th century."¹⁴ Organization was the pillar of Napoleon's success in using the mass armies of the Revolution and it was to be the key to grafting the rapid technological changes onto existing military structures in Prussia. The problems inherent in supplying and deploying large diverse forces had long made necessary the expansion of military staffs, not including the multitude of difficulties associated with the introduction and speed of railways. Scharnhorst and Gneisenau had initiated a prototype of the General Staff structure in the early 19th century, but it was not until Moltke took control that the general staff became a highly centralized, elite, and intellectually vigorous organization.¹⁵ As such, this organizational development coincided with the culmination

¹⁴op. cit. Howard. p. 100

¹⁵Holborn, Hajo. "The Prusso-German School: Moltke and the Rise of the German

of piecemeal developments in armament technology, a communications transformation and a great increase in mobility to form the new foundations of warfare. In W.W.I new communications technology was changing aspects of the war effort, but it was neither sophisticated enough, sufficiently reliable, nor properly integrated to amount to either a tactical or strategic advantage. The great bloodshed and military disasters of the early 20th century were a result of the failure to assess adequately the impact of technology and to apply that to a re-creation of strategy. The Systems Revolution overturned the basis of strategy and tactics of W.W.I by greatly increasing the speed, destructiveness and scope of warfare. Previously under-developed technologies, such as communications technology and transportation technology, were enhanced and integrated into military structures on an unprecedented level. The revolutionary introduction of nuclear weapons was to overturn these developments.

The complete transformation of war as an institution and its associated conceptions of strategy by mechanization/industrialization were stunted by the atomic bomb. Robert Jervis captures the crucial defining backdrop to any analysis of nuclear weapons, "The most important points are often the simplest ones. No one can win an all-out nuclear war... and its implications have not been fully appreciated."¹⁶ The nuances of the various aspects of nuclear strategy are inconsequential to the thrust of the argument underlying the latest revolution in warfare. Nevertheless, certain aspects concerning the nature of the nuclear revolution must be highlighted.

General Staff' in The Makers of Modern Strategy: From Machiavelli to the Nuclear Age, ed. Peter Paret. Princeton University Press, Princeton. 1986. pp. 290-94

¹⁵Jervis, Robert. The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon. Cornell University Press, Ithaca. 1989.

First, nuclear war was illogical in that a nation's security rested upon its vulnerability. Second, it was a paradox in strategy, in that to prosecute general war translated into self-destruction. Third, while the chief purpose of the military had been to win wars, it was now to avoid them.¹⁷ Lastly, the purpose of armed force in international society was significantly altered so that nuclear military advantage resulted in the political ability to compel and deter rather than to prosecute by force. It resulted in a dramatic mutation of international politics, if not military structure.

In approaching military revolutions, as outlined in the above large scale changes in warfare, it becomes apparent that it can not be solely technology that alters the nature of warfare. Technology and innovation are the catalyst of change that may provide the paradigm for the future.¹⁸ Current technological innovations based on precision-guided munitions and spaced-based communications systems are supposedly at the core of the next revolution and while there is some substance to this view, it ignores the larger strategic and political issues surrounding a military revolution. This view may lead to the false identification of changes as revolutions, where in reality they qualify as merely evolutionary developments in weapons or institutional structure. For example, the identification of the 17th century "revolution" in warfare mainly involving the widespread use of gunpowder by Soviet scholars, and other authors such as Geoffrey Parker,

¹⁷Buzan, Barry. An Introduction to Strategic Studies: Military Technology and International Relations. St. Martin's Press, New York. 1987. p.35 see also Bernard Brodie, The Absolute Weapon.

¹⁸This is reflected in Kuhn's argument that in a revolution in science one key point was the *recognition* that the dominant paradigm had been challenged and overturned. In this context, innovation occurs in the face of the incomensurability between the techniques of war (weapons systems, operations and tactics) and strategies which ultimately questions the prevailing view of the relationship of war to society. Kuhn, T.S. The Copernican Revolution. pp. 135-143; The Structure of Scientific Revolutions. pp.68-69.

ignores some of the central aspects of revolutionary change.¹⁹ Gunpowder had been in use for centuries before it had attained technological efficiency sufficient to be incorporated as the main weapon of the battlefield, and it took generations before institutions shifted structure, training and strategy to make use of it. Understanding the effect of introducing new technologies is crucial to finding the path that modern conflicts and the simultaneous transformation of armed forces will take.

The great confusion surrounding the term "military-technological revolution" should be reason enough to dispense with it.²⁰ The process of integration and innovation of new technologies is highlighted as a more fruitful method of understanding military change. What writers of military-revolutions seem to ignore commonly is the ripple effect of technology, especially military, upon the prime characteristics of domestic and international society. Political and social organization, emerging conflicts, organizational structures, methods of thinking and waging combat are but a few of the areas in which new technologies eventually impact society. Nikolai Ogarkov described technology as a process of momentum, where first technology is introduced at a low level (tactics) and years down the road eventually spreading to higher levels and greater importance (strategy and doctrine).²¹ It can be deduced from the experience of other

¹⁹Parker, Geoffrey. The Military Revolution: Military Innovation and the Rise of the West, 1500-1800. Cambridge University Press, Cambridge. 1988 and see Dan Gouré "Is there a Military-Technological Revolution in America's Future?" The Washington Quarterly. Autumn 1993 p. 177

²⁰Gouré. p. 179

²¹see Ogarkov, Nikolai. History Teaches Vigilance. Voenizdat, Moscow. 1985 as cited in Gouré, Dan.

revolutions that the type of conflict likely to be found in the international arena would be subject to the same process.

Scientific-technological revolutions in war are, for the most part, a recent phenomenon in Western military and political discourse. However, the idea of a military-technological revolution has been a longstanding component of the military intellectual traditions that emerged in the Soviet Union. While there are distinct conceptual differences between the Western, primarily American, views on revolutions in warfare and the Soviet View of a military-technological revolution, there exists some intellectual lineage and even borrowing on the part of Western academics and military writers. The term a “revolution in military affairs” was first used by Friedrich Engels to describe the slow introduction of gunpowder into warfare. However the term was widely used by Soviet military writers up until the late 1960's to describe the various technological changes to warfare.²² The later writings of Ogarkov and others employed the terminology of a scientific-technological revolution in warfare and unfortunately abandoned the much broader concept of a revolution in military affairs.²³ Whatever the terminology that was employed at any given time, Soviet writers focused primarily on the technological aspects warfare, whether it be gunpowder, mechanization, rockets and missiles, or nuclear weapons. This intellectual lineage makes it is useful to outline the Soviet model and compare it to what has already been revealed about the process of revolutionary change in warfare.

²²Scott, Harriet Fast and Scott, William. Soviet Military Doctrine. Westview Press, Boulder. 1988. p.22

²³The term that was picked up by the Americans.

Soviet military thought began to explore the tumultuous changes in warfare during the inter-war period. In particular, General Tukhachevskii in 1936 and the officers in his circle developed concepts and strategies based on 'operation in depth' as a way of using modern weapons in mobile offensive warfare.²⁴ Such concepts bear a striking similarity to some of the ideas behind the blitzkrieg warfare practiced by the Germans three years later. The transition from ideas to strategic and tactical doctrine never materialized because of Stalin's tight control on military policy and his eventual purges of the more farsighted military planners(1937-8).²⁵ The mechanized corps was even disbanded in 1939 due to an incorrect analysis of the lessons of the Spanish Civil War.²⁶ It was in the post-Stalin period when most writings emerged on the various revolutions in military affairs noted by Soviet scholars. According to Soviet military writers a military-technological revolution occurred between 1953-1960, and while touted as being a total revolution in all aspects of military organization, its principal concern was with rockets and nuclear weapons.²⁷

The more prominent Soviet theorists that took up the task of writing on the revolution included Marshall Vasiliy Sokolovskiy, Marshall Malinkovsky, General Nikolai Ogarkov, and General Major Svyatoslav N. Kozlov.²⁸ It is clear in their writings that the revolution

²⁴Holloway, David. "Doctrine and Technology in Soviet Armaments Policy" in Derek Leebaert (ed). Soviet Military Thinking. George Allen & Unwin Ltd., London, 1981. p.268

²⁵For details on Stalin's role see Holloway, David. The Soviet Union and The Arms Race. Yale University Press, New Haven. 1983. pp.21-31

²⁶Ibid.

²⁷Scott, Harriet Fast and Scott, William. Soviet Military Doctrine. Westview Press, Boulder. 1988. p.22-23

²⁸See the many direct excerpts from Soviet journals and texts in Scott, Harriet Fast and

consists primarily of nuclear and rocket forces and their impact upon the conduct of war. It was not until the 1970's that the idea of a military-technological revolution was expanded, principally under Ogarkov, to include cybernetics - or command and control, computerization, the development of sensor and radar. As Holloway indicates, "Nuclear weapons and long range rockets were the most important, but not only, elements in this military-technological revolution."²⁹ However, military planners and theorists were hamstrung by a declining economy and a turbulent political situation in the 1980s, so that further work on the military-technological revolution centered around communications and precision technology remained undeveloped.

The Soviet model falls short on several fronts in its analysis of warfare from the W.W.II period. First, there is conceptual difficulty in not splitting the mechanized, industrialized and systematized transformations of the W.W.II period from dramatic introduction of nuclear weapons and again from the computer and communications innovations of the late twentieth century. These are clearly distinct processes of change. Second, the Soviet military writers paid great homage to the economic and historical forces behind warfare but, as the Americans have recently done, failed to incorporate them into their analysis of changes to warfare.³⁰ Soviet notions of a military-technological revolution surprisingly lacks historical perspective of other possible revolutions and as result does not see the changes in the sociological structure of society, its views

Scott, William (eds.). The Soviet Art of War: Doctrine, Strategy and Tactics. Westview Press, Boulder. 1982. pp.123-156.

²⁹Op. Cit. Holloway. p.271

³⁰ Soviet writers may have been "hamstrung" in the scope of their analysis due to the possibility of ideological and political ramifications.

on war or the interaction between these components and war as a primary sight for investigation. In the end, although the views on military-technological revolutions emerging out of the Soviet Union lacked conceptual clarity and scope, they included some aspects of organization, ideology, and defence-industrial production that are only recently being found in Western military writings and academia.

Lethality, Mobility and the Expansion of the Battlefield

The essential goal of war is still, as Clausewitz observed so many years ago, the subjection of the enemy to one's will. Warfare, as the application of force for the means of prosecuting political ends, has been significantly altered by the introduction of technologies and innovations. Technology has increased the potential of subjecting the enemy to one's will and of inflicting an 'unacceptable' amount of damage. The accelerated pace of innovation and technological change in the past two centuries has resulted in a significant change in the nature of warfare. Principle to these changes are the quantum leaps in lethality of weapons, mobility of forces, and supply on the battlefield. Since the initial introduction and widespread use of firearms on the battlefield, the lethality of weapons has increased steadily. Similarly, mobility has spiraled upwards so significantly that traditional warfare, especially tactics and strategy, has clearly been turned on its head.³¹ Richard Dunn, a modern analyst of land warfare, confirms this observation:

³¹ One important observation Bellamy makes is that the *pace* of technological change is increasing. So not only are there more innovations in warfare in the hundred years from 1890 - 1990 than from 1790-1890, but that the innovations are coming more frequently so that in the next one hundred year period the number of innovations will be exponentially larger. Bellamy. pp. 51-52

"The most significant technologically induced change has been the greatly increased lethality of the battlefield. The technological revolution has caused quantum improvements in the ability to kill targets at extended ranges."³² Evolutionary changes in the increase of weapons systems lethality are natural to the general progress of armaments development and closely follow the Kuhnian notion of a 'normal scientific' process. The two revolutions of the 20th century have overturned this course of improvement with quantum alterations to weapons lethality potential. Recently, the Gulf War presented the synthesis of lethality and mobility to such a degree that it represents a massive expansion of the battlefield and the likely transformation of war.

The expansion of the battlefield has a historical foundation in the large unprecedented innovations in either mobility or lethality (or both) during periods of military revolutions. The basis of warfare since it was rejuvenated under the Napoleonic and Revolutionary Wars has been the dominance of manoeuver tactics and strategy. Central to the Napoleonic method of warfare and that which significantly contributed to his early success was the speed with which he moved his armies. The speed of movement, which allowed an unprecedented 175,000 man army to move from the Channel coast to envelope the allied army at Ulm in three weeks, shocked the powers of Europe.³³ The organizational feat Napoleon had effected in strategy and tactics in order to bring his combined forces to bear upon a single area was truly original. The problems of support and supply of this large highly mobile military force quickly became apparent as supply columns could not closely follow these movements. In this vein, the strategic and organizational innovation

³²Dunn, Richard III. From Gettysburg to the Gulf and Beyond. p.24

³³Paret, Peter. Napoleon and the Revolution in War. p.123

surrounding the exploitation of mobile forces at decisive points, outstripped the technological capability of support and supply. Indeed, the agricultural "revolution" in North Western Europe was largely responsible for creating a surplus of food which allowed for the "live off the land" policy, temporarily substituting for Napoleon's obvious deficiency in supply.

The other half of the Napoleonic revolution was the introduction of the *levée en masse* and the expansion of warfare to incorporate all the resources of the state. The battlefield was not necessarily changed by this. It only increased the potential consequences of war and expanded warfare backwards from the front-line. Mobility was to push the battlefield hundreds of miles beyond the traditional scope of 18th Century warfare. Forces could move farther, faster, with greater threat to the homeland of the enemy, therein transgressing the traditional advantage of the defence and threatening that which had not historically been possible. Therein, the Napoleonic revolution in warfare was essentially the introduction of mass mobility which expanded the battlefield lengthwise as well as forever shifting the political nature of warfare to a tool of the state rather than that of the sovereign.

After the initial success of the Napoleonic campaigns his tactics and style of warfare were to be incorporated by all military institutions in Europe.³⁴ As such, warfare was again to settle down into a battle of attrition with both sides employing a Napoleonic offensive doctrine thereby annulling any advantage imparted by mobility. W.W.I was also a strikingly bloody example of the widespread use of the Napoleonic style of warfare without fully interpreting the expanded battlefield combined with rapid industrialization. W.W.II would break the mold set in

³⁴With the notable exception of the British who followed 18th century style land warfare for some time, a product of their geographic location.

W.W. I in both areas, mobility, and lethality. The technological innovations of the inter-war period pushed a complete reformation of strategy and tactics to the fore of military planning. The considerable technological strides made in the development of the tank and the airplane were to act as a catalyst in Germany and create an institutional technological momentum eventually evolving into the rule of technocracy in the military.

The military-revolution of the W.W.II period was to find ultimate expression in the principle component of German strategy: Blitzkrieg. Mobility was the key to Blitzkrieg warfare and was made possible by the technological innovations of the inter-war era and a philosophy of warfare that was ultimately self-destructive to the German army. Michael Geyer points out the two elements of this strategy, "Indeed, the general condition that shaped Blitzkrieg strategy was the conjuncture of two elements: the emphasis on the optimal use of weapons and competitive military leadership."³⁵ The maximization of weapons and force by German generals had become the central element of their philosophy. Blitzkrieg was not a strategy so much as a combination of occurrences that included radical formations of new technology, a command and control structure capable of handling rapid mobility and "lastly but probably most important, young officers and soldiers of superb quality, who were brought up and conditioned to believe that they were bound to win."³⁶

The internal combustion engine in the form of troop transports and especially tanks brought land warfare mobility to an all-time peak. On top of mobility, of course, were the great achievements

³⁵Geyer, Michael. "German Strategy in the Age of Machine Warfare, 1914-1945". in Paret, Peter Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Princeton University Press, Princeton. 1986 p.527

³⁶ibid.

made in the lethality of traditional components such as artillery, machine guns and the tank. As such, mobility had now been merged with lethality with the resultant effect of expanding the possible scope of military maneuvers and objectives.

Changes in the scope of the battlefield due to greatly increased mobility were overshadowed in the second half of W.W.II by the widespread assimilation of air power into the military. Air power had been used in W.W.I to some degree, but the advent of strategic bombing circa 1942 was to forever alter the course of warfare. Many air-power visionaries such as General William Mitchell, Air Chief Marshall Sir Hugh Trenchard and the most publicized of all, Giulio Douhet, envisioned the complete transformation of war because of the ability to attack centres of gravity and undermine the will of the enemy.³⁷ The simultaneous developments in bomb lethality and continuous developments in aircraft design and targeting ability were to provoke the next expansion of the battlefield. Much more than the revolutions in land warfare, air power changed conceptions of strategy and the use of military force. Air power expanded warfare to a new dimension and allowed the ability to circumvent defence systems and not only threaten, but directly target the homeland. The combination of the speed and lethality of land warfare and the addition of the new dimension of air warfare revolutionized combat.

Nuclear weapons overturned all previous notions of the utility of war in the political arena and threatened the survival of the system itself. The massive indiscriminate destructive power of nuclear weapons and their basic indefensibility expanded the battlefield to

³⁷Howard, Michael. War in European History. Oxford University Press, London. 1976.
p.129

its potential zenith. In this fashion, lethality of weapons increased in such magnitude that it rendered war, at least great power war, unthinkable. The battlefield was therefore void of parameters as all parts of society became targets in the paradoxical defence dilemma of nuclear warfare.³⁸ This was to present a fundamental challenge to the ability of nuclear nations to utilize war as a tool of policy, no matter how unattractive this was in the light of W.W.II. Nuclear weapons eliminated concerns about mobility and drove to perfection that of quantity and quality of lethality. The overriding presence of Mutual Assured Destruction and the fears of the general populace resulted in a significantly diminished role for conventional forces in military and strategic planning. However, this may be about to change due to the international political climate and the ongoing developments in weapons technologies.

Clausewitz wrote a great deal about war in his 1832 treatise *On War* and little about strategy. To him strategy was a simple and practical concern and he expressed his thoughts in this manner, "strategy, [is] the use of engagements for the object of war".³⁹ Under these constraints operational strategy fits neatly into Clausewitz's definition but it ignores the qualities and formulation of 20th Century warfare. Evident during W.W.I, through the Systems Revolution and continuing to the present day, warfare has continued to become more lethal and encompass more of society. Technology played a significant role in the shift from a limited war between national militaries to a complete and total war based on the destruction of societies. Technology

³⁸For a discussion of the defence dilemma see Buzan, Barry. *An Introduction to Strategic Studies: Military Technology and International Relations*. St. Martin's Press, New York. 1987.

³⁹Book Two, Chapter I. Clausewitz, Carl Von. *On War*. Howard and Paret Eds. Princeton University Press, Princeton, New Jersey. 1989.

requires the will and resolve to be used for warfare in the 20th century and must be married to the emergence of ideologies and nationalism. These are equally potent factors in determining the character of war in the 20th Century.

Specifically, these technologies were improvements in heavily destructive mobile mechanized weapons systems as well as the introduction of air power, especially strategic bombing. Early air power theorists such as Douhet and Mitchell predicted that warfare would be forever changed by strategic bombing. However, they spoke far in advance of the technology required to make air power decisive and it required the extraordinary development of atomic weapons to realize this fully. It is, however, unquestionable that strategic air power resulted in the expansion of war into a different arena of conflict, and also induced changes in targeting to include civilians. The expansion of war to the air and the increased destructiveness and mobility of ground and naval forces led to a parallel expansion of the theatre of conflict to that of the entire nation-state.

While the arena of conflict had expanded, the resources needed to conduct modern warfare had also steadily increased since the French Revolution. The radical political ideology of the Revolutionary Wars and Napoleon's ability to organize resources and people had provided the initial impetus for a national war.⁴⁰ Instead of one army against the other, it was transformed to one nation (people) fighting for its existence against the other. Napoleon stood at the beginning of what has come to be understood as the modern age and the entrance of total warfare. His genius was the

⁴⁰Paret, Peter. "Napoleon and The Revolution in War" in Makers of Modern Strategy: From Machiavelli to the Nuclear Age. Peter Paret Ed. Princeton University Press, Princeton. 1986. p.129

product of his ability to coordinate and combine resources so as to use them on a scale never before seen. What limited Napoleon's operational capability was the technological capacity of the early 19th century.⁴¹

The technological capacity of society to maintain and expand a large war effort grew exponentially in the latter stages of the industrial revolution. In *The Pursuit of Power* William H. McNeill thoroughly documents the advance of technology and the industrialization of the military as the next transformation in warfare.⁴² However, the increase in capability had to be matched to a philosophy both capable and willing to expand war beyond traditional geo-political and moral boundaries. The political upheaval of the inter-war period in Germany and the rise of national-socialism effectively destroyed the remaining traditions of 19th century warfare. As Michael Geyer notes, this was to change the conception and use of strategy;

In rejecting strategy in this sense, the Supreme Command proceeded along two paths. On the one hand, it diversified and expanded the understanding of what constituted a decision-oriented use of force by introducing indirect means of warfare against the moral and social fabric of Allied nations. On the other hand, it dissolved the instrumental nexus between means and ends that had guided "idealist" strategy and the utilitarian approach to limiting warfare in the nineteenth century. The new "strategy" expanded war beyond the confines of the military institution and provided a rationale for national mobilization.⁴³

In effect, the institutional and political changes wrought in Germany in the mid 20th century legitimized total war. As such, strategy was not destroyed, but as a social "institution" was transformed in response to changes in society to become a *total* strategy.

⁴¹ibid. p.137

⁴²McNeill, William H.. *The Pursuit of Power: Technology, Armed Force and Society.* The University of Chicago Press, Chicago. 1982. pp. 215-261

⁴³op.cit. Geyer. p.546

The growing changes in 19th century technology made large scale participation in, and organization of, war possible and therefore necessary.⁴⁴ The developments in sociological and technological areas of society have impacted warfare so as to invalidate previous conceptions of strategy. The changes are so significant during the last two hundred years that they undermine Clausewitz's defiantly simplistic separation of strategy into the two components of logistics and operations. In military and political traditions, strategy had fallen under a number of different definitions, many contradictory, which must be examined in order to pursue the changes wrought by the Gulf War. In terms of traditional military theory, Clausewitz's narrow conception of strategy as strictly an operational concern in the theatre of warfare has already been exposed. General André Beaufré, Edward Luttwack and Michael Howard stand out as offering unique conceptions of strategy in the 20th century. In the following analysis different elements of each theory will be used to develop an understanding of the changing nature of strategy.

General Beaufré systematically deconstructed strategy and provided a "textbook" pattern of three forms of strategy; total, overall and operational. It is from his conception of total strategy that the combination of tactical, operational, diplomatic, political and economic areas may be melded together into a single strategic effort.⁴⁵ This is a novel strategic concept in that it allows for the inclusion of fields not commonly under the purview of strategy. Although a more complex and controversial analysis, Edward Luttwack follows a traditional breakdown of strategy into five

⁴⁴Howard, Michael. The Causes of Wars; Second Edition. Harvard University Press, Cambridge, Massachusetts. 1983. p.104

⁴⁵Beaufré, General André. An Introduction to Strategy. Frederick A. Praeger Publishers, New York. 1965. pp. 30-33

component parts: grand strategy, theatre, operational, tactical and technical strategy.⁴⁶ This categorization is not remarkable in any way. However, with the introduction of the complementary concept of horizontal and vertical "influence", a new understanding of strategy can be formed. Luttwack makes a simple, yet significant, analysis that each level of strategy acts both vertically and horizontally on all the other levels of strategy. This is a far-reaching concept as strategy has usually been confined to the military realm and was rarely seen to go beyond these parameters.

André Beaufré and Edward Luttwack both offer original interpretations of strategy and contribute greatly to the literature *writ large*. In contradistinction to the limited scope of the previous analyses, Michael Howard offers an insightful analysis that incorporates many of the qualities of modern strategy. "So by the beginning of this century, war was conducted in these four dimensions: the *operational*, the *logistical*, the *social*, and the *technological*."⁴⁷ These distinctions are of increasing relevance in a period where warfare does not occur solely in one dimension but cuts across many simultaneously. Failures to comprehend this has led to ill conceived strategies and disastrous military campaigns. At the root of the Vietnam failure in the 1960s was an inadequacy of socio-political analysis in the West to deal with post-colonial revolutionary movements.⁴⁸ In comparison to the other dimensions of strategy, the *social* was most consequential and the increasing technological and logistical support provided was rendered ineffectual. The

⁴⁶Luttwack, Edward N.. Strategy: The Logic of War and Peace. The Belknap Press of Harvard University Press, Cambridge. 1987. pp. 69-70

⁴⁷op. cit. Howard. p.105

⁴⁸ibid. p.106-108

Vietnam conflict differed substantially from the two World Wars, in that they were fought between politically and socially stable nations and were decided on the basis of social attrition, whereas Vietnam was fought in the context of a politically and socially unstable nation (South Vietnam).

Formulating strategy with the above four dimensions has certain advantages for the military historian and strategist. First, it allows for the entire gamut of strategic concerns to be compiled together and therefore considered together. In this vein, the terminology of *total strategy* coined by General Beaufré is appropriate and when merged with Howard's analysis gives added depth to Beaufré's concept of strategic thinking. Second, horizontal/vertical strategic influence as portrayed by Luttwack buffers aspects of Howard's theory and provides a larger arena for strategic consideration. At first glance this appears to make strategy unduly complex and yet with this new *total strategy* structure, Howard's "dimensions" become interactive and much more valuable. The 1990-91 Gulf War was important to the development of strategy, because of how it has affected these areas and the continued application of armed force in the international arena.

The twentieth century presented many challenges to traditional conceptions of strategy, not the least of which was the introduction of nuclear weapons in 1945. The ability to project nuclear weapons on such a scale so as to make them ultimately decisive for both the U.S. and U.S.S.R. did not come for over a decade.⁴⁹ Although strategic thought was to be almost permanently imbued with the doctrines of strategic bombardment, changes in strategy were almost instantly noticeable. Bernard Brodie wrote a timeless treatise on the effect of nuclear weapons only six months after Hiroshima, and described the eradication of strategy as it had previously been

⁴⁹Freedman, Lawrence. The Evolution of Nuclear Strategy 2nd Ed. MacMillan/International Institute for Strategic Studies, London. 1989. pp. 22-44

formulated.⁵⁰ History and experience have proven that nuclear weapons did not push strategy to the background of military theory. Indeed, the "strategy" of deterrence has dominated military thought processes and concerns for nearly half a century. The dimension of strategy that was prevalent in the attrition wars of W.W.I and W.W.II was that of logistics. But in nuclear strategy, operational, logistic and more importantly socio-political concerns had been forgotten. The technological dimension of nuclear strategy has grown to be so dominant that it has become an end unto itself with strategic "questions" being solved solely by technological "answers".⁵¹ With the advantage of hindsight, one can see that the 'technological imperative' nature of nuclear strategy has been rather forceful in determining American policy. Contrary to the prevailing technological emphasis placed on nuclear strategy, the nuclear dilemma appears more of a question of political motivation and social cohesion. As Michael Howard explains;

The technological capabilities of nuclear arsenals are treated as being decisive in themselves, involving a calculation of risk and outcome so complete and discrete that neither the political motivation for the conflict nor the social factors involved in its conduct - nor indeed the military activity of fighting - are taken into account at all.⁵²

As such, nuclear strategy represents a subtle paradox in modern strategic thought, and that while the strategy and use of nuclear weapons is essentially a social-political concern all emphasis has been placed on technology. Technology, as seen in the deterrence debates

⁵⁰Brodie, Bernard. The Absolute Weapon. Harcourt, Brace and Company, New York. 1946 pp. 70-71

⁵¹Howard. p.109-111

⁵²ibid. p.109

surrounding anti-ballistic missiles and the strategic defence initiative, only exacerbates social-political differences and leads to greater strategic uncertainty.⁵³

⁵³Many books and articles have been written about the dilemmas of nuclear deterrence. For a valuable look at problems of the technological aspects of deterrence see Barry Buzan, An Introduction to Strategic Studies: Military Technology and International Relations.

CHAPTER 5

THE GULF WAR

The invasion and annexation of Kuwait in 1990-91 presented the international community with a blatant defiance of international norms, laws and practices. Response to the invasion by the United Nations and the world community was immediate; it unanimously condemned the actions of Saddam Hussein. As President Bush so often stated, this was a "defining moment" in world history. Indeed, he was correct as the international community had rarely acted in concert on any matter, especially militarily, and seldom had the world seen such a textbook case of aggression. These factors, in combination with the end of the Cold War, were unique conjunctures in modern history to Saddam Hussein's ultimate misfortune.

The political aspects leading to the Gulf War have received the bulk of attention from analysts, journalists and politicians. However, there appears to be a lacuna in the literature regarding the unique applications of military force evident in the Gulf conflict. Keeping Clausewitz's famous dictum in mind, it must be stated that it is impossible to separate the political, economic, and diplomatic aspects from the military. This multiplicity of components, each sufficiently complex and consequential in its own right, does not preclude nor negate a separate analysis of the role of military power. Nonetheless, as Edward Luttwack points out, it is important

to refrain from any attempt to learn supposed lessons from the war.⁵⁴ In both political and military terms, the Gulf War is representative of significant changes in the international use of armed force, military strategy and military technology. As much as lessons need to be avoided, analysis must be extended to include these monumental shifts.

The Gulf War in 1990-91 undoubtedly represents one of the most lopsided military victories in history. Whatever the outcome of the political situation in the Middle East, "the most important feature of the Gulf War in military terms was its decisive, overwhelming character."⁵⁵ The type of warfare evident in the conflict was exactly what the West had been preparing for during the many years of the Cold War. Attrition warfare was behind the strategies pursued by both sides in the conflict. While Saddam Hussein was to make strategic and logistic blunders during the war, it quickly became apparent that the untested technological supremacy of the West had outstripped the confines of traditional strategy and both opponents' perception of the war. The air campaign has been accredited with the majority of success in the Gulf War, perhaps ignoring the impact of technology on all of the institutions of the armed forces. Command and control, intelligence gathering and dissemination, land warfare improvements, space based support systems and the overall application of precision guided munitions have the potential to revolutionize the conduct of warfare.

⁵⁴Luttwack, Edward. "The Gulf War in Its Purely Military Dimension" in War and Its Consequences: Lessons from the Persian Gulf Conflict. John O'Loughlin, Tom Mayer and Edward Greenburg eds. Harper Collins College Publishers, New York. 1994. p. 35

⁵⁵Freedman, Lawrence and Karsh, Efraim. "How Kuwait Was Won: Strategy in the Gulf War". International Security. Fall 1991 (Vol. 16, No. 2) p.5

Each war is distinctive and any interpretation drawn from events found therein must include a recognition of these factors. The unique features of the Gulf War take it one step beyond this. John O'Loughlin outlines some of the unusual political/military characteristics of the conflict;

First, it marked the clear return to interstate conflict... Second, for most people in the West, the Persian Gulf War will be remembered as the first "real-time" television war... Third, the Persian Gulf War was unusual for a regional conflict because of its global interest and involvement... Fourth, the Gulf War was the first expression of the long-promised "electronic battlefield"... Finally, many observers ... viewed the Gulf War as a vindication of the defence dollars spent in the Reagan years and an opportunity to erase the blot of Vietnam...⁵⁶

O'Loughlin's analysis is insightful, but can be buffered by two other observations: the end of the Cold War, allowing rare United Nations agreement and support of the US led coalition; and the unique nature of the aggression that started the conflict. The importance of these political characteristics need to be kept in mind when analysing the military/strategic nature of the Gulf conflict.⁵⁷

As many writers have indicated in the wake of the Gulf War, a paradigm shift seems to be occurring in the nature of modern warfare.⁵⁸ Indeed, these 'visionaries' resemble those

⁵⁶O'Loughlin, John. "The Context and Consequences of the Persian Gulf War" in War and Its Consequences: Lessons from the Persian Gulf Conflict. John O'Loughlin, Tom Mayer and Edward Greenburg eds. Harper Collins College Publishers, New York. 1994. pp. 8-10

⁵⁷A variety of extremely good literature on the political and economic features of the Gulf War is available. For examples see; Freedman and Karsh, The Gulf Conflict 1990-1991; Bresheeth and Yuval-Davis, The Gulf War and the New World Order(1991); and Nye and Smith, After the Storm (1991).

⁵⁸ See Dunn, Richard J. III. From Gettysburg to the Gulf: Coping with Revolutionary Technological Change in Land Warfare. The Institute for National Strategic Studies, Washington, D.C.. 1991; the conclusions in Keaney and Cohen. The Gulf War Air Power Survey Report; Arquilla, John and Ronfeldt, David. "Cyberwar is Coming" Comparative

air power theorists of the early 20th century in their predictions that land and naval methods of war would act only as support units for the air campaign. The logical evolution of air power was, however, supplanted by the revolutionary nature of nuclear weapons. The large gains made in fighter and bomber aircraft technology in later years still tended to be overshadowed by the nuclear debate. Nuclear weapons had such a great impact that many traditional concerns of military theory were placed on the back burner, if not eradicated entirely. Naturally this resulted in a parallel effect in formulating strategy. The Gulf War breaks the cycle of strategic dominance by nuclear weapons in the West, so that conventional forces and warfare may assume a dominant place in strategic planning.

In order to pursue the argument that certain elements of the Gulf War represent or at least foreshadow revolutionary practices in war, it is essential to view the conduct of the war itself. It was not until Operation Desert Storm that any actual military attacks were carried out although the military build-up in Saudi Arabia had been intended to compel Saddam to leave Kuwait. The air offensive on Iraq began on January 17, 1991 and less than 48 hours later Baghdad was effectively cut-off from the rest of Iraq and Kuwait.⁵⁹ The astonishing speed by which Hussein's command and control infrastructure was crippled became the hallmark of the war effort and reduced Iraq's commanders' ability to send orders to the front. Hussein did manage to order

Strategy. April-June 1993; and even Edward Luttwack's guarded comments on the military in the Gulf War hint towards a paradigm shift, albeit in the distant future. Luttwack, Edward. "The Gulf War in Its Purely Military Dimension" in War and Its Consequences: Lessons from the Persian Gulf Conflict. John O'Loughlin, Tom Mayer and Edward Greenburg eds. Harper Collins College Publishers, New York. 1994

⁵⁹Lt-Col. McCausland, Jeffrey. The Gulf Conflict: A Military Analysis. Adelphi Paper #282 International Institute for Strategic Studies, London. 1993.

limited attacks such as the Kulfi offensive, but these were isolated because of the lack of communication infrastructure between the command and the field units ,and amongst field units. In the thirty-four days left, the air war proceeded to solidify the achievements of the first two days and to spread the effects to front line troops, supply lines, and throughout Iraq.

It is important to draw lines of distinction between the type of warfare fought, compared to that which had been planned by the coalition forces. The Gulf War has been portrayed as the perfect air/land battle; a concept that had been developed over the past ten years by the United States, primarily in the context of the Cold War central front in Europe. In the actual conflict though, there were two distinctive wars, not combined campaigns: an air war and a land war.⁶⁰

In identifying the effectiveness of the air campaign, there are assessments that appear to be valid under the light of current information. First, air power was so decisive that it goes unprecedented in the annals of history. Second, the air campaign "differed in kind rather than in degree from all previous air campaigns."⁶¹ Rarely has military history seen a victory so stunning as a result of technological innovation and supremacy in one method of warfare. One may have to look as far back as the Battle of Crecy and the advent of the longbow in order to appreciate the magnitude of such an event. Also, the air war was a remarkable testing ground for new technology and proved the effectiveness of "smart" weapons. However, the strategic bombardment philosophy of W.W.II was still applied in the sense that the overall objective was to destroy the enemy's **will**

⁶⁰Luttwack. op cit. pp. 33-37

⁶¹ibid. p.36

first, and then their ability to fight as had been the theory in W.W.II.⁶² However, the application of air power in the Gulf Conflict had a different tactical strategy than that of the mass attrition bombing of W.W.II. Gulf war planners placed greatest concentration of effort and the bulk of the precision weapons on dismantling the command and control of the Iraqi military and the country's infrastructure.

Strategic considerations in the planning of the air campaign were largely determined by the social and political constraints of the situation.⁶³ Given that the multi-national force fighting in the Gulf consisted of many Arab and Islamic states, there were social constraints against the type of targeting as it could be seen to unduly inflict harm on the Iraqi civilian population. Also, the political mandate was to drive the Iraqi army out of Kuwait and to inflict enough damage so that an attack in the near future would be unlikely. Saddam Hussein, in particular, was not made a direct target and his removal was not a policy goal of the Bush administration. In this environment, precision strikes by aircraft were both desirable and politically necessary. The logic of neutralizing the 'nervous system' also made strategic sense in light of these constraints. While targeting in this manner was not an entirely new concept, the startling effect of this was that it could actually be done under the technological auspices of Stealth bombers and precision guided munitions. For example, after day three in the air war Iraq launched SCUD missiles into Israel in an attempt to divide the coalition. Targeting was immediately changed to

⁶²Freedman, Lawrence and Karsh, Efraim. The Gulf Conflict 1990-1991. Princeton University Press, Princeton. 1993. p.312

⁶³Keaney, Thomas and Cohen, Eliot. Gulf War Air Power Survey Report. Washington, D.C.. 1993. pp. 44

focus and eliminate the new threat, at which the USAF and coalition forces had a limited degree of success. As information and targeting gained more accuracy over time, the coalition forces had greater effect in eliminating the SCUD launching capability, and ensuring that later on a post-war Iraq would pose no threat.⁶⁴

The air war as argued by many, including Edward Luttwack, should have been sustained in order to disable totally the Iraqi military machine without the risk of a messy land war.⁶⁵ The problem with land warfare was that high casualties would result from "the incidentals of war: troops stepping on unmarked mines, short fire-fights with stragglers and hold-outs, mechanical accidents, and the ragged fire of some surviving fraction of the huge number of Iraqi artillery tubes."⁶⁶ The problem with the earlier 'gloomy' estimates was two fold: first, many theorists underestimated the capability of both air power and the speed and agility of land based warfare; and second, little emphasis was placed on the Iraqi authoritarian political and military structure which made it highly vulnerable to surgical strikes. At its core the war represented the fusion of technology to the goals of war as set out by political leaders; something which was noticeably absent during the Vietnam War.

A substantially more controversial view on the air campaign is that it was not the volume but the extraordinary precision that yielded results. This conclusion comes from some simple statistical data. The total amount of tonnage dropped during the entire Gulf War air

⁶⁴ibid. p.85

⁶⁵Freedman and Karsh. "How Kuwait Was Won: Strategy in the Gulf" p.21

⁶⁶ibid. p.19

campaign was 90,590 tons, including all sea-based launches and all coalition force members. On its own this figure is in no way outstanding but in comparison to the 134,000 tons dropped on Germany in March of 1945 alone, out of a total of 1.25 million tons during W.W.II, and given the significant damage and hit ratio during the air campaign these numbers can be put into perspective.⁶⁷ "Smart" weapons comprised seven percent of this total but accounted for over thirty percent of the inflicted damage. In addition, the targets selected for smart weapons were often centred in and around Baghdad, Republican Guard armoured divisions, and infrastructure (i.e. electricity, C³I, bridges). The use of precision guided munitions in general and laser guided bombs in particular was not new. Vietnam saw the use of laser-guided bombs throughout the nine month air campaign over North Vietnam in 1972. However, the extent to which the technology was used in the Gulf War dwarfs that of Vietnam and the fact that the majority of "smart" munitions drops occurred at night and were enhanced by precision guided missiles (notably HARM, MAVERICK, and TOMAHAWK missiles) is a definite qualitative difference.⁶⁸ The gap between the Gulf conflict and Vietnam is enlarged by a natural evolution in technology which greatly enhanced the quality of laser-guided bomb dropped in the Gulf as compared to Vietnam.

Much of the technology observed in the air war had been used in several different campaigns before the Gulf War (i.e. stealth aircraft in Panama). While there has been significant qualitative changes in munitions and the platform on which they are carried, the impact of the air campaign is the transformation of strategy within the air force. As the *Gulf War Air Power Survey*

⁶⁷Luttwack. "The Gulf War in its Purely Military Dimension" pp. 36-37

⁶⁸Keaney and Cohen. p.241

Report suggests: "In this war air power crossed some operational thresholds that, if not as obvious as the initial use of a new weapon or operational concept, did suggest a transformation of war."⁶⁹ In tactical strategy there are two direct effects of precision-guided munitions. First, the ability to attack multiple strategic targets simultaneously quickly became apparent to the planners of the air campaign as less and less ordinance was required to destroy targets. The capability to engage a certain operational theatre expanded exponentially. Second, the precision allowed the ability to attack specific targets of an unprecedented nature such as telephone and telecommunications systems. Air superiority had to be accomplished in order to allow this operational "revolution" and was done so as the result of radical new technology and information systems. As such, the entire strategy of air warfare was mutating throughout the conflict as planners ran across unexpected results and abilities and were met head on with planning inadequacies that seem to suggest a transformation in air warfare.

Where is the Revolution?

The air campaign was definitely unprecedented in the annals of warfare and represents significant shifts in the use of air power and strategic considerations overall. Military theorists have pursued this facet of the Gulf War in great detail and most have extracted similar conclusions. It is logical to conclude that such technical innovations can not be limited to precision guided munitions and wide scale use of stealth aircraft. It also begs the question of where else technology is transforming warfare at the close of the twentieth century. An analysis of other

⁶⁹ibid. p.243

changes quickly reveals that the technological impact of the silicon and information revolutions on warfare are as momentous in land warfare, naval warfare, and military infrastructure systems. The existing attrition warfare paradigm based upon the logistical dimension of strategy with which the Gulf War was fought, by both sides, will be rendered useless in light of these system wide technological changes.

In the same manner in which strategy has evolved into *total strategy*, now operating over all four dimensions due to societal and technological changes, the coming shifts in warfare will again alter conceptions of strategy.⁷⁰ The innovation of precision guided munitions is the first to impact upon, and be noticed by, the armed forces because it enhances components of traditional attrition warfare, including strategic bombing. Land based warfare, as viewed in the Gulf conflict, has also undergone changes in technology that will relate directly to strategy and force structure. In a parallel development to air based systems, precision warfare and mobility on the ground foreshadow large alterations in operational strategy. Indeed, the alterations in ground force capability may be more significant than the changes in air power capabilities.

At the heart of precision warfare is C³I and even more central to that is information, both accumulation and dissemination. As Richard J. Dunn III notes, "Collectively, C³I capabilities provide commanders at all levels their ability to manage the battle...commanders must be able to collect, analyse, disseminate and act on battlefield information...".⁷¹ Of course, these components

⁷⁰*Logistic, social, operational, technological.*

⁷¹Dunn, Richard J. III. From Gettysburg to the Gulf: Coping with Revolutionary Technological Change in Land Warfare. The Institute for National Strategic Studies, Washington, D.C.. 1991. p.29

of warfare are not unique. Commanders since Alexander the Great and Napoleon have needed the capabilities to do this. Successful generals, such as Napoleon, led from the front, not because of great bravery, but because this was where the information to conduct battle could be found. Therefore, none of the functions inherent in C³I are new. What is revolutionary is the advent of technology that greatly enhances and facilitates the use of these functions. In land warfare this has four direct implications: decreased battlefield losses, increased force potential, reduced force structure, and enhanced mobility.⁷² An obvious ramification of these changes lies in strategy and operational deployment, indeed with the increase of lethality and mobility it is clear that the traditional tenets of strategy do not suffice.

Most exponents of the revolution in warfare believe that it is a military-technological revolution (MTR) based on the primacy of new "intelligent" and highly lethal weapons systems. Technology, however, is not enough to make a revolution in military affairs (RMA) for it requires deeper organizational and structural changes and above all else it requires a rethinking of strategy. This MTR was interestingly first formulated in the Soviet Union, primarily under the foresight of Marshal Nikolai Ogarkov and his idea of the fourth revolution occurring in computer systems and sensing devices.⁷³ The idea of military-technical revolutions developed underneath Ogarkov's guidance were principled on past 'technical revolutions', like that of the internal combustion engine, gunpowder, and nuclear weapons. Indeed, the military - technological revolution, as the Soviets called the advent of nuclear weapons and ballistic missiles,

⁷²ibid. pp. 46-51

⁷³cited in Dan Gouré "Is There a Military Technological Revolution in America's Future?". The Washington Quarterly. Autumn 1993. p.178

followed Kuhn's analysis closely as it was followed by an important scientific elite - the Soviet military, forming a crucial part of a paradigmatic belief system. However, the Soviet argument was solely technologically oriented and failed to address social and structural issues surrounding military-technology. It is here that the revolution will occur if institutions are capable of adapting to new technology.

Today, most of the strategies and contingency plans developed during the Cold War are judged to be of dubious utility in the new international environment. In order to retain an effective fighting force, emphasis will have to be placed on information, mobility and flexibility. The key to 'information dominance' in the Gulf War was space-based communication and surveillance systems, which partially contributed to the one sided nature of the conflict.⁷⁴ The global positioning system (GPS) units provided to ground forces and in aircraft left no doubt as to the position of Iraqi troops and strategic targets. Also, as Richard Dunn points out, it basically eliminated the "lost-lieutenant" syndrome in coalition forces.⁷⁵ In the conflicts of which Clausewitz would have been familiar the ability to dispel the fog of war on a minute level, such as the individual or company level, would be enough to guarantee the revolutionary stature of the technology. This is enhanced by the knowledge that the problem of the "lost-lieutenant" syndrome has plagued soldiers since the inception of large scale mass conflict. It is unlikely that any other war will be so lopsided in terms of information dominance, because of similar advancements in civilian technology and global use of space-based satellite systems. The ability to render the Iraqi

⁷⁴Keaney and Cohen. p.247

⁷⁵Dunn. p.30

leadership blind, deaf, and dumb so quickly in the Gulf War is not a guaranteed outcome of the next conflict. However, the refinement of space based systems combined with an organizational infrastructure capable of transferring information and communicating to hand-held units of individual soldiers in the field over the area of a continent will transform command and control and operational strategy.

Information dominance and all its associated components are still in their infancy in military terms, but they have the potential to expand warfare to a fourth dimension. Similar to the way airplanes brought war to the third dimension (the air), and expanded the theatre of conflict by hundreds of miles virtually overnight, information dominance has strategic implications in warfare that are equally as powerful, but more subtle in nature. An analysis of information dominance requires some specification as to what the term means. The simplest and most accurate definition is that information dominance "consists of knowing everything about an adversary while keeping the adversary from knowing much about oneself."⁷⁶ Although, a 'loose' definition it contains enough specificity in military terms to be meaningful and is wide enough to capture the variety of different concepts within information dominance. Information dominance is not revolutionary to warfare. It has been practised in the past, and has been waiting in the 'wings' until technological innovation and structural opportunity allow it to be used *en masse*.⁷⁷ Two events

⁷⁶Arquilla, John. "The Strategic Implications of Information Dominance". Strategic Review. xf p.25

⁷⁷The British (Allied) code breaking section associated with Sir William Stephenson is a clear example of information dominance with their use of the Enigma machine (code named Ultra) against the German Navy. This tool allowed the Allies complete access to German signal transmissions and was pivotal in the battle for the Atlantic during W.W.II. The American

caused the eruption of information dominance so that it has become a major factor on the battlefield. First, the increased size of the operational battlefield, which has resulted from both increased accuracy and destructiveness of weapons, and the ability to coordinate and control complex manoeuvres. Second, this combined with complex and massive logistical support over great distances, and together act as the factors which pushed information dominance to the forefront of military concerns.⁷⁸

Information dominance has brought about what John Arquilla has coined "control warfare".⁷⁹ Control warfare is the logical extension of major developments in C³I and use of precision guided munitions. This method of warfare is reflected in the near complete information dominance the U.S. had during the Gulf conflict. At an operational level the Iraqi's rarely knew the extent of forces arrayed against them and had no ability to communicate and coordinate their own in response to the attack. This was painfully evident in the large flanking manoeuvre to the west that Schwarzkopf used to cut off front line forces from Iraq's reserves and supply lines. While the mobility of the coalition forces was a prominent factor in the success of this battle, the Iraqi's could not mount an effective response because they had no communication between units and their commanders in Baghdad.

Control warfare is the destruction of command and control facilities of the military and civilian infrastructure. This includes, inter alia, command centres, early warning systems,

military was also successful in breaking the Japanese Navy and Embassy transmissions before Pearl Harbour but failed to heed the signs of impending attack.

⁷⁸ibid.

⁷⁹ibid. p.26

telephone and telecommunication hubs, electric or nuclear power centres, and main arteries of supply and support. To those of the late twentieth century, this targeting preference appears logical, but strategists of W.W.II would have been amazed at the ranking order and the ability to follow through upon such a course of action. The technological changes across society at large are reflected, not only in changing military capability, but also in societal dependence on technology and its sub-structures.⁸⁰ While information dominance and control warfare are essentially operational and tactical changes in the conduct of warfare, there are wider structural changes that are necessary or threaten the coherence of armed forces. It can be argued that budgetary constraints have been acting to reduce forces in industrialized nations throughout the world. However, technological improvements may smooth this trend. Increased force potential through greater lethality, mobility and targeting may suffice to maintain force capability. However, larger challenges face armed forces under a technologically determined capability, John Arquilla notes; “The changes necessary to exploit the potential of information dominance go well beyond the technologies themselves, implying also a need to reshape military organization, strategy and doctrine. For a new technology, simply grafted onto existing structures, will have negative effects.”⁸¹ History is rife with examples of the misuse of technology because it wasn't understood or was integrated into armed forces without due concern for its effect. Arquilla goes on to suggest

⁸⁰For a discussion of society and technology see Slavko Splichal and Andrew Calabrese Information Society and Civil Society and Nathan Rosenberg Exploring the Black Box: Technology, Economics, and History.

⁸¹Arquilla. p.29

that new technology can be a force multiplier.⁸² However, this does not conform to experiences in the application of technology in society at large, or in big business. In these instances, technology has been known to create more positions and require outside technical services, and hasn't become dramatically effective without large societal changes, such as the movement towards "work at home" with personal computers and telecommunications.

Military institutions have both a need and advantage in restructuring their own organizational profile. Already receptive to new technology and possessing a highly structured chain of command, military organizations possess a relative advantage in addressing new technology, albeit large organizations have a bureaucratic inertia which takes time to overcome. There are two large organizational changes which occurred unintentionally during the Gulf War that may be a harbinger of a revolutionary structural change. The first innovation was the Black Hole planning group; an ad-hoc organization staffed mainly by people outside the military inner circle and by civilians in Riyadh. The second innovation was an ad hoc group formed by Schwarzkopf at the field headquarters to coordinate coalition forces; a group which assumed increasing importance as the war went on.⁸³ Both of these structures disappeared quickly after the ground campaign and may be symbolic of the organizational necessities that are forced under the complexities of control warfare. Unforeseen by military planners was the devolution of command and control functions outside the theatre, of conflict. "...but the dependence of modern military organizations on vast amounts of information, and the relative ease with which communications

⁸²ibid.

⁸³Keaney and Cohen. p.247

technology could disseminate the information, meant that supporting authority would, in some measure, trickle out of the theatre."⁸⁴ In the basement of the Pentagon, at Langley Air Force Base, and at Space Command/NORAD in Colorado Springs, staffs were involved in the detection of Scud attacks on Israel and Saudi Arabia, helped pick targets and plan attacks, kept up to date supply information for the theatre, and provided weather reports. The implications for the future of warfare are monumental. First a command and control structure, although not 'hands on' in the theatre, is insulated and protected. Second, the theatre commander can tap the extensive expertise of staff thousands of miles away instantaneously. The direct result could be more than a trend as in the Gulf War and lead to the transformation in the nature of military command and structural organization.

The Future of Strategy

The dominant military thinkers in history, Carl Von Clausewitz and Sun Tzu, wrote little about the nature of information in warfare. Clausewitz believed that while information was important it usually lost much of its value in the "fog of war".⁸⁵ Sun Tzu emphasized that information was valuable in surprise and night attacks only.⁸⁶ In the twentieth century the expanse of the battlefield due to mobility, air and naval power, and precision warfare has necessitated the ascent of information. Although operational and tactical changes have been forced due to the

⁸⁴ibid. p.248

⁸⁵Book Two, Chapter Two.

⁸⁶Sun-Tzu. The Art of War. Ralph Sawyer ed. Barnes and Nobles Books, New York. 1994. p.134-137

momentum of technology, it is strategy that needs to be consciously altered. Here, the significance of what strategy is comes to bear upon the future efforts of the armed forces of all nations. Therefore, an understanding of *total strategy* as the evolution of strategic thinking in the twentieth century is particularly relevant. The four dimensions of total strategy: *logistical*, *operational*, *social*, and *technological* and the interaction among them in the conduct of future warfare will increase due to technology and the limited financial capabilities of individual military organizations. The failed efforts to understand *total strategy* has been detrimental to the conduct of numerous battles over the past century and has shown little sign of abating in the coming years.

In a RAND and National Defense Research Institute study labeled *The Present and Future of Warfare* certain conclusions emerged that challenge the nature of the new paradigm of precision warfare as conceptualized by military theorists such as Richard J. Dunn III.⁸⁷ Precision warfare is theatre dependent in its effectiveness, and in future conflicts is not likely to be as obliging to this form of warfare as in the Gulf. Also, the United States is not likely to monopolize technology in such a fashion again. As a result of the Gulf conflict, strategy, of course, is already mutating as nations learn not to be open to the type of warfare to which the U.S. is now most capable.

Recent Russian strategic writings indicate that the future of war will be a high-tech regular combat battlefield. Precision weaponry, information support and electronic warfare will

⁸⁷Bennet, Bruce W. [et al.]. Theatre Analysis and Modelling in an Era of Uncertainty: The Present and Future of Warfare. RAND, Santa Monica. 1994.

combine into an integrated combat system that will fundamentally change the nature of warfare.⁸⁸ It is easy to conclude that the political/economic situation in Russia prevents them from pursuing this strategy. Indeed, most nations face such a difficult economic situation that it is unlikely that any will pursue high-tech, high-intensity warfare. Armed force build-up is usually a matter of regional considerations where conventional attrition based warfare still has great relevance. The most likely type of warfare which high-tech nations are likely to face in the near future, as evidenced by the international arena after the cold war, is low-tech irregular combat. The RAND study refers to this as the "ability to deny battle".⁸⁹ Control warfare in this environment is exceedingly hard to pursue and requires specific strategic developments along with a different emphasis in technological capability. The problems and challenges forced by this type of combat were evident in U.S. operations in Mogadishu, where simple communication devices such as cellular phones, runners and drums evaded U.S. strategic 'considerations'.⁹⁰

Strategy will have to be much more fluid and much more total, grasping the full impact both vertically and horizontally of logistics, social-political, technological and operational developments. Political considerations seemed to have negated the deterrent effect of nuclear arsenals upon those countries determined to practice low-tech/intensity warfare. Generally, domestic opinion will not accept the use of overwhelming force upon a less capable nation, especially when there is no direct threat to the homeland. In this environment, strategic events are

⁸⁸ Dick, C.J. Russian Views on Future War. Conflict Studies Research Centre, The Royal Military Academy Sandhurst, 1993. cited in Bennet, Bruce. The Present and Future of Warfare.

⁸⁹ibid. p.44

likely to have more impact than originally presumed by technology advocates. Indeed, since the passing of the Cold War bipolar relationship the uncertain and unpredictable international environment translates into increased strategic considerations. Cold War planning is not capable of dealing with the possible contingencies of the international environment, or the possible responses as a result of technological breakthroughs. The much heralded military-technological revolution is not yet evident, for strategy and structural changes have not been implemented in order to take advantage of technological change. The Gulf War has indicated that change due to technology is occurring haphazardly in 'pockets' throughout the armed forces. Strategy has not been addressed and force effectiveness will continue to suffer as technology is implemented without due concern for the stress placed upon attrition warfare based institutions coping with control warfare mechanisms. Total Strategy needs to be comprehensively approached before the ability to pursue control warfare outstrips the capability to control it. That is, more accurate, more destructive technologies will emerge which will be put into a theatre of operations without either knowledge of their potential capability (or misuse), the ability to integrate properly the technology, and the failure to adjust strategy appropriately. As such, a basic understanding of the components of strategy and their evolving nature is central in an era of technological proliferation.

The developments in the command and control structures that occurred spontaneously during the Gulf War indicate the importance of realizing technological change and adjusting social structures accordingly. A military revolution has occurred in the past both under the auspices of military organizations and inadvertently from the civilian community. Whether social structures are military organizations, government agencies, political groups or private

⁹⁰Arquilla. p.30

corporations the analysis of technology is central to developing political policy and military strategy. Two of the three distinguishable military-revolutions over the last two hundred years signify great surges in the lethality and mobility of armed forces and indicate the areas where technologies have altered war. Consequently, war and its political utility in the international arena has at times been shaped by new technologies and their process of assimilation.

The expansion of the battlefield in the post-Gulf War era introduces an era of possibility in which conventional forces are being rejuvenated within the nuclear powers and war has again entered the policy equation. This assessment must always be tempered with the consideration of the societal constraints which impact upon war. In the United States this can be found in the overriding desire of the general populace for “bloodless war”; the ability to pursue foreign policy initiatives and homeland defence with little chance of casualties. The rapid influence of the Gulf War on American military policy is partially attributable to its extensive use of high-technology and the perceived correlation with low Gulf War casualty rates, which, of course, is only part of the equation. Additionally, the movement towards small, highly trained, powerful armies/units and the reliance on technology is driven by similar concerns. Assessing the potential of military force in the following years requires an analysis of the likely movement of technology, strategy and organizational capability combined with an understanding of the relationship of warfare to society at large.

The New Face of War

If it is true that every part of war is touched by technology, it will be no less true that every part of technology affects war. Indeed, technologies not ordinarily regarded as military, such as roads, vehicles, communications, and timekeepers, have done as much as

weapons and weapons systems to shape the face of war. That infrastructure goes a long to dictate the character of organization, logistics, intelligence, strategy, even the concept of battle itself.⁹¹

Sparked by the industrial revolution, technological innovation has been the engine of modern society and of modern warfare. The nuclear umbrella operated as a damper on the utilization of technologies continuously being developed in the defence industries. The development of weapons and platforms continued unabated as societies searched for a way to break the nuclear stalemate and return war to a tool of policy. The Systems Revolution of the inter-war and W.W.II period continued to develop to the point where it has become the dominant paradigm of military affairs, while the nuclear issue enveloped grand strategy. Facilitated by the collapse of the Cold War and international bi-polar tension, the Persian Gulf War (1990-1991) broke many barriers in the use of force in modern times. Spawned by the silicon revolution, changes in modern warfare have resulted from the introduction of computer technology, satellite communications systems, precision guided munitions and leaps in the mobility of almost all types of forces. Occupying the centre of new technological aspects of warfare are the concepts of *information dominance* and *control warfare*. The air war in the Persian Gulf conflict has been earmarked as the real revolution in modern warfare where air force technology now overrides all other types of warfare. Indeed, it has been surmised that technology has finally allowed airmen to achieve what visionaries such as Douhet and Mitchell had predicted in the 1920s and 1930s. However, as noted by the authors of *The Gulf War Air Power Survey Report*, "[this view] tends to overlook how results envisioned by the earlier theorists differ from those envisioned by the

⁹¹Crevelde. Technology and War. p.311

architects of the Desert Storm air campaign."⁹² One of the prime differences allowed by the advance of technology was the targeting of the 'nervous system' of Iraq as opposed to a traditional industrial bombing approach. Tactical and strategic possibilities required new formulations of procedure and targeting lists not because these targets were especially new to military planners but that they could actually be hit successfully in a short period of time.⁹³ Precision guided weapons alone were not the sole explanation for this since these weapons had been used in the Vietnam war, although the technological capability had been improved upon considerably in the intervening years. The use of widespread 'precision strategic bombing' with the use of precision guided munitions, mainly laser guided bombs, represented the real departure. The acceptance of, and willingness to use, high grade technology *en masse* differentiated this air campaign.

The employment of weapons in the war saw a qualitative change more than a quantitative one in which new technologies were employed in a more technologically conscious manner. The impetus of technology in the air force was to be paralleled in the development of land force capability. Richard Dunn sees the revolution in land warfare as a paradigm shift pushed by radical technological developments in precision weapons and enhanced mobility.⁹⁴ The analytical error that Richard Dunn makes is that he neglects the essential component that has allowed mobility to be effective and precision weapons to be used at all, that is information and

⁹²Keaney, Thomas and Cohen, Eliot. The Gulf War Air Power Survey Summary Report. Washington, D.C. 1993. p.236

⁹³ibid. p. 239.

⁹⁴Dunn, Richard III. From Gettysburg to the Gulf and Beyond: Coping with Revolutionary Technological Change in Land Warfare. p.47

communication. Alternatively, Martin Van Creveld contests the idea of a revolution in land warfare, in that there is no replacement for the internal-combustion engine or the track based suspension system.⁹⁵ What Van Creveld seems to ignore is the radical improvements in existing technologies which have made them so much more mobile and lethal. The drive towards miniaturization has made the mounting of new technologies and the command systems necessary to make them feasible for all types of platforms. One of the key areas in which the face of war is being transformed is the **spectrum of technologies**. Not only have existing weapons been improved to very high efficiency ratings and increased lethality but a huge spectrum of new technologies both directly and indirectly related to combat have had calamitous effects on war. It is increasingly apparent that these new technologies have made it very difficult for even major industrial powers to keep up with the pace of technological change. This is naturally reflected in the economic inability of the individual nations to invest in every potentially crucial area of technology and in this sense has made the war "effort" increasingly complicated and draining. In contrast, there is also a wider variety of strategic options available to those nations that are capable of economically pursuing the latest technologies.

The use of new technologies in the Gulf War is representative of a far larger shift in the technology-military relationship. Precision guided munitions, fast deployment and highly mobile forces were capable of stunning successes in the Gulf War due primarily to access to information and a weak enemy. Each of these 'systems' can not operate effectively without a great deal of information, properly assessed, channelled and acted upon. This is the basis of the next

⁹⁵Creveld. p.273

revolution in warfare. The Gulf War was in many senses a primitive testing ground for warfare based upon the unification of a variety of completely unrelated capabilities in warfare. These were strung together only by real-time access to data regarding the enemy forces, command, positions, and support and supply. As well, information regarding forces was increasingly relevant to allied inter-communication and strategic deployment. Kenneth Keller alludes to the significance information based technology is having on military infrastructures, "Command, control, communications and intelligence (C³I), the bases for military strategy and tactics, all now depend on new developments in information technology."⁹⁶

The display of modern technology in the Gulf War was more accidental in its usage of information technology than it was premeditated. The allied forces, principally the U.S., had been pursuing the capabilities surrounding the 'electronic battlefield' but were far from prepared in how to manage and exploit strategically the technological advantages. As the conflict proceeded the ad hoc organizational groups supplanted entrenched W.W.II paradigm institutions in order to utilize and organize the technology. The first organizational innovation was the Black Hole Planning Group, in Riyadh, and was the closest equivalent to a reconnaissance-strike complex put together in order to interpret swiftly data and plan strikes.⁹⁷ The second innovation was completely unforeseen, developed out of necessity, and revolved around the dispersion of much command and control activity outside the theatre of operations. Swartzkopf and other commanders had access to staffs in the basement of the Pentagon, Langley Air Force, Space Command and other centres

⁹⁶Keller, Kenneth H., "Science and Technology". Foreign Affairs. p. 123

⁹⁷Keaney and Cohen. p. 247

that had real-time telecommunications links and were responsible for everything from support and supply to providing warnings of missile attacks.⁹⁸

The ever growing use of telecommunications and information on the battlefield was also a result of the growing dispersion rates of soldiers in the field resulting from increases in lethality.⁹⁹ Geoffrey Bellamy indicates that as technology has increased from primitive weapons to modern artillery, or more specifically as lethality of weapons has increased, it has created a subsequent and often proportional rate of dispersion among soldiers on the field.¹⁰⁰ As weapons have become more lethal, in that they have a greater area of effect, troops have spread out to decrease causality rates and in large part this has worked.¹⁰¹ Dispersion has increased faster than lethality as apparent in the decreased casualty rates in combat that were lower in W.W.II than in W.W.I and less again than the American Civil War.¹⁰² Geoffrey Bellamy hits on many of the important underlying trends in the development of warfare. Unfortunately he calls the introduction of new weapons, so responsible for the increased lethality capability, as being a revolution in

⁹⁸ibid.

⁹⁹ Dispersion rates refer to the number of square meters per man in combat.

¹⁰⁰Bellamy, Geoffrey. The Evolution of Modern Land Warfare: Theory and Practice. Routledge, London. 1990. p.46. see the related tables on lethality vs. dispersion rates - figures 2.1, table 2.1

¹⁰¹Of course, medical technology on the field has also improved and will affect the qualitative and quantitative measure of casualty rates, and while it most likely that this will not significantly skew the statistics, Bellamy makes no mention of this.

¹⁰²The statistics Bellamy uses indicate the following dispersion rates for different periods; American Civil War, one man occupied 200 square meters, in W.W.I it was one man per 2,000 square meters, and in W.W.II, one man over 20,000 square meters. ibid. p. 47

warfare.¹⁰³ In this vein he abuses Kuhnian paradigm shift to mean leaps in technological progress, where in fact, as demonstrated in the previous military revolutions, they are wholesale changes in basic guiding philosophies, procedures, social conduct and in general alter the focus of further technological or theoretical investigation. All in all, the end effect of increased dispersion among soldiers and logically units, companies, battalions and whole armies was to necessitate effective methods of communication and control. The Systems Revolution of the 20th century perfected these techniques and encouraged growth of military infrastructure and whole systems of intercommunication between the resources of the state, the different military arms and by and large the entire international community.

Contributing to this is the ever expanding complexity of supplying, supporting and deploying a vast military organization on a highly mobile basis. Combined with the great distances over which military operations now take place, these trends are positioning information-based warfare to the front of military concerns. The logic of information dominance does not appear that alien to traditional concepts of warfare. However, John Arquilla notes that the concept of dominance implies that the advantage decisively enhances one's own strength.¹⁰⁴ The Gulf War displayed a situation where such complete and overwhelming information dominance was matched by force and weapons technology to equal a clear change in the nature of combat. A unique manifestation of information warfare was the use of space-based communications on a universal level with a qualitatively different emphasis. For example, hand-held global positioning systems

¹⁰³ *ibid.* p.41

¹⁰⁴ *Op. cit.* Arquilla, pp.29-30

(GPS) were widely used by field commanders resulting in the near eradication of the "lost-lieutenant" syndrome and increased overall control by the operational commanders.

Information dominance is bolstered in its validity by the emerging telecommunications revolution in other areas of society, most important of which is the individual and governmental involvement in these areas. Information dominance under the impetus of tactical developments, the need for technology to run more advanced technology, and the overall movement towards greater technological innovation has resulted in the mounting strategic importance of information control. The new face of warfare is not merely the acquisition and acceptance of new technology in the battlefield but is centred around a certain strategic and political view of war. It is a logical assumption that the majority of powers, especially those involved in regional conflicts, will continue to pursue warfare on a W.W.II paradigm for reasons of bureaucratic inertia and economics. Those who can follow the new method of warfare based upon information dominance and a "systems approach" will have a distinct advantage in the international arena.

The ability to attack, control, misinform, blackout and altogether dominate the 'nervous systems' of an opponent is the essence of control warfare. While the field of international relations has a proliferation of ideas regarding the "systems" approach to international relations, the sub-field of strategic studies has been noticeably void of such concerns. The available technology, in concert with the appropriate strategy, can allow this form of control warfare to be exercised. The conjuncture of developments in weapons technology, in both lethality and mobility, the telecommunications revolution and overall reliance on these type of systems by civilian and military organizations ensures that the next "revolution" in warfare is waiting in the wings. The

coming changes to the nature of warfare will be acutely felt in institutions that are unable to find a doctrinal foundation upon which to base future development. As Lt-Col J.P. Sweetnam asserts, it is the uncertain global political environment and the nature of modern warfare that is pushing the massive reorganization and re-alignment policies in many armed forces.¹⁰⁵ Assessing military structure and its use in the future will require a complete understanding of how the current changes in technology, mainly the communications/information revolution, will change institutions and the outcome of conflicts and in so doing usher in a true revolution in warfare.

In sum, the Gulf War did not display the necessary elements of change in how society views war, its purpose and utility and lacked any large scale organizational alterations found in previous revolutions in warfare and can not be considered a revolution in warfare. However, new technologies of war, that is the specific technical/strategic components of warfighting, have clearly emerged and are beginning to have an impact upon military organizations. The structures and capabilities of military organizations have begun to feel the pressure of increased technological capacity and while ad hoc institutions were created during the Gulf War, they are not sufficient in depth or breadth of their impact upon the military to be deemed revolutionary. Indeed, the structural violence often associated with this transformation is not apparent and the conduct of the U.S. military in this scenario was to merely extend those structures or strategies already existing in order to incorporate its new capabilities; capabilities it often did not know it had, or that would be successful, until well into the conflict. Most important in light of the Gulf War is the fact that very few alterations in international understanding of conflict and

¹⁰⁵Sweetnam, Col. J.P. "New Thinking in the US Army: The Louisiana Maneuvers, Battle Laboratories and the Third Wave Army" Canadian Defence Quarterly September 1994 p. 23

the conduct of wars have appeared in the wake of the Cold War and the Gulf War. As such, changes in how humankind views conflict and the individual state's role in the international system have not emerged and, as the historical studies indicate, may be the necessary precursor to a true revolution.

In the end, the structural framework provided via the five components of a revolution, which are; a revolution is first identified by crisis, a revolution occurs within a relatively compressed time frame, a revolution is marked by the alteration of the relationship of war to society, a revolution changes the demands made of military organizations, and a revolution produces the specific strategic technical changes in the strategies, technology and weapons of warfare, combined with the historical analysis provided above may indicate a much different conclusion regarding the nature of warfare during the latter part of this century than has been assumed by much of the current literature.¹⁰⁶ The quantum leaps in communications technology, the overall information revolution, enhanced military platform capabilities (sophisticated computers and communication on tanks, ships, planes and the individual soldier(GPS)) have combined with massive increases in force mobility, weapons accuracy and lethality to create a highly integrated military structure both within and between each arm of the military (navy, airforce, army). As such, although a revolution in warfare has not emerged there have been increasingly complex adaptations to existing military capabilities. Just as the Systems Revolution continued to develop underneath the umbrella of the Nuclear Revolution from the 1950s until it lost its impetus with the collapse of the Soviet Union, the Systems Revolution continues today.

¹⁰⁶ see Introduction

Modern military organizations in all their complexity now have the capability to act as a single military structure instead of group of structures attempting to work together through the fog of war.

While the information and capability exist, it is clear that this coordination and integration of the military “body” is far from perfect, complete or even desired. Smashing the growing “myth” of the current revolution in warfare reveals the very complex evolution of the Systems Revolution continuing underneath. Study of the evolution of military organizations must be tempered with the knowledge that very few countries are currently capable of this evolution and most military structures are several evolutionary steps behind the leading countries.¹⁰⁷ Further analysis of different military organizations is required as well as study of the changing nature of international conflict and the complexities behind the emergence of joint international military action by multi-national bodies such as the UN and NATO.¹⁰⁸

¹⁰⁷ The United States is the obvious leader in technology and integration ; most of the NATO countries are at some stage of evolution, Israel, parts of the Chinese, Indian, Russian military and other countries in varying degrees.

¹⁰⁸ See FREEDMAN, Lawrence. “The Revolution in Strategic Affairs”: IISS Adelphi Paper 318

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