by Dr. Scott Robertson

[The military] is like a sailor navigating by dead reckoning. You have left the terra firma of the last war and are extrapolating from the experiences of that war. The greater the distance from the last war, the greater become the chances of error in this extrapolation. Occasionally there is a break in the clouds: a small-scale conflict occurs somewhere and gives you a 'fix' by showing whether certain weapons and techniques are effective or not: but it is always a doubtful mix . . . For the most part you have to sail on in a fog of peace until at the last moment. Then, probably when it is too late, the clouds lift and there is land immediately ahead; breakers, probably, and rocks. Then you find out rather late in the day whether your calculations have been right or not.[1]

The strategy and operations of any war can be understood only in the light of conditions of the ten or twenty years before its beginning. Technology, organization, doctrine, training, command and staff appointments–all the essentials of action in war–are put in place and developed in peacetime. The testing experience of combat will bring about change, but prewar elements continue to affect many events throughout the longest of conflicts.[2]

H.J. Mowat. A NIGHT RAID. Canadin War Museum CWM 8559

EXPERIMENTATION AND INNOVATION IN THE CANADIAN FORCES

During the Spring of 1940, just as the 'Phoney War' was coming to an end, one finds a telling juxtaposition between getting it right and getting it wrong. On one side of the English Channel, troops from the 1st Canadian Infantry Division deployed to the Trench Warfare Training and Experimental Centre at Imber. There, they would undertake an eight-to ten-day course in trench warfare. This programme of training, for all intents and purposes, prepared the 1st Infantry Division for the middle years of the Great War of 1914-1918. At the same time, on the opposite side of the Channel, *Panzergruppe Kleist* was ripping through the French front line west of the River Meuse on its drive to the Channel coast.[3] The reasons for this juxtaposition, while complex, can be summed up by Sir Michael Howard's observation, namely that the strategy and operations of any war can only be understood by examining the developments of the previous ten to twenty years. On the one hand, the Canadian Army in 1940 was an institution that had suffered from a prolonged period of political and professional neglect. The German Army, on the other hand, was the product of a period of professional development and innovation that remains today very much a model to be studied and emulated.

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FACING THE FUTURE

Throughout much of the West, military establishments are wrestling with complex factors that will influence the way armed forces organize, plan and equip to fight future battles. This planning environment is shaped by two competing, some might even say contradictory, considerations. The first is the aftermath of the Cold War, which brought with it an understandable desire to reduce the expense associated with large and technologically sophisticated armed forces. This desire is not new, or even remarkable. It has been a hallmark of the aftermath of most modern conflicts. The second shaping consideration arose largely from the conduct of the Persian Gulf War. Military establishments around the world watched in awe the performance of the Coalition force. That performance was characterized by a degree of technological sophistication, married to doctrinal and operational concepts that resulted in a new vision of what high-intensity, fast paced operations of the future might entail.

Across the Western defence community and beyond, we are witnessing a vigorous effort to master the problems of reduction in force structure, and at the same time ensure that armed forces make the best use of technological and doctrinal changes brought to light by the Persian Gulf War. In part, this effort is driven, at least in the West, by the prospects for what has come to be termed a Revolution in Military Affairs (RMA). A RMA has been defined as "a major change in the nature of warfare brought about by the innovative application of technologies which, combined with dramatic changes in military doctrine, and organizational concepts, fundamentally alters the character and conduct of operations."[4] So far, however, the discussion of the RMA has not reached definitive conclusions. As one commentator noted recently, "the exchanges [over the RMA] have become increasingly intense. The two positions, pitting advocates against doubting Thomas', contrast a revolutionary interpretation as opposed to an evolutionary one."[5] Undoubtedly, this debate will continue in the years to come.[6]

The challenge this poses for armed forces is significant. To quote again from Sir Michael Howard: "there are two great difficulties with which the professional soldier, sailor, or airman has to contend in equipping himself as a commander. First, his profession is almost unique in that he may only have to exercise it once in a lifetime, if indeed that often. Secondly, the complex problem of running a [military service] at all is liable to occupy his mind and skill so completely that it is easy to forget what it is being run *for.*"[7] Faced with this situation, it is hard for armed services to consider long-term future requirements removed from the press of day-to-day matters. Difficult as it may be to stand above the day-to-day, there is a compelling requirement, otherwise one may find oneself in a position similar to that of the 1st Canadian Division in May of 1940, training for trench warfare.

EXPERIMENTATION AND INNOVATION

What steps need to be taken to ensure that the armed forces of 2020 do not find themselves in a situation similar to that faced by the Canadian Army in Spring of 1940? Put another way, how do armed forces, such as the German Army of the interwar years, transform themselves in a way that they overturn the previous model and embark upon something significantly if not radically different? Absent the opportunity to hone skills and judgement on the battlefield, armed forces need to look to their equivalent of the laboratory to undertake a comprehensive programme of experimentation and innovation.

While this may appear so obvious that it is hardly worth mentioning, the reality is very much the opposite. In a recent study on military innovation during the interwar period, Williamson Murray noted: "To understand innovation … one must not lose track of the fact that the interplay among human factors, uncertain knowledge, misreadings of the past, political and strategic parameters placed innovation on a complex playing field in which not only were the players uncertain of the future, but they were often more concerned with immediate problems than with long-range changes."[8] This observation is a trenchant statement of the problems confronting military planners. It is often difficult enough to sustain the current force, let alone attempt to envisage long-term influences that may affect the future nature of war through technological, doctrinal or organizational developments. The problem is, as Murray reflected, a case of military planners endeavouring to prepare for a war that "will occur at some indeterminate point in the future against an unidentified opponent, in political conditions that cannot be accurately predicted and in an arena of brutality and violence which one cannot replicate."[9] Faced with this, what factors and influences are central to the process of translating a notion of future, perhaps even revolutionary developments, into a capable force structure in the face of external and internal constraints? Clearly, experimentation plays a key, if not critical role in this endeavour. The degree to which one is likely to be successful is dependent, to a certain extent, upon developing an overarching approach to guide the process of experimenting with innovative force development concepts.

While the Canadian Forces have, over the years, carried out some measure of experimentation, this has by and large focused on individual systems and the means of integrating these weapons systems into existing structures and doctrine. The CF has had little experience with higher level experimentation. In large measure this is understandable: for much of the past fifty years the Cold War defined and determined military requirements. The apparent certainty of the Cold War, coupled with the largely tactical-level focus of the CF resulted in a situation in which the compelling question was "how much is enough?"

Events of the past decade have altered the strategic context. At a stroke, the apparent certainty of the Cold War was replaced by a confused and confusing geopolitical situation. While the overwhelming threat posed by the Cold War no longer exists, and as there is nothing on the horizon that would indicate a threat of the same magnitude re-appearing, the future is both murky and fluid. Paralleling this strategic confusion, most of the 1990s were taken up by a period of reduction and rationalization. Significant developments in military arts and sciences, while not unnoticed, have taken something of a back seat to this process. The risk, however, is that without devoting sustained attention to the future, we may fall prey to the same fate that plagued the Canadian Army in the early years of the Second World War.

EXPERIMENTATION AND THE CANADIAN FORCES

A number of factors suggest that the Canadian Forces has reached a point where it can turn its attention from matters of the moment to longer term issues that will affect its future. A major indication is the initiative that culminated in Strategy 2020, the aim of which was to develop a roadmap to meet the imperatives of the period twenty years hence. After some considerable effort, one of the more significant outcomes of the *Strategy 2020* process was to identify the need to produce an innovative, transformed force model. While the specifics of this are not clear, in fact they cannot be clear at this early stage, the objective has been set. To a large extent, success of the *Strategy 2020* exercise will hinge upon the framing of a programme of innovation. And, in developing this programme, experimentation will be critical.

Flowing from the *Strategy 2020* initiative, there has been a nascent but still evolving effort to consider how a coherent experimentation capability could be fostered within the CF. This initiative has gained momentum over the past months. *Defence Planning Guidance 2000 (DPG 2000)* included a reference to the need to establish a CF experimentation capability. At this juncture, no resources have been set aside to create this capability, and departmental thinking is only in a preliminary stage, but at least the ground is being prepared. It may be well to consider some of the more significant issues that will undoubtedly arise if the experimentation initiative is to move forward.

Before the CF leaps into experimentation, however, some thought should be given to exactly what is meant by it, and what it can provide. The United States Atlantic Command defines experimentation as *"an iterative process of collecting, developing and exploring concepts to identify and recommend the best value-added solutions for changes to DOTMLP (Doctrine, Organization, Training, Materiel, Leadership and People) required to achieve significant advances in future joint operational capabilities."*[10] If one were to deconstruct that definition carefully, there are a number of significant aspects to consider. The first is the iterative nature of the experimentation process. Second, is the emphasis on collecting, developing and exploring concepts. This is the heart of experimentation, and probably where the greatest difficulty will lie when the philosophical underpinnings of scientific enquiry come up against those of the military culture. A third aspect of this definition is the identification and recommendation of solutions.

Taken together, this definition is a fairly all-encompassing representation of experimentation in a general sense. However, the difficulty will be in devising a framework within which experimentation can take place, and a philosophy that should serve to guide our enquiries. For instance, experimentation depends on a spirit of inquiry that in some ways runs counter to the military culture. The table below sets out some of the distinctions between the military and scientific cultures as they apply to experimentation.[11]

This is not intended as a criticism of either the scientific or military cultures. It is simply a reflection of the characteristics of two different worlds driven by two different philosophies or outlooks. However, it may be important to recognize these differences when the two worlds come into contact, as will be the case when the military embarks upon a programme of experimentation.

A CONCEPT FOR CF EXPERIMENTATION

In embarking upon a programme of experimentation, the CF should give considerable thought to an overarching concept to guide its efforts. As a basic premise, CF experimentation should proceed from the general to the specific, or, put another way, from the hypothetical, through the conceptual, to the detailed examination,

The Scientific and Military Cultures	
Scientific Culture	***Military Culture***
• driven by discovery • hierarchical • embraces the unknown • externally directed • long-term orientation • outcomes are secondary	• driven by knowledge • non-hierarchical • avoids the unknown • internally directed • short-term orientation • outcomes are paramount

Table 1: Comparing The Scientific and Military Cultures

ultimately leading to a validated idea or principle after a number of iterative examinations. There is an implied hierarchy to this. The table below depicts this implied hierarchy and suggests the nature of the activities as well as the methodologies that will predominate at the various levels.

At the exploratory and strategic levels, the preponderance of activity will be conducted at the CF level by a CF experimentation facility, although clearly the services will have a role to play and an impact on this level of activity. At the operational level, the activity will be balanced between the CF and the service experimentation facilities. Finally, at the tactical level, most of the activity will be borne by the service experimentation facilities, as depicted in Figure 1.

The aim of conducting experiments is to generate and explore issues associated with future warfare with an eye to developing force structures. Broadly speaking, these issues could be grouped into a number of general categories. One such grouping could be:

- geo-strategic;
- technology and trends;
- evolutions in military art (doctrine); and
- human and organisational issues.

It is important, however, to consider these separate categories as part of a larger whole. Developments or changes in one area have the potential to affect any or all of the others. Hence, there is the potential of a spill-over or knock-on effect which must be appreciated in approaching experimentation.

Given the problem of considering appropriate force structures for an uncertain future, and the interconnected nature of the various elements that must be combined to generate a force model, the approach to experimentation should be both cyclical and iterative. In that sense, it would parallel the CF Future Process, which itself should be cyclical and iterative. At this point, there is *not* really a formal CF Future Process. Rather, there has been a distributed, *ad hoc* approach to future issues and considerations. In time, a formal process such as the Defence Planning and Force Development Process (DPFD) might supersede this.

Given the CF's lack of recent experience with high level experimentation, it may take some time to find our way. As such, it might be worth drawing on historical experience. Andrew Krepinevich alludes to several examples where experimentation was key to a process of military innovation.[12] It may be useful to illustrate by means of historical example, such as the development of *Blitzkrieg*. At the end of the First

Level	***Activity***	***Methodologies***	***Examples***
Exploratory	Hypothetical	Brainstorming	Seminars
Strategic	Conceptual	Qualitative	Seminars Table top discussion
Operational	Validation	Qualitative & Quantitative	Seminars High-level simulation
Tactical	Design	Quantitative	Force design Modelling and simulation Live trials

Table 2: Notional Levels of Experimentation Activities

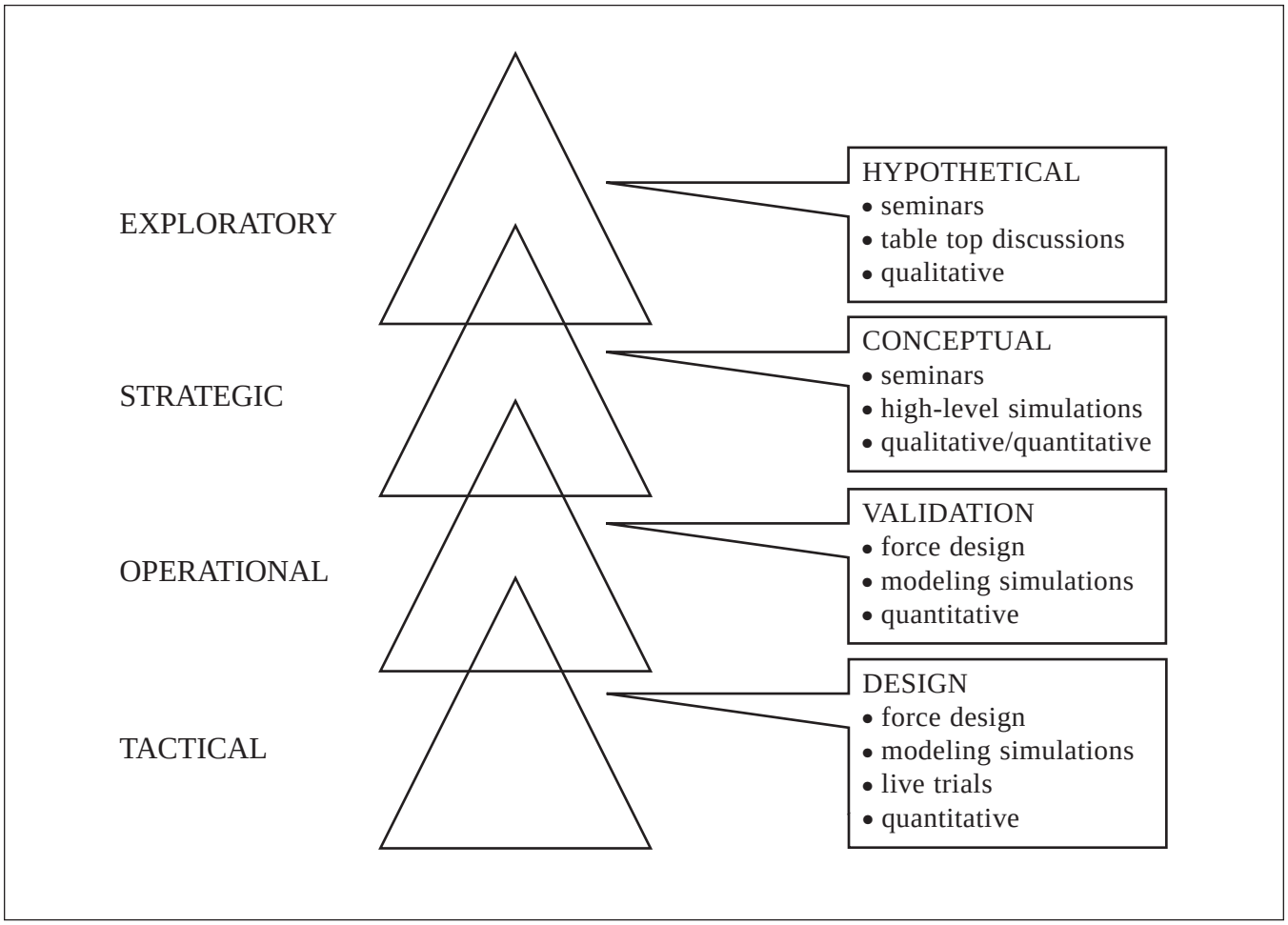

Figure 1: Hierarchy of Experimentation Activities

World War, there existed precursors of what would later come to be known as *Blitzkrieg*. Each of the major combatants emerged from that war with the same basic experience and technologies, and with largely similar organizational and doctrinal approaches. However, following the war, it was Germany that was most successful in building upon these lessons. Rather than simply grafting the lessons and technologies to the existing force model, the Germans undertook a radical re-think. As *de facto* Chief of Staff of the German Army from 1919 to 1926, General Hans von Seekt embarked upon a thorough and serious study of the 'lessons' of the Great War.[13] These were embodied in the force design of the German Army that launched the devastating mechanized attacks in the opening phase of the Second World War.[14] In contrast, other combatants such as Britain and France did not adapt nearly so readily; for the most part, new technology was merely grafted onto existing organizations in piecemeal fashion. Doctrinal precepts did not evolve markedly. As such, there was an incremental increase in combat power, and an incremental change in approach, but nothing as revolutionary as that of the German *Blitzkrieg*. Krepinevich cites a number of other examples of experimentation, beginning with the railroad, rifle and telegraph in the mid-19th century, the emergence of the combination of big-gun battleships, submarines and torpedoes at the turn of the 20th century, and the development of carrier aviation in the period between the two world wars.

It is one thing to simply note past examples of successful experimentation and innovation. It is equally important, however, to identify the factors that aid in the process of experimentation as well as some of the obstacles that stand in the path of experimentation. There are a number of generalizations that one may suggest as being central to a successful revolution in military affairs. Krepinevich identified the key to success as the "trinity of [the] intellectual, institutional and physical" domains. That trinity should be at the heart of experimentation, and is probably a point that cannot be over-stressed. In his view, experimentation:

- is critical to any effort of transformation or innovation;
- is a key part of a process;
- is as much philosophical as it is tangible; and
- must be part of a larger process.

Williamson Murray and Allan Millett, as well as Stephen Rosen[15], have also addressed not only the factors that contribute to successful innovation and experimentation, but the obstacles and barriers as well. Murray claims that revolutionary innovation "appears largely as a phenomenon of top-down leadership that is well informed about the technical as well as conceptual aspects of possible innovation[16]". He also points out, however, that there have been numerous examples where top-down leadership, while certainly present, failed to deliver, citing as a case in point the Royal Air Force and strategic bombing. In this instance "top-down leadership had a disastrous impact on the process of innovation."[17]

A second general consideration is that of the military culture in which a revolution or innovation is being contemplated. "One of the most important components of successful innovation during the inter-war period had to do with the ability of officers to use their imaginations in examining potential innovations."[18] Two other influences merit consideration. Both are negative influences that contribute directly to the failure of a revolutionary development. One is the misuse of history. Murray has stated that of the several barriers to innovation, "[p]erhaps the most obvious is a wilful desire to discard history or to twist its lessons to justify current doctrine and beliefs."[19] Another is institutional rigidity. "Rigidity is undoubtedly a fact of life in many military organizations – one which has exercised a consistent and baleful influence over institutional capacity to innovate."[20] At the risk of oversimplifying, the barriers to transformation can be summarized as follows:

- complacency;
- 're-fighting the last war';
- short-tenure of senior leaders in key posts;
- inappropriate or non-existent analytical tools; and
- lack of a process that 'institutionalizes' innovation.

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A WAY AHEAD

How then, can one balance the understandable difficulties of carrying out a programme of experimentation, against the compelling need to undertake meaningful experiments to aid in innovation? As a first step, there should be a concerted effort to examine and understand the experimentation and innovation imperatives. Only by developing a broad consensus of the value and importance of experimentation and innovation, can the first bridge be crossed. This will be something of a challenge, as it will bring the different perspectives of the scientific and military cultures into conflict. While this type of conflict can be uncomfortable, it can also lead to a better, more comprehensive result. While the scientific culture is moved to seek the best solution, the military culture recognizes the need for a *good-enough* solution. By harnessing the inevitable tension between these two characteristics or traits, solutions can be proposed and tested, and recommendations made.

A second basic consideration is to devise and put in place a coherent CF futures process. Only then can a programme of experimentation assist in meeting the identified need to develop an innovative force model for an uncertain future. As with the basic need to develop a consensus on the requirement for experimentation, this too will face a number of practical challenges. The most significant of these will be weighing short-term immediate needs against the more abstract needs of a longer-term nature. Again, this will require achieving an appropriate balance. Just what that balance might be, or how it will be achieved is, at this stage, difficult to ascertain, but there are encouraging signs. The *Strategy 2020* initiative, coupled with the recent high-level interest in experimentation, is a positive indicator. It is important that the momentum of these two activities be maintained and incorporated into a futures process that routinely addresses the future health of the CF. While this may seem something of a contradiction – in that it calls for the institutionalization of innovation – it is not. What it suggests is that experimentation and innovation should be integrated into larger planning processes. Only then will it be possible for the CF to establish long-term objectives, and to develop effective plans for implementation. This is not to suggest that experimentation is a panacea, for that is clearly not the case. Put starkly and simply, however, experimentation is central to the task of ensuring that in twenty years time we are not preparing for trench warfare when the requirement is for something radically different.

NOTES

1. Michael Howard, "Military Science in an Age of Peace", *Journal of the Royal United Services Institute*, No. 119, March 1974, p. 4.

2. Foreword by Peter Paret, in Harold R. Winton, *To Change an Army: General Sir John Burnett-Stuart and British Armoured Doctrine, 1927-1938* (Lawrence, Kansas: University Press of Kansas, 1988), p. vii.

3. For a fuller discussion of this episode see John A. English, *Failure in High Command: The Canadian Army and the Normandy Campaign* (Ottawa: Golden Dog Press, 1995.), pp. 76-7.

4. This definition, which has been developed by the Office of Net Assessment, US Department

of Defense, is reproduced in Earl H Tilford Jr, "The Revolution in Military Affairs: Prospects and Cautions" Strategic Studies Institute, United States Army War College, Carlisle Barracks, June 1995, p. 1.

5. Jacob W. Kipp, "The Revolution in Military Affairs and Its Interpreters: Implications for National and International Security Policy", unpublished paper presented at a joint conference of the Foreign Military Studies Office and the Academy of State Management of the President of the Russian Federation, September 1995, Moscow, Russia, p. 1.

6. For a full discussion of the notion of a Revolution in Military Affairs, see several of the papers presented at the Fifth Annual Conference on Strategy held at the US Army War College in April 1994. In particular, Paul Bracken and Raoul Henri Alcalá, "Whither the RMA: Two Perspectives on Tomorrow's Army", (Carlisle Barracks PA:, US Army War College, Strategic Studies Institute, July 1994.); Jeffrey R Cooper, "Another View of the Revolution in Military Affairs", (Carlisle Barracks PA:, US Army War College, Strategic Studies Institute, July 1994.); David Jablonsky, "The Owl of Minerva Flies at Twilight: Doctrinal Change and Continuity and the Revolution in Military Affairs",*Professional Readings in Military Strategy, No. 10* , (Carlisle Barracks PA:, US Army War College, Strategic Studies Institute, May 1994.); and, Michael J. Mazarr, "The Revolution in Military Affairs: A Framework for Defense Planning" (Carlisle Barracks PA:, US Army War College, Strategic Studies Institute, June 1994.)

7. Sir Michael Howard, "The Use and Abuse of Military History", *Journal of the Royal United Services Institute*, Vol 107, February 1962, p. 6.

8. Williamson Murray, "Innovation: Past and Future", in Williamson Murray and Allan R Millett (eds.) *Military Innovation in the Interwar Period*, (Cambridge: Cambridge University Press, 1996.) pp. 303-04.

9. Murray, "Innovation: Past and Future", p. 301.

10.USACOM has been designated as the executive agent for Joint Experimentation in the US Armed Services. In this role, CinCUSACOM is referred to as the J-9.

11. See Kenneth F McKenzie Jr., "An Ecstasy of Fumbling: Doctrine and Innovation, *Joint Force Quarterly*, Winter 1995-96, p. 63.

12. Andrew Krepinivich, *"Military Transformation: The Role of Experimentation"* presentation at US Atlantic Command, Norfolk VA., n.d.

13. For a discussion of this see James S. Corum, *The Roots of Blitzkrieg: Hans von Seekt and German Military Reform,* (Lawrence KS.: The University Press of Kansas, 1992).

14. This is but one example, although by far the most frequently cited, of what was a period of intense military development and innovation. Other examples were the advent of carrier aviation, and strategic bombardment to name but two. See for example, Commander Jan van Tol, "Military Innovation and Carrier Aviation: An Analysis", Joint Force Quarterly, Autumn/Winter 1997-98, pp. 97-109; and Williamson Murray and Allan R. Millett (eds.), Military Innovation in the Interwar Period, (Cambridge: Cambridge University Press, 1996.)

15. Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca NY: Cornell University Press, 1991.)

16. Murray, "Innovation: Past and Future", p. 306.

17. Murray, "Innovation: Past and Future", p. 308.

18. Murray, "Innovation: Past and Future", p. 312.

19. Murray, "Innovation: Past and Future", p. 320.

20. Murray, "Innovation: Past and Future", p. 322.

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