



# Effective Wargaming: Impact of the Changing Nature of Warfare

by Sanu Kainikara

## FOREWORD

The global security situation is becoming increasingly complex and military forces around the world are transforming to cope with the extreme fluidity of the situation. The ADF is no exception. Although the global war on terrorism has taken centre stage in the past two years as the main concern of the armed forces, the defence of Australia is still the prime objective of the ADF, as detailed in the recently released review of the Defence Capability Plan (DCP). Regional security concerns and domestic tasks such as border protection further enlarge the operational complexity facing the force.

High-end capabilities are becoming more expensive to acquire and operate while the ADF has to work within the national resource allocation. Optimisation of available equipment and their employment techniques is one of the ways to leverage the scarce resources into greater efficacy. The need of the hour is to generate smarter ways to enhance the decision making process in acquisition and utilisation of equipment to produce the desired capability. These issues require new ways of thinking, which is being labelled 'transformation' within the United States forces.

There is a distinct requirement to encourage innovation and fresh ideas that can be further developed into operational concepts. These concepts can be assessed and verified for their effectiveness by experimentation. Wargaming, simulation and modelling are therefore very valuable tools in this process of 'transformation'.

This paper provides an insight into how wargaming can assist the future development of air power so that Effects Based Operations (EBO) and Network Centric Warfare (NCW) can be optimised to improve the overall capability of the ADF.

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## **EXECUTIVE SUMMARY**

Predicting the future has never been an exact science, even though in the early 1970s some experts were confident that prediction could be made with considerable assurance. While all human endeavours suffer from this dilemma, the dynamic nature of war makes it even more difficult to predict. As a corollary, the armed forces find it difficult to be completely prepared for a 'future' war.

The unpredictability of war coupled with its intricate and costly nature makes experimentation important to the military since it enables the investigation of innovative ideas in a cost-effective manner. Wargaming, simulation and modelling are terms that denote distinct areas of military experimentation.

The origins of wargaming are shrouded in history, the Indian game 'Chaturanga' being thought of as the first formally laid out game that taught the player to anticipate the consequences of one's own actions. In the modern era, war games have been recorded from late 1700s, but the modern war game can be assumed to have been ushered in by the Prussian war counsellor, Baron von Rösswitz, in 1811. War games thereafter played an important role in military circles around the globe, especially in circumstances wherein the actual forces of a nation were reduced either compulsorily or by choice.

During World War II wargaming was used by all the major powers, although the lessons that were drawn and their implementation to real-life scenario varied, dependent on the personalities of the individual commanders as well as on the national socio-political culture. Over the past few decades there has been an increased awareness in the Defence and the broader political community regarding the need to study national security issues and evolve an optimised solution to emerging threats. This has given added impetus to wargaming techniques being refined to provide a tool to enhance decision making at the strategic level.

Military war games can be categorised conceptually under two broad types: analytical and educational. They can also be classified in a time-based manner depending on how a particular game is designed to deal with time. Analytical games assist the higher command echelon in the formulation of high level policies and doctrine, while the educational war game is more conducive to skill development at the lower levels of tactical operations. Educational war games foster an understanding of the profession of arms in a general manner and can also enhance the understanding of joint operations.

War games have to be developed within a robust framework for them to be successful. Their effectiveness will depend on the clarity with which the basic objective of the game is defined and the depth of analysis of the lessons that emerge. War games contribute the maximum to strategic development when they are planned within the context of a relatively stable environment. The current complex global situation makes accurate wargaming extremely difficult and also indicates the necessity to conduct war games that can assist in understanding the uncertainties.

Operational strategies are being changed fundamentally with the advent of Network Centric Warfare (NCW) as the centrepiece of warfighting capabilities. Since NCW uses new doctrine, processes and technology, new techniques will have to be employed in its validation and wargaming. NCW brings in one more stage to the traditional war game and also compresses the boundaries between tactical, operational and strategic levels. The development of NCW war games will involve changes in the gaming environment because they can be played in the cognitive domain.

War games have many strengths and limitations and cannot be used as a substitute for all other types of training. It is not a cost-effective way to train commanders but a tool well suited to supplement other training techniques. That being so, war games are of great benefit to airmen throughout their careers, both as educational tools and for operational training. The utility of wargaming in the evolution of doctrine and strategy cannot

be over emphasised, especially in the current scenario where short duration conflicts do not provide adequate developmental opportunities to commanders.

The current climate of limited resources, the need to limit collateral damage and environmental impact of large scale exercises, combined with the lack of opportunities for higher command teams to develop real life experience in warfighting, brings wargaming to the fore as the only genuine training technique to optimise military power projection capabilities. This paper examines the characteristics of war games and the impact of the changing security environment on wargaming. The paper discusses the complexities of wargaming NCW and highlights the need for air forces to emphasis wargaming NCW.

*There are experts of land, sea and air warfare. But as yet there are no experts of warfare.  
And warfare is a single entity, having a common purpose.*

Giulio Douhet<sup>1</sup>

## INTRODUCTION

Real life security paradigms dictate that a nation and its armed forces be prepared to face all possible eventualities in the sphere of national defence. This indicates the need to have a sufficiently robust method of predicting the future and preparing for it, in order to be assured of at least a modicum of security. The unpredictable nature of human behaviour, which is one of the prime drivers of security imperatives, however, makes the probability of arriving at a clear and successful prediction in this sphere extremely low.

### Predicting the Future

In the early 1970s, experts in many fields were confidently optimistic that they could predict what was going to happen in their areas of expertise. There were even claims that all key areas of civilisation could be predicted with almost complete assurance of correctness. Today despite vast improvements in data collection, manipulation and dissemination, the experts are not so sure. Predictions that have enjoyed publicity and much acclaim as correct have turned out to be incorrect.

Predictions are based primarily on the past, on the belief that there are established patterns and regularities in nature, including human behaviour, that can be counted on to apply in the future.<sup>2</sup> A given set of circumstances is expected to produce a certain result later, evaluated after the relationship has been observed for some time to ensure that it was not negated at any stage. In order to arrive at generalisations, there is a necessity to have sufficient number of observations as well as for a theory of causality to emerge.

Predictions in the domain of physical sciences are done taking into account the 'laws' of sciences with varying degrees of confidence and the predictions themselves are fairly accurate. Their accuracy is purely dependent on the relevance and estimated values assigned to the variables. In the field of social sciences the difficulty in achieving accuracy in prediction is more acute. In this case the human being is the underlying source of complexity.<sup>3</sup> Any sociological, economic or security predictions are almost completely dependent on theories and assumptions regarding human behaviour, combined with the available knowledge of the global scenario. The general principles of human behaviour can never be assumed imperviously and therefore even predictions based on accepted principles at times may, or can turn out to be, completely incorrect.

### Preparing for War

War is the most chaotic of all human endeavours: it is full of unknowns and generally governed by chance. Even if predictions of reasonable accuracy were possible, the only way to master war is by practice and the best practice is obtained from conducting actual campaigns. Training can substitute for the actual combat experience to a large extent, but at the highest level of campaign direction there is no substitute for actual experience. Theatre-level exercises come close to this level in activating command structure but are extremely costly to conduct both in terms of resources and time.

The classic military virtues of courage, tenacity, loyalty, esprit d'corps, and morale will heavily influence the outcome of any battle. It is, however, not possible to accurately quantify these qualities and any attempt to do so in itself will be flawed. If such a quantification attempt is encapsulated into the preparations for war, it is more than likely that the outcome will be far from that predicted. In addition, winning a battle, campaign or war is almost completely dependent on the decision-making ability of the leaders, from the lowest level at the fighting unit to the highest level at the Forces' headquarters, and this is yet another non-quantifiable factor.

Faced with the requirement to educate and train the armed forces in order to ensure that they become war-winning forces, strategic thinkers have tried to improvise and simulate actual conditions with the help of war games. By analysing history and attempting to make predictions as close to reality as possible they have tried to make these games useful to the decision-makers in the military hierarchy. These factors, combined with the overriding need for the military to avoid failure, led to the invention of war games as a training tool. Initially war games were simplistic and abstract tools, played not only by military enthusiasts but also by the general population.

## **Predicting War**

Manoeuvre warfare has become the centrepiece around which future warfighting concepts are being developed. Most of these concepts, in different stages of development, are heavily dependent on network centric operations for their success. In fact, the conduct of any multi-dimensional manoeuvre is primarily enabled by Network Centric Warfare (NCW). 'At its core, NCW seeks to provide the future force with the ability to generate tempo, precision and combat power through shared situational awareness, clear procedures and the information connectivity needed to synchronise the actions to meet the commander's intent.'<sup>4</sup> Since the concept of NCW is still being developed, it has to be borne in mind that it will not bring a universal solution to all the problems of warfare and neither is it likely to change the basic nature of warfare. It is more than likely that older methods of warfare will exist alongside NCW, making it ever more important to be able to look ahead into the future as best as possible.

The dynamic nature of the concepts that buttress NCW makes it very difficult to predict the outcome of any application of force within its context or understand with clarity the direction of conceptual development in the conventional warfare context. Yet there exists the requirement for the defence forces to be prepared for the next conflict. In this increasingly complex scenario, the planner and the decision-maker are left with very few tools to arrive at what could at least be termed 'educated' guesses. In a contradictory and complex manner, the complexity of the evolving nature of conflict and the unpredictability of the evolution by itself makes it imperative that this process be carefully studied and if possible predicted. War games, therefore, become one of the primary tools that can render invaluable assistance in understanding the intricacies and inconsistencies of the future of warfare.

## **Wargaming, Simulation and Modelling**

The terms wargaming, simulation and modelling are commonly used as interchangeable terms meaning the same thing. In actuality they are distinct elements that denote particular areas of experimentation. The term 'war game' has been variously defined as 'a training exercise that imitates war, in which commanders, staff and assistants perform war duties, but no troops are used'<sup>5</sup> and as 'a simulation, by whatever means, of a military operation involving two or more opposing forces, using rules, data and procedures designed to depict an actual or assumed real life situation.'<sup>6</sup> Modelling is a proportional representation of reality and varies in its abstraction from one context to the next. For example, a physical

scale-model of an aircraft, the blueprint of that aircraft and the mathematical equations that represent the aerodynamic characteristics of that aircraft are all models. Simulations are proportional representations of reality over a laid down time period. For example, the same physical scale-model of an aircraft when trialed in a wind tunnel and measured for various effects can be termed simulation. Where the earlier war games were abstract representations, modern games incorporate more complete simulations.

## **Military Experimentation**

Military experimentation—in the form of war games, simulations and field exercises—has become an essential element of innovation and transformation. From a science and technology point of view, basic and applied research will lead to experimentation if the concepts are to be assessed. There are two main approaches to scientific inquiry: field research and experimental research. Experimental research needs verification or testing of concepts before they can be accepted for further implementation. The verification is done by explanation testing leading to prediction and control.

Experimentation is important to the military because it enables innovation and transformation within limited means by avoiding large-scale production of forces with declining value, and permits the military to consider options on emerging systems that can be rapidly developed when a threat emerges. These characteristics make experimentation especially beneficial during periods of high uncertainty and rapid change.<sup>7</sup> Experimentation of technologies beneficial to military usage is, however, difficult for three major reasons. First, realistic experimentation is expensive because it involves building up multiple copies of devices using emerging and unproven technologies. Second, it is time consuming because proper experimentation requires that these devices be used over a period of time using different tactics. Third, because the basic warfighting concept is conceived as joint, the experiments will have to be conducted jointly. The need for experimentation cannot, however, be over-emphasised.

The aim of this paper is to discuss the characteristics of traditional war games and the impact of the changing security environment on wargaming. The paper also discusses the complexity of wargaming NCW. It endeavours to highlight the need for air forces to concentrate on wargaming NCW effectively because of the central role that air power assets play in NCW.

## **HISTORY OF WARGAMING**

War games emerged amongst the rulers of all early civilisations, with the oldest and best known being chess. It is generally agreed that chess originated from the Indian game ‘Chaturanga’, which was played by four players according to fixed rules and involved a standard map and pieces representing the arms of the day like elephants, cavalry and infantry.<sup>8</sup> Though the game is abstract in its depiction of war, it teaches the player to anticipate the consequences of one’s own actions both in terms of the opponents’ possible reactions as well as the further progress of one’s own forces.

### **Early Years**

The early examples of wargaming in the modern era were simulations used to gain tactical insights into battles. In late 1781, John Clerk, a Scotsman, developed such a simulation to study sea battles. Napoleon used to ‘walk through’ his campaigns in advance, using coloured pins on a map to visualise the relative positions of units in time and space, and may have invented the first operational war simulation. The modern war game was actually ushered in by the Prussian war counsellor, Baron von Rösswitz, in 1811. He used blocks to represent units and depicted the uncertainties of the battlefield by determining the casualty rate and total attrition by the role of a dice. His son, who was also a Prussian artillery officer, refined the game and introduced the concept of red and blue forces by colouring the blocks.<sup>9</sup> The game was named ‘Kriegsspiel’.

By 1837, General von Moltke, chief of staff of the Prussian Army, had introduced assessed performance in wargaming as part of the requirements to be accepted to the War College. The War College curriculum itself consisted of a large number of war games. His consistent efforts were rewarded by Prussia winning a series of wars against numerically superior enemies. It was therefore not surprising that the rest of the world started copying Prussian training methods including the idea of wargaming. Around the same time, the rigid rules under which the games were conducted were also relaxed and some proponents of wargaming went as far as to suggest that the games should be played without any set rules with tactical rules emerging in the process of the game itself.<sup>10</sup> Even today the dichotomy is visible between games whose outcomes are decided by rigid rules and games that are adjudicated by umpires.

## The Spread of Wargaming—Up to World War II

Other countries started to use wargaming as a training tool in the late 1800s. Both the British and the Americans started off by using German rules and then adapting them to individual requirements. The British conducted the game under very rigid rules and therefore were not prepared for the unconventional tactics of the Boers in the Second Boer War (1900–1902). Since the war games did not predict the psychological and political dimensions of the Boer War, and because the campaign was less than successful, the British abandoned the whole concept of wargaming for almost fifty years.<sup>11</sup>

Wargaming had mixed fortunes in the United States. While the army almost completely rejected the idea, the navy was fortunate in having William McCarty Little espouse the advantages of naval wargaming and found the Naval War College. He conducted the first naval war game in 1889, a tradition that has continued to date. The biggest contribution of McCarty Little to wargaming was the arguments he put forward in an article published in 1912 in the US Naval Institute *Proceedings* that wargaming had and should continue to shape national policy, that it not only produced better plans but assisted the practitioner in being quicker at decision-making, hence gaining the advantage.

The extremely successful Prussian Army was used as the model to form the modern German Army. The initial campaign plan of 1914, that envisaged a wide flanking movement through Belgium and Holland, was wargamed and found to be effective. The failure of the field commanders to adhere to the timetable evolved through the gaming, mainly because of unforeseen factors, was the primary reason for the disastrous performance of the German Army in the later phases of World War I. The German Army did not wargame or simulate the diplomatic and political consequences of their actions and these factors produced the setbacks. Similarly, the German offensives conducted to ensure amicable peace terms also did not take into account the strategic objectives of the campaign and hence failed. The German defeat was attributed to poor grand strategy and this in turn was caused by the purely military analysis of war plans. The German government therefore established strategic war games at the ministry level to include political aspects of military actions.<sup>12</sup>

War games played an important role during the inter-war years in Germany since the military was reduced to skeletal levels. The Germans took an extremely pragmatic look at World War I and derived lessons that were then compared to the reality and thereby evolved a new doctrine. The doctrine was tested in war games and the concept that developed was called ‘mobile operations’—*Blitzkrieg*. War games were also responsible for the German High Command adopting the deep thrust, concentrated at an unexpected point as the *modus operandi* for the invasion of France in 1940.

US Army wargaming reached a low point during this period. In addition, Air Corps Tactical School (ACTS) representatives participating in the few war games that were organised were not allowed to contribute freely to the progress of the game, thereby devaluing what little impact these games would have on strategic development. The ACTS regularly participated in the Army War College annual war games from 1923, with the stated intention of educating senior Army officers in the doctrine of air power.<sup>13</sup> The results were not encouraging, mainly because the participation of air elements was restricted to the combat zone and never against the vulnerable rear-area targets of the enemy.

The US Navy built upon the work of McCarty Little and continued to refine wargaming techniques. The Navy also concentrated on looking at possible war with Japan, and as the games became more sophisticated it was clearly understood that it might take years for the US Navy to move into positions in the Pacific from where it would be possible to commence an advance on Japanese positions. By 1940, the naval games had achieved remarkable success. The US Navy was able to allow the officers to study the strengths and weaknesses of the Japanese and then devise strategies to pit US strengths against them. The core idea was refined to forcing decisive engagements at a time and place of one’s own choice. Since US air power was almost completely resident in the Army at that time, it is paradoxical that it was the US Navy that used war games to advantage in understanding the contribution that air power was capable of bringing into the equation.

## World War II and Beyond

There are conflicting reports regarding Hitler’s attitude to wargaming. It has been argued that Germany did not play potentially the most decisive war games because Hitler had put a stop to strategic war games. Yet it was

a war game that induced him to adopt the bolder plan that led to the faster than expected collapse of France. The Germans also wargamed the attack on the Soviet Union, however, the setting did not take into account the Soviet mobilisation plans that left more than 220 divisions in the field when the game had predicted that only a maximum of 60 would be available. The impact of winter was also not taken into account.<sup>14</sup>

In 1941, Japan's Total War Research Institute conducted a global political military war game.<sup>15</sup> The game predicted an early Axis victory, which may have influenced the Japanese decision to enter the war. This game, however, did not include an attack on Pearl Harbor. The Japanese Navy conducted a number of war games prior to the actual attack on Pearl Harbor, and the actual attack constitutes as resounding a tactical victory as any other. However, the long-term political implications were not considered in the games and were therefore not fully understood, even though Admiral Isoroku Yamamoto is reported to have said, 'I fear all we have done is waken a sleeping giant and fill him with terrible resolve'.

The United States, Soviet Union and Germany used war games throughout the course of World War II to facilitate decision-making and to predict the outcome of projected actions. There is no clear indication regarding the veracity of the games in any of the countries, nor is there any verifiable proof that any one country relied more than others on war games to evolve strategy as the war progressed. It is, however, clear that several campaigns of the war were carefully orchestrated after extensive wargaming, and only when the games were manipulated to arrive at a particular desired or preferred outcome did the games prove to be of no value to the actual campaign.<sup>16</sup>

The immediate post-war years saw the increased reliance by military planners on operational research (OR). The OR community supported wargaming as a valuable tool in the decision-making process and thereby ensured the continued interest in the concept within the military intelligentsia. From humble beginnings, wargaming thereafter moved on to the arena of combined concepts that included economic and political factors, broadening beyond the purely military and attrition-based environment. The politico-military war game, however, did not take root and basic wargaming returned to being attrition oriented.

From the 1970s, there has been an increased awareness, not only within the defence community but also the broader political leadership, of the necessity to study the impact of war on the well being of the entire nation. The need to foster strategic visions at the highest level also brought wargaming techniques to the fore. From the 1980s, wargaming has become a tool that can only be ignored at one's own peril and at the cost of courting disaster in actual operations. The study of the potential adversary's strategy, tactics and operational ethos therefore assumes great importance. Although war games have become extremely sophisticated it cannot be said with any assurance that a foolproof system of gaming has been derived.<sup>17</sup>

Predicting the outcome of battle is the most difficult task for an analyst. Just as a small band of Spartans changed the course of battle in Thermopylae against all odds, and a numerically inferior RAF thwarted the proposed German invasion of Britain, battles down the ages have developed in unexpected ways for a number of reasons. Wargaming provides a unique way of exploring the uncertain dynamics of war, merely pointing the way rather than predicting anything in absolutes.

## TYPES AND CHARACTERISTICS OF WAR GAMES

The purpose of military<sup>18</sup> wargaming can be categorised under the two broad types: analysis and education.<sup>19</sup> These two types will themselves automatically spawn the concepts and characteristics that define the range of wargaming as applied in contemporary military utilisation. War games can also be classified in terms of the way in which the design of the game deals with time, but this classification does not follow the conceptual division mould.

### Types

**Analysis.** War games designed to facilitate analysis are primarily aimed at assisting the higher command echelon in the formulation of national doctrine, defence policies and strategy. Issues of importance to national

security are best suited for such an approach and could lead to a great deal of refinement in the operational strategies of the defence forces, if the lessons are correctly percolated downwards. At a lower level, analytical wargaming can become a tool to develop the relevant support infrastructure to assist the commander in decision-making and also to evaluate current combat development and future force capability requirements. Force capability evaluation, by virtue of its requirements, tends to focus on quantifiable factors such as financial resources, technical specifications and personnel needs. The broader but subjective factors are normally not factored into the gaming sequence, thereby making it more relevant in the analysis of current scenarios of immediate consequence. These games are also at times referred to as research games.

**Education.** War games designed for education and training applications, that include skill development from the individual to the team level, will tend to take unquantifiable factors of human nature like social and psychological issues into consideration in the planning stage. These games can also cater to different levels, starting from the individual tactical levels to wing and command levels. By virtue of the larger framework under which the games are played, this type of wargaming is ideally suited for the development and training of officers in the employment of military power in all its manifestations. In a broader context, war games designed for generic training are extremely useful in promoting a deeper understanding of the profession of arms and the art of warfare within the officer cadre. This in turn will improve the decision-making process within any one service, and in the case of joint war games inculcate a joint thinking process at an early stage of an officer's training and development.

**Time-Based.** While conceptually war games are divided into analytical and educational games, they can also be classified by the way the construct of the game deals with the time frame of the game. Time can be dealt with in stages wherein a specified period of time is gamed and then the game frozen to derive the full benefit of analysis, both individual and combined between the players and the control cell or umpires. The time frame of each stage is determined by the context of the game, tactical-level games having short-time stages and strategic level ones having longer duration. The alternate method of handling time is for it to be moved continuously, typically at four or six times normal speed. This method is suitable for gaming at the tactical level where the players are presented with continuous changes in the context of the situation. Network-centric games will have to be played in this mould, whether they are analytical or educational in nature.

War games that emphasise analysis or education impact on an air force in different ways. Since analytical wargaming is normally focussed on the defence contribution to national security issues and mostly deal in absolutes rather than abstracts, it is better suited to validate and develop the basic doctrine as well as strategic, operational and tactical concepts. On the other hand, educational types of war games can be adapted to cover a whole range of possible scenarios as well as futuristic concepts and therefore, do not necessarily have to be true to life. They can be hypothetical in nature and can explore the transient and unpredictable aspects of warfare in a realistic manner. In this respect, the training games have the capacity to become a very powerful tool in the conduct of effective operations. Both types of war games can simulate all aspects of warfare and can replicate the nature of conflict—conventional, unconventional and asymmetric—within the laid down scope. The laid down scope can restrict the game to purely military activities or include other aspects that are considered in a whole of nation approach.

## Characteristics

The primary characteristics of war games are time, geography, rigidity, environment, predictability and automation. These characteristics are common to both analytical and training games and both can be further divided into more subtle sub-types if necessary.

**Time.** The most flexible of all the variables in wargaming is time and it can be dealt with in a number of ways. Chronological events can be made to unfold at a normal pace (real-time), slow pace (extra time is made available to arrive at a decision that would normally have to be made in a few minutes) and fast pace (events happen faster than in reality). Time can also be manipulated to ensure that events occur at a variable rate in a combination of the three paces. Perhaps the biggest flexibility is afforded by the fact that the game can be stopped and restarted and events can be sidelined or even ignored if they are insignificant to the central theme of the game. Other than for games played in real time, all manipulations of time have the inherent disadvantage



of subjecting the players to disorientation, especially in cases of fast pacing or event sidelining. Dependent on the learning outcome intent of the game, time manipulation can be made. For example a game designed to emphasise the importance of correct decision-making can be played in fast pace initially and then repeated in slow pace so that mistakes in the process can be identified.

**Geography.** The extent of the conflict and the nature of the game will be greatly influenced by the geographical span. This span can range from global to regional and down to the theatre and sector level, and will be determined by the defined scope under which the game is designed. The other aspect of geography is the impact of terrain (in its broadest definition) on the conflict being depicted. Terrain plays a vital part in wargaming land warfare and to a lesser extent in air exercises. Air power war games need to take into consideration the limiting impact that terrain has on information, surveillance and reconnaissance (ISR), strike capabilities and air defence operations.

**Rigidity.** The degree to which the fluid dynamics of the game can be directly influenced by human interference determines the rigidity of the design.<sup>20</sup> A game designed wherein all details in terms of input, interaction and outcome are predetermined is considered extremely rigid and is at one end of the rigidity spectrum. At the opposite end is the free flowing war game, in which the constraining rules are kept to the barest minimum and the role of the umpire is limited to intervention as a last resort to move the game forward. Free flowing war games are the most flexible in terms of arriving at alternative solutions to complex and broad issues. These types of war games are best suited to analyse broad national security issues to identify possible courses of action in international engagement. The role of the umpire is the easiest in rigid war games and most difficult when it is free flowing. The umpires in a free flowing war game would have to be equally if not more qualified than any of the participants in the understanding of the issues being analysed since most of their decisions would have to be subjective and arrived at as the game progresses. It is obvious that every free flowing war game would progress differently even if all the conditions and designs of the game are kept constant.

**Environment.** The environment of a war game is dependent on the accuracy with which reality is simulated and is mostly a function of the sophistication of the wargaming process. The more characteristics of the real world that can be simulated, the more realistic and accurate the wargaming process will become. Weather is a major factor that can be realistically depicted and can also be manipulated easily to produce diverse results. In the case of air power projection, wargaming weather assumes added importance since offensive as well as defensive actions emanating from the air domain will be directly affected by it. Weather criteria are also easily manipulated and, therefore, add to the flexibility of the war game's design.

**Predictability.** It is an accepted fact borne out by history that no battle or campaign can be fought with complete assurance that all elements will operate and perform as laid out in the war plan. Unforeseen technical faults and human errors have turned 'certain' victory to defeat and unpredicted human resilience have turned defeat to victory, albeit at a high cost. The history of warfare is replete with examples of both these conditions. It is therefore necessary that all war games introduce an element of chance or random errors into the basic construct of the game itself. Once again the predictability can go from one extreme of the spectrum where all outcomes are pre-determined and therefore completely predictable, to the other end where all outcomes are unpredictable even when other factors have remained constant. Predictability impacts the status of the war game predominantly when it is considering military issues and is normally not a primary characteristic in abstract war games. From an air power perspective, the lack of predictability in any given scenario is of great importance in gaining a clear understanding of the variables that may be encountered in real cases. Since the application of air power deals with comparatively more variables and is extremely dynamic in its complete spectrum, increased random error probability will assure the robustness of emerging solutions in an air power dominated war game.

**Automation.** War games can be conducted manually (no automation), partially automated (computer-aided) and fully automated (computer war games).<sup>21</sup> In a manual war game, all aspects of the game are conducted by the participants or the umpire and are therefore very human resource intensive. This type of war game is reliant exclusively on pre-programmed tables that provide resolution of engagement, terrain and weather effects, predictability and other important, but tedious details like logistics planning and record-keeping. In computer-aided war games, the actual playing is still done manually but the calculation of attrition, logistics and even

record-keeping are done by computers. The advantage is that the time-consuming mechanics of wargaming is drastically reduced. In fully automated war games, the entire event from start to finish is done through a computer that filters all inputs in line with the rules, construct and design of the game. The computer also does all the duties of the umpire and human arbitration is seldom required. Fully automated war games have four distinct advantages. First, computers can master large sets of rules and therefore make the war game extremely complex yet simple to play. Second, the computer is capable of assimilating extensive databases, which provide high resolution and can make the war game very close to reality thereby increasing their validity. Third, the timeframe to play a given war game is minimal in the fully automated mode, which makes it additionally attractive to senior decision-makers. Fourth, it allows multiple runs of the game to explore random errors, which enhances the capability to deal with uncertainty. The only major drawback in a fully automated war game is that the software needed is very expensive to develop and needs constant fine-tuning to make it relevant to emerging scenarios.

## **DEVELOPING EFFECTIVE WAR GAMES**

War games, like any other games, require clearly laid down rules to be successful. The development of a war game involves adherence to certain basic principles in the holistic understanding of the perceived necessity for its development. The objective of the war game will dictate the design and development as well as its conduct. The effectiveness of the developmental system will depend on the clarity with which the basic objective is defined, systematic selection of the scenario(s), effectiveness of the laid down rules and the acceptability of the trade-off between reality and simulation in the construct of the game.

### **Combining Theory and Practice**

All nations constantly attempt to find an optimum way forward in terms of their defence requirements by trying to assuage the tensions between managing the here-and-now threats and the long-term challenges that are difficult to accurately predict. Simultaneously, it is also accepted that there is a conundrum in balancing defence priorities and funding constraints. The usefulness of wargaming in attempting to predict an increasingly complex security environment by exploring the constant evolution of military doctrine, operational concepts and the accompanying organisational changes has never been greater.<sup>22</sup>

Although war games have been historically used as an analytical tool rather than for training purposes, one of the major uses that it has been put to in recent times is to examine what concepts, ideas and capabilities flow from evolved doctrine and are competent to face a range of future threat possibilities. This is more apparent when emerging technologies or capabilities are being analysed. On a more specific level, the platforms and capabilities are tested against realistic scenarios, both current and futuristic, to assess their effectiveness. The changing basis of international security makes wargaming an effective tool to forge the way ahead, and offers a framework for considering the transformations taking place in the nature of warfare.

In 1999, the North Atlantic Treaty Organisation (NATO) laid down a 'Code of Best Practice' for command and control assessment by way of a technical report.<sup>23</sup> Stuart H. Starr suggested the adoption of this framework, although specific to command and control issues, as a guideline for considering reformation of wargaming in order to bring it in consonance with the current improvements in information dissemination and the requirements of NCW.<sup>24</sup> The following four primary factors were identified:

- a) framework for a good war game should be based on operational analysis and should clearly define the problem to be addressed;
- b) design of the game should take into account organisational and cultural issues that emerge, so that rules can be laid down regarding the acceptability or otherwise of decision processes;
- c) the game must be able to devise alternative scenarios so that all facets of the relevant problem can be studied; and
- d) insights or lessons that emerge from the game's result must be carefully drawn and assimilated after proper analysis with appropriate tools.

**Identifying the Problem.** The utility of wargaming is such that there will not be any paucity of problems to be addressed and analysed for a solution. In an Australian context, the major problems that confront military wargaming could be identified as the uncertainty regarding future strategic environment; national security imperatives that are moulded by changing threat perceptions; realistic operational appraisal of the security agencies; conceptual transformation of doctrine at all levels of the armed forces; and the validation of the three higher level, philosophical concepts, ie. *Force 2020*, *The Australian Approach to Warfare* and *Future Warfighting Concept*.<sup>25</sup> The strategic environment can range from global scenarios, which may not directly threaten Australia, to future situations that may have a direct impact on the very survival of the nation. National security imperatives are dependent on emerging threat perceptions that in turn are driven by a large number of factors, some within the control sphere of the nation and some with complete outside influence. The realistic appraisal of security preparedness in the pursuit of domestic security has assumed added importance in the past few years, and wargaming can be used to play an important if not vital role in optimising the operational efficacy of the security services. The emerging concepts within the ADF will need careful experimentation and validation before the vision can be clearly articulated. Even in this sphere wargaming becomes the best tool to analyse futuristic concepts that have been envisioned in capstone publications so that they can be modified and adapted to suit the peculiar needs of the ADF.

**Cultural Issues.** In most of the conflicts that have been fought in the modern world, culture has been an underpinning factor that has normally not received the attention it merits from commanders. Understanding cultural differences has been identified as one of the most important factors in the development of warfighting capabilities within the ADF. In recent times, the impact of culture has not only influenced concepts of operations against the enemy, but has become a strategic influencing factor within coalition operations. It is, therefore, not surprising that the incorporation of cultural influences into the wargaming design has now become imperative if the game is to be considered valuable. On the other hand, the abstract nature of the influence of culture on warfare in general and decision-making in particular makes it extremely difficult to impart appropriate values and effects to this factor in the design of a war game.

**Alternative Scenarios.** Learning from the history of wargaming, it can be acknowledged with certainty that no single scenario can adequately portray the uncertainties and risks associated with a problem being analysed. The best way to ensure that acceptable solutions could be derived from gaming multiple scenarios would be to create a broad scenario framework from a common baseline taking into account external factors, possible participants and the environment. Variations of the scenario can be then be played by altering any or all the baseline parameters as well as altering the uncertainty and risk attached to each one of them. In order to derive the maximum benefit from the multiple scenario game it will be necessary to keep the variations in sequential games as diverse as possible so that players do not have partial insight into the current scenario from a past one that has already been played.

**Lesson Analysis.** The primary measure of effectiveness of a game is in its ability to arrive at a clear and precise solution to the problem that is being addressed. In order to achieve maximum effectiveness the lessons that emerge from the game must themselves be analysed for their veracity and usefulness within the overall context of time and environment. This process could be fairly simple and easy at the tactical level of wargaming, but as the levels are raised and the abstract components within the game increase in percentage representation, the lesson analysis also becomes complicated. In fact, it may become necessary to review the lessons and the gaming process itself in certain cases where the analysis does not produce a sufficiently clear forward projection.

Apart from the above primary factors, war games should be carefully constructed simulations wherein the participants must be asked to make decisions regarding the use of force in the context of a future conflict. Here it is important that these war games encompass the fundamentals of military operations while operating at the future warfighting concepts level. Equally important is the need for these games to be based on joint and/or coalition operations since the ADF will always operate in these conditions. It is necessary to allow the games to be free flowing and to give the participants sufficient leeway to move the concept as far into the future as is logically necessary. Future wargaming will not meet the requirements of the ADF if it does not interlink the

Future Warfighting Concept, and current and projected strengths and capabilities with the changing threat perceptions and national security imperatives.

## **Enduring Issues and New Challenges**

Thinking through a war game's purpose and thereafter distilling the lessons that emerge have always been the Achilles Heel in the entire process. The fact that the entire exercise is meant to achieve that very purpose makes the situation even worse. The distinction between the game and reality that is being simulated would have to be carefully preserved in the after-game analysis so that the fundamental issues of strategy, resource requirement and national security can be recognised. The tacit approval of verbal discussions after the game wherein some sensitive constraints are removed also leads to better understanding of the issues. This is another facet of wargaming that has only recently been given the importance it deserves.

Another long-standing issue that is yet to be clearly dealt with is the inflexible nature of decision-making systems that are in use. By being focused on explicit choices rather than having the capability to retrace the process to arrive at an alternative course of action junction, the decision-making systems detract from achieving optimum benefits from the game.<sup>26</sup> In most cases these systems also continue to operate within the laid down rule limits even after the game has transcended to a level where it does not make such adherence logical. In the increasingly complex battlefield and operational scenario, the decision-making system will have to be adaptable rather than staying within fixed rules throughout the game as happens in majority of the cases.

In the last two or three decades, the complexity of problems that need analysis with the use of wargaming techniques has increased very rapidly. Issues such as the proliferation of weapons of mass destruction; multipolarity resulting from the collapse of the Soviet Union; asymmetric warfare and security threats like transnational crime; terrorism and drug trafficking; have all added to the complexity of the wargaming environment. Further, technological enhancements in the form of greatly improved precision strike capability and information availability have markedly affected the nature of warfare and are driving revolutionary changes. The almost complete hegemony that the United States exercises over the rest of the world in matters concerning conventional warfighting capabilities and the less than optimised development of these capabilities in other parts of the world has also added to the variables that impinge upon the critical design of a game.

A consequence of this imbalance in conventional military capabilities is the continuing search in some of the developing areas of the world for the capability to produce and field weapons of mass destruction. The fact that no large scale chemical or biological attacks have so far taken place, while being fortuitous, also means that realistic gaming of the physical and psychological consequences is extremely difficult. The experimental base is negligible and the ramifications of such an attack are enormous and horrendous. The wargaming community will need to consider this aspect as a possible sphere of unpredictable developments when approaching this situation. The development of ballistic missiles in nations from the Middle East to North Korea is another area where expertise is lacking when considering possible scenarios.

## **Impact of Uncertainty**

The contribution of wargaming to strategic thinking is best realised when the games are planned within the context of a relatively stable environment because the variables are less in number as well as volatility. The current complex global situation wherein non-state entities have become major forces and the threat has become transnational, wherein troubled states evolve as destabilising influences bringing the region closer to becoming flashpoints, points towards both the necessity for accurate wargaming as well as to the difficulty in doing so. Innovation and insight are required to ensure that war games are developed correctly in a time of uncertainty.

Gaming in such a complex and uncertain security environment is a challenge and needs necessarily to break from tradition.<sup>27</sup> In such a scenario, the war games can be expected to throw up issues and ideas rather than clear-cut tactics based on relative performance merits and demerits of platforms and their capabilities. Compensation for the imperfections of doctrine by means of tactical innovations cannot be expected to be forthcoming as lessons in the new environment. The convoluted nature of the environment and the complexity

in developing a suitable game would only provide insights into the extreme difficulties in theorising warfighting and doctrine in the current state of flux as well as future scenarios.

Strategic wargaming will continue to provide a number of insights irrespective of the uncertainty under which the game is developed and conducted. It will still be possible to fathom the benefits from platform and weapon characteristics albeit in a slightly diminished manner. If the applied strategy and underlying doctrine is found to stand the test of the gaming, it could then lead to the development and evaluation of appropriate tactics, at least for the near-term. Potentially the most important advantage that could be gained from such games is the understanding of the impact of the deployment of new technologies and the retesting of already accepted assumptions under new conditions.

Uncertainty in warfare is not new. Ancient military thinkers like Sun Tzu (around 500–400 BC) have deliberated on it, and more recently Clausewitz (1780–1831) explained uncertainty in terms of the fog and friction of war.<sup>28</sup> In today's context, the concept of uncertainty and its application to warfare has become additionally important because it is now possible to achieve disproportionately high effects with relatively small applications of force at the right time and place. In the forward projection of force this becomes a critical factor to be considered. Uncertainty in warfare is a direct function of the tempo, scope and scale of operations, and control of operations are also dependent on these three factors. The line dividing uncertainty and order is not fixed and differs in each scenario because of changes in the context and the participants. It is, therefore, imperative that the area of uncertainty be studied and gamed the most to ensure that awareness of when own forces would encounter uncertainty are clearly delineated while the tempo, scope and scale of operations that push the adversary into this area are also marked out.

## **NETWORK CENTRIC WARFARE**

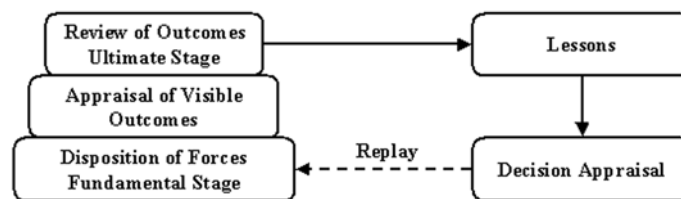
In the security domain, fundamental changes are taking place in the development of operational strategies and overall battle management in the wake of the advent of Network Centric Warfare (NCW) as the centrepiece of warfighting capabilities, so dramatically demonstrated during the recent operations in Iraq. These changes need to be tested and balanced with joint and combined capabilities so that technological innovations can be brought to bear on emerging warfighting forms, optimally leading to long-term organisational and doctrinal changes. Essentially the concept of a 'system of systems' will need validation with every change in the individual system architecture in linear and multiple dimensions. The games must also cater to testing and exploring degradation mechanisms as well as the robustness of built-in redundancies.<sup>29</sup>

NCW uses new doctrine, processes and technologies to create effective and speedy sensor and communications architecture. Employing technology as force multipliers has become the acknowledged way forward in warfare, but the main problem to be ironed out in this case is the identification of the correct combination of technologies that optimises the available potential within the existing force. In order to assimilate the rapid changes that are taking place in the basic concept of operations, an adaptive and flexible framework for wargaming will have to be developed, building on the currently available one.

The inherent nature of NCW is such that it will need new techniques to be employed in its validation and wargaming for the correct lessons to be drawn from them. Traditional wargaming methods that rely almost completely on the inherently structured nature of warfighting capabilities become difficult to use effectively as the number and type of participants increase, as well as when the flexibility of these participants increases in terms of doctrinal and employment concepts.

The primary advantage of NCW is that it permits the side employing it to generate a tempo of operation and rate of change that becomes unmanageable for the adversary. By the same token, any NCW game will have to be a constantly moving one that can accommodate the increasingly non-linear manner of warfare.<sup>30</sup> The traditional levels of warfare—tactical, operational and strategic—have also been used commonly as the framework to progress wargaming. NCW compresses these traditional levels of warfare making its gaming further complicated. The management of time is the primary problem to be solved in network-centric gaming and analysts are still grappling with it to find a suitable way forward.

The organisational hierarchy that all war games follow can be embedded within a three-tier system, as shown in Figure 1. These three tiers can be termed stages in the process of the game. The base level denotes the fundamental stage wherein the disposition of own forces and that of the adversary is encapsulated so that the relationship between the different elements within a force can be clearly understood. It is vital to get this stage correct because the veracity of the next two stages and the usefulness of the game as a whole is dependent on this foundation. The next stage is the appraisal of visible outcomes after the game has been conducted up to the desired timeframe. This will give a clear indication of the effectiveness of the courses of action selected by the players and also lead to the third stage where the decisions made in the course of the game are critically analysed. A balanced combination of the last two stages will bring out the intended lessons of the game. Review of outcomes by themselves also can be indicative of the quantum of the degradation that decision-making suffers from the fog and friction of war. From the lessons that are distilled from the review, a clear appraisal of the decision-making process and its veracity can be made. Depending on this assessment the game can be reconstituted, if necessary incorporating appropriate changes.



*Figure 1. Stages in the Wargaming Process*

NCW brings in one more stage to the framework of a war game, that of a shared network. The difficulty in dovetailing NCW requirements into the traditional wargaming framework is the necessity for the NCW network to have a significant bandwidth and also be comprehensive, responsive, adaptable and survivable.<sup>31</sup> Networks can be rendered ineffective by flooding them with information that can neither be shared nor used effectively. Shared awareness is a prerequisite for networks to be optimised, but in general they still need refinement in its actual usage to achieve adequate awareness. The capability of NCW to produce a very high tempo of operations enables it to compress the traditional boundaries between tactical, operational and strategic levels of war. Although this effect is felt most at the operational level the combined effect of tactical and strategic levels impinging on the operational level makes its gaming extremely complex.

In order to ensure that NCW wargaming does not create a situation of information overload for the players that will then overwhelm the game itself, it is necessary to develop adequate techniques for appropriate sharing of awareness. This will have to be done initially in the context of traditional command and control structures before the entire NCW warfare can be effectively gamed.<sup>32</sup> The basic gaming structure will have to be modified to include two unique characteristics of NCW—shared information and the characteristics of the network by itself.

The two new factors shown in Figure 2 can be fed in either at the highest stage of the traditional gaming model, or used as inputs at the fundamental stage where the disposition of both the forces are discussed. The stage where the inputs have to be given will depend on the context and construct of the game. Where the shared information and network characteristics will impact heavily on the tactical doctrine of the force it will be beneficial to provide the input at the fundamental stage. If the same inputs influence the decision-making process throughout the game it will prove to be of more value if it is considered at the ultimate stage. In this situation it will lead to a further review of the outcomes, perhaps as a fourth stage if it is warranted. The distilling of lessons and review of the decision-making process leading to further gaming will thereafter follow the same pattern as a traditional game.

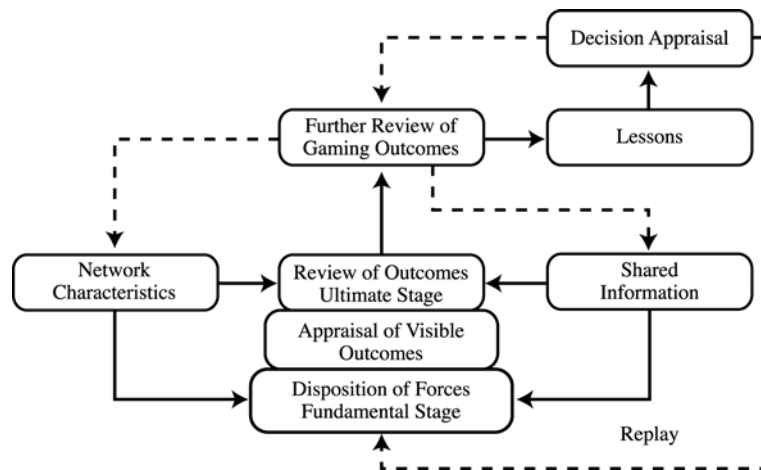


Figure 2. NCW Gaming Stages

The development of NCW war games will involve major changes in the gaming environment because unlike the traditional games that involve the actual movement and interaction of ‘playing pieces’ often in a clearly demarcated geographical arena, NCW games will be played mainly using the cognitive domain as the arena. This is necessary since the events being gamed will have to be oriented around shared information and the characteristics of the flow. In effect, the game arena will be almost completely virtual and geography will become less relevant. The ramifications for the construct of the game are fundamental in that the experts and analysts who double as umpires for the games will now have to be social scientists in addition to also being subject matter experts. The near absence of geographic plotting in these games also makes them next to impossible to analyse completely, making it imperative to capture the players’ awareness at key points along the game sequence. This will subsequently help reconstruct the decision-making process for greater clarity in analysis.

Even with all the difficulties in gaming NCW, it is the only tool that can be effectively employed to train commanders to adopt this radically new style of warfare. It will only be through wargaming that optimisation of NCW can be achieved and the forces adequately prepared to abandon ingrained tactical and operational concepts, which may have outlived their usefulness.

## PERCEPTIONS, STRENGTHS AND LIMITATIONS

### Perceptions

**Value.** Wargaming has been used as a tool by the military for a long time and its importance in preparing the fighting forces for their primary role will only increase in the days to come. The value that is derived from a game is directly proportional to its relevance to the players and the broader community they represent. Adherence to reality therefore assumes critical importance in building the fundamental stage of a game. War games are not infallible in this respect and the endeavour of a good war game is to ensure that no one side has a preponderance of information or optimistic assumptions, which would lead to predetermined results. In order to retain the value of wargaming it is of the utmost importance to ensure that the setting of the game is as balanced as possible and the progress of the game is neutrally observed to ensure impartiality at all times.

**Challenges.** The main challenge in any war game is to ensure that the actions taken by the adversary are correctly designed into the game. The team emulating the opposition’s possible actions (‘Red Team’) has to be credible and must have in-depth knowledge of the adversary strategy, operational art and tactics dependent on the context of the game. In the current international security environment this might be difficult considering the global nature of the threat and more importantly its asymmetry and unpredictability. The challenge also will encompass the ever-present threat of the first use of the ultimate weapon of mass destruction by a cornered adversary.<sup>33</sup> The outcome cannot be predicted in such a situation and there is no prior precedent to fall back on under these circumstances. Wargaming such a situation is not only difficult but may not produce a visible outcome that can be comprehensively analysed. The reasons mentioned above indicate that any useful game will

have to consider the limits to which the adversary's actions can be predicted and further simulated correctly. This factor will remain the biggest challenge in future gaming situations.

**Players.** In the final analysis the value of a war game is almost totally dependent on the people involved. The design, the game itself and the post-gaming analysis are all done by humans, even if advanced techniques are used in facilitating the actions. While being the greatest asset in terms of the utilisation of war games as an analytical, educational or training tool, human interference is also the Achilles Heel of the entire gaming system. If the players conduct a game with a preconceived notion regarding its outcome, there will be no advantage to be gained from it. The strength of wargaming lies in its ability to be unpredictable and the capacity to move into the unknown without the risk of expending material or resources. Only by ensuring the correct perceptions within the players and the controlling team (umpires) will any game produce the desired level of debate and understanding.

## Advantages

There are a number of major advantages that accrue with the conduct of well-researched and conducted war games.

**Safe Development.** The first and perhaps the most important advantage from a purely military perspective is that war games facilitate the study and investigation of theories, doctrine, strategy and even down-in-the-weeds tactics without actually endangering any participant. This also permits the repeated trials of new and controversial ideas without any chance of loss of life or property. For example, the Japanese gaming of the Pearl Harbor attack led to the development of the tactics for delivering effective torpedo attacks in shallow harbour waters.<sup>34</sup>

**Brevity.** The second advantage that war games bring to the understanding and study of warfare is the ability to compress time. It has often been said that war is hours of boredom interposed with stark moments of absolute terror.<sup>35</sup> The majority of critical decisions in the course of a battle are made during these moments of terror. Wargaming can expand the moments within the decision-making time frame in order to clearly focus on the process and derive the full benefit of post-gaming analysis. The same critical periods can be repeatedly gamed to ensure that the analysis and the lessons learned that are subsequently arrived at are correct in their premises. By the same token, periods of relative inactivity can be compressed to move on to the next important stage of the game, avoiding the onset of boredom and lethargy.

**Cost Effectiveness.** War games are relatively inexpensive to run when compared to the cost of carrying out the same exercises in the field, even if they are done as command post skeleton exercises. In addition to the material cost of conducting exercises, war games permit continuous running of a particular campaign or battle without running the risk of causing fatigue to fielded units and troops or degrading the operational readiness of frontline forces. This also leads to the understanding of the efficacy of operating procedures and command and control systems that are in place within the unit and all the way up to command headquarters. There are any number of examples of particular operations having been gamed repeatedly and therefore being carried out impeccably at the actual time, since virtually nothing that happened came as a surprise to the commanders.

**Secrecy.** Wargaming can be carried out in complete secrecy if necessary, thereby avoiding any kind of political fall-out in terms of sensitivity of other nations. There is also the opportunity to speculate on the likely courses of action that could be adopted in case of a breakdown of existing treaties or the formation of new ones that may have repercussions to one's own national security interests without unduly disturbing any treaty obligations and other international diplomatic norms. It is possible to use any geographical part of the world for the setting of the game and also not be constricted in terms of safety requirements and environmental demands.

**Politics.** The next advantage is an extension of the previous point wherein the opportunity exists to game and understand the vagaries of international relationships in terms of challenges to the intellectual, strategic, economic and cultural aspects that impinge on national behaviour. The unasked

'what-if' questions in the arena of global strategic relationships can be better understood and contingency plans developed without running the risk of alienating allies or future coalition partners. It is also possible to consider the actions of other nations in a holistic manner both as adversaries and allies. A truly realistic war game that takes into account all aspects, including the political imperatives, will be able to predict with a certain amount



of assurance the economic, psychological and strategic ramifications of any action that is initiated by the government.

**Awareness.** War games bring thinking about war and its consequences to the forefront of training and education within the officer cadre. A great deal of credit for the tactical success of the German armed forces in the initial stages of World War II can be associated with the rigorous war games that the officers were subjected to in their training schedule. War games are also an effective way to inculcate a feeling for the uncertainties and imperatives of warfighting within the political leadership of a nation. This assumes critical importance in a truly democratic nation where the military is completely subservient to the elected representatives.

## Limitations

At the outset it has to be understood that wargaming is not a substitute for all other types of training. It cannot be used as a cost-effective way to educate and train commanders, but is best suited to supplement other training techniques. There are a number of limitations that war games have that make them less than the optimum and panacea for all training needs.

**Context Awareness.** The first concern that has to be kept in mind by all participants is the context of the game and the fact that it will become totally predictable if taken too seriously. Neither should it be taken lightly because it would then lose its value completely. There has to be a clearly defined balance given to the veracity of the assumptions and the outcomes that flow from the game. The value of the game clearly depends on this crucial factor.

**Detachment.** In war games the actual reality of war is not duplicated, in that there is no threat of death or destruction to anyone. Winning and losing a battle, campaign or the war itself does not bring with it the attendant complications that follow in real life situations. The absence of physical threat and moral responsibility will tend to make the players complacent of collateral damage and more aggressive than in actual combat situations without taking appropriate cognisance of attrition. A sense of detachment from reality can pervade the entire game.

**Unpredictability.** Although war games try to be as realistic as possible, there is still a gap that exists between the game and the actuality on the ground when battle is joined and even during the preparatory phase. Even with computer generated random modelling, it is still impossible to accurately predict mechanical breakdowns. In addition to the vagaries that surround human factors that are also equally if not more difficult to predict, the element of unpredictability degrades the actual value that war games bring to planning and preparedness. The unpredictable nature of war can never be fully addressed, even with all the technological tools that are available to the war game designer.

**Cost.** Cost effectiveness has been listed as one of the advantages of wargaming. A comprehensive military war game, however, is time intensive to develop and can take anything up to two years to be ready to play from the initial inception. It also involves the integration of a number of disparate specialists into a team. The need to have complete control during the gaming process makes it imperative to have an adequate number of umpires, sometimes exceeding the number of actual players. In an obtuse manner, the time and knowledge intensity required to develop a reasonably viable war game moves it out of reach of a resource constrained military, thereby denying the very advantage of cost effectiveness.

**Complexity.** While joint war games are becoming more common in the ADF and other forces, there is still a very palpable single service-centric approach to their development. This approach is likely to compress the lessons and outcomes into single service-centric views, leading more often than not to validation of existing concepts rather than challenging them. With the current developments in warfighting and the increasing integration of different service capabilities in pursuit of a common effects-based approach, single service war games would seem to have outlived their usefulness unless they are comprehensively integrated into joint concepts. This will increase the complexity of a game and also make it more time consuming and resource intensive both to develop and to conduct.

**Communications.** There is a distinct global trend towards coalition and allied operations in the application of military force. This leads on to wargaming having to accommodate the intricacies of such operations within its ambit. The operations by themselves are not unduly difficult to model and game, but the communications part of the game becomes extremely complex. In coalition operations, the language, culture and perceptions of the different partners have to be taken into account and the chances of misinterpretation of communications increase dramatically under these circumstances. Communications in this scenario are liable to become noisy

and contextually irrelevant at times. The difficulty in ensuring that the correct balance is arrived at in the acceptance of the disruption in communications diminishes the value of a coalition war game.

**Information Overload.** With the introduction of computers with their expanded data processing capability it has become possible to overload a decision-making player with information availability in the context of a war game. The human limitation in accepting and using available data will be different under different circumstances, and the threshold arrived at in a war game cannot be considered the actual threshold in a real-time scenario. The difference between the two also cannot be accurately predicted and therefore the utility of war games in intense information exchange situations is somewhat limited.

**Organisational Solution.** The rigid hierarchical command structure of the military as compared to civilian organisations could lead to the players tending to adopt a solution in a game that they perceive as the organisation solution. Under these circumstances almost no value will emanate for the game as no challenges will be posed and no new ground broken in the conceptual development of the force. This may not be the case in a majority of games, but even the few that succumb to this pressure devalue the entire concept of wargaming. Yet, there is no clear solution to this problem, since wargaming is a tool used in training and education in which the underlying criteria of performance and ranking are ever present.

## IMPLICATIONS FOR THE AIR FORCE

Can war games become an effective tool in the education and training of air force officers and commanders? The answer has to be an emphatic yes! Airmen can benefit from wargaming throughout their entire careers, both as educational tools as well as for operational training. Almost all staff and war colleges incorporate war games to enhance the efficacy of the curriculum and to emphasise the command and staff functions. The single-service air force syllabus of the Australian Command and Staff College includes a fairly comprehensive, fully automated war game that is of a generic design to cater for the unclassified nature of the course.

The current deficiency in the optimum employment of wargaming to improve the quality of leadership within the air force stems not from the inadequacy of the games *per se*, but from the limited availability of well designed games at all levels of the force. In the absence of real combat experience within the air force, wargaming can be an effective tool for training future decision-makers and introducing them to the world of unpredictable situations.

Well-conceived and thoughtful application of air power is of primary importance in winning wars, especially in today's context. The era of long drawn conflicts that produce a large number of experienced and battle hardened commanders have long since given way to short duration conflicts that do not provide the commanders with the background they need. Under these circumstances, the utility of wargaming in the evolution of doctrine and air strategy cannot be over emphasised. The development of doctrine and strategy at the highest level can be considered as a long-term application of wargaming.

Wargaming will continue to be the only politically acceptable way to carry out anticipatory training for contingencies outside one's own borders. These games *per force* would have to be joint in nature as well as military-political in their content. Air power is the most complex power projection capability and, therefore, the least understood combat force. The air force will have to conduct these kinds of war games to reinforce the role of air power in the strategic arena, and also to foster and increase air power awareness in the higher defence command structure. These strategic games will have to be tailored in such a way as to be able to dovetail easily into the broader all-services strategic games that would be designed for the defence headquarters. These war games will have

medium-term applications for the air force and when merged with the larger defence game will feed into long-term applications of the defence force in a generic manner.

Air force war games at the tactical level are perhaps the most popular in commercial terms. The available commercial games can be modified with very little expense to suit the requirements of a particular squadron or wing. Although the most prolific and the simplest to manage, these games have limited utility. Since the

resource requirements to develop these games are fairly low, it is possible to develop them locally and further modify them to suit peculiar circumstances.

An application of wargaming to a unique air force problem is to improve the logistical preparedness of the force. Since combat support operations cannot be exercised as readily as the flying operations themselves, wargaming gives the logistician a very powerful tool to test and understand the readiness levels from a support perspective. Because of the resource requirements, the logistics organisation of the air force is seldom activated completely. By resorting to realistic wargaming the logistic support infrastructure can be studied under simulated combat related stress, leading to the development of innovative ideas and further to their testing and validation.

The most important use of wargaming as a tool to develop and improve the efficient application of air power is in its ability, if so designed, to stretch the force to the point of failure. In order to improve any system it must be tested to its breaking point so that the maximum output can be measured and the weakest areas identified. Once this has been done, then it will be possible to initiate future concepts, which will be capable of moving the force to higher levels of performance. This method will also improve the doctrine development process.

Another peculiarly air force situation that can be effectively understood by wargaming is the application of the Rules of Engagement (ROE) when operating as part of a coalition force. This has become more complex in recent times and solutions will have long-term implications to the air force's participation in coalition operations. It is in the application of force by air power that the proponents have the least time available to make the decision to strike or to abort. By repeatedly wargaming the different types of targets and situations as well as introducing different levels of control that the operators will face in actual conditions, the chances of making a mistake can be substantially reduced. This is one of the key areas in which air forces should concentrate in terms of game development.

Wargaming combat situations under information overload and limited decision-making time is another area that has direct relevance to the air force. The proliferation of information gathering and disseminating sources that are embedded within the air power spectrum of operations tends to make decision making an extremely complex action within the air force environment. Repeated wargaming of set piece actions and the review of the decision making process as well as the outcome will help to clarify a potentially confusing state of affairs to the key players.

As discussed earlier in the paper, NCW is complex to wargame. Since the characteristics of air force assets make them well suited to optimise NCW, it is likely that they will be the centrepieces of future NCW campaigns. It is, therefore, important for the air force to adapt the NCW war games to their particular needs and arrive at solutions. Thereafter the solutions can be incorporated into the larger picture to become part of the overall scenario.

## **CONCLUSION**

Wargaming as a tool for military thinkers and commanders have been in existence for a long time. The increasing complexity of modern warfare points towards it becoming even more important as a mechanism to develop, test and validate emerging concepts. Correctly used it is capable of clearly identifying and establishing the preconditions for success as well as the factors that would effectively shape the environment and thus the outcome of events.

As much as the concept of wargaming has been praised for its ability to develop and improve the capabilities of a force, the pitfalls that are common in the pursuit of gaming must also be borne in mind. There are three major factors that can completely nullify any advantage that wargaming can bring to the participants. The first is a flaw in the design process of the game itself wherein a predetermined outcome is factored in and the rest of the game is tailored around it. This essentially destroys the very basic concept of the game—to view the unpredictable future. The second is to view the outcome of a game as an infallible indicator to real life situations. The implications of such an attitude, especially when the result has been favourable for the concerned side, can be catastrophic. Such an attitude does not take into account the unpredictable and intangible aspect of warfare. The third, less serious pitfall is for the participants to think that the design of the game itself is at fault when

it is not going the way they perceived a situation to develop. This has no serious repercussions other than to diminish the value of the game in the minds of the participants.

There is clear understanding today, at least within the military community, that the future of warfare lies in joint operations. Yet there are no practitioners who can claim expertise in all forms of war—air, land and sea. The only way to reach a level of proficiency in prosecuting a truly joint operational concept is for the protagonists to be effectively trained in the areas that they lack by adequate wargaming experience. The current climate of resource crunch and the genuine need to limit collateral and environmental impact of large scale exercises, combined with the lack of opportunities for higher command teams to develop real life experience in warfighting, brings wargaming to the fore as the only genuine training technique to optimise military power projection capabilities.

## ENDNOTES

- <sup>1</sup> Douhet, Giulio, *The Command of the Air (1921)*, Trans. Sheila Fischer, Rivista Aeronautica, Rome, 1958.
- <sup>2</sup> McKern, R.B., in Introduction to McKern R.B & Lowenthal G.C. (Ed.), *Limits to Prediction*, Australian Professional Publications, Mosman, NSW, 1985, p. xi.
- <sup>3</sup> *Ibid.*, p. xii.
- <sup>4</sup> Department of Defence, *Future Warfighting Concept*, ADDP-D.3, Department of Defence, Canberra, 2003, p. 29.
- <sup>5</sup> *The Macquarie Concise Dictionary*, Third Edition, The Macquarie Library Pty Ltd, NSW, 1998, p. 1322.
- <sup>6</sup> Joint Chiefs of Staff (JCS) Publication 1, *Department of Defence Dictionary of Military and Associated Terms*, Government Printing Office, Washington DC, June 1987, p. 393.
- <sup>7</sup> Krepinevich, Andrew, 'Military Experimentation—Time to Get Serious', [http://www.csbaonline.org/4Publications/Archive/B.20000331.Military\\_Experimen](http://www.csbaonline.org/4Publications/Archive/B.20000331.Military_Experimen), accessed on 5 November 2003.
- <sup>8</sup> Hjalmarson, J.K., 'The Development of War Games', *Canadian Army Journal* 15, No. 1, Winter, Canadian Army Press, Ottawa, 1961, p. 5.
- <sup>9</sup> Wilson, Andrew, *The Bomb and the Computer*, Delacorte Press, New York, 1968, p. 5.
- <sup>10</sup> Matute, Edgardo B., 'Birth and Evolution of War Games', *Military Review* 50, No. 7, Command & General Staff College, Fort Leavenworth, KA, July 1970, p. 53.
- <sup>11</sup> Hope Thompson, M.R.J., 'The Military War Game', *Journal of the Royal United Service Institution*, RUSI, London, February 1962, p. 50.
- <sup>12</sup> Craig, Gordon A., in Paret, Peter (Ed.), *Makers of Modern Strategy*, Princeton University Press, Princeton, NJ, 1986, pp. 349–350.
- <sup>13</sup> Finney, Robert T., *History of the Air Corps Tactical School, 1920–1940*, Center for Air Force History, Washington DC, 1992, p. 22.
- <sup>14</sup> The Germans played the war game of the attack on Soviet Union only up to early November and did not carry it forward further. One reason was that the war game predicted the destruction of 240 Soviet divisions with only 60 remaining on a front line deep in the Soviet Union. It is worth noting that in the actual campaign, the Germans had advanced as far as the war game predicted by early November and also destroyed 248 Soviet divisions. But the Soviets still had 220 divisions because of the rapid mobilisation that was effected.
- <sup>15</sup> Prados, John, *Pentagon Games: War Games and the American Military*, Perennial Library, New York, 1987, p. 2.
- <sup>16</sup> The Japanese war game prior to the Battle of Midway is a good example of such interference. Rear Admiral Ukagi Matome, commander of the carrier force for the actual operations, is reported to have unilaterally reversed the decision of the umpire and brought back two carriers that had been sunk by the US forces, subsequently

going on to capture Midway. In the actual operations the Americans sank the same two carriers, which the Admiral had no way of bringing back to 'life'.

<sup>17</sup> Caffrey Jr., Lt Col Mathew, 'Toward a History-Based Doctrine for Wargaming', *Aerospace Power Journal*, Fall 2000, Air Power Research Institute, Maxwell AFB, AL, USA, 2000, p. 55.

<sup>18</sup> The term 'military' is being applied since there are a number of commercial war games available for use by enthusiasts. In fact, the rapid spread of computers and information exchange has bred a new generation of armchair warriors interested in the concepts, strategies and tactics of war without being professionally involved in the art of warfighting.

<sup>19</sup> McCarry, SQNLDR P.J., *This is Not a Game: Wargaming for the RAAF*, RAAF Air Power Studies Centre, Canberra, 1991, p. 20.

<sup>20</sup> *Ibid.*, pp. 23–24.

<sup>21</sup> *Ibid.*

<sup>22</sup> Haffa, Robert P. Jr. & Patton, James H. Jr., 'The Need for Joint Wargaming: Combining Theory and Practice', *Parameters*, US Army War College Quarterly, Autumn 1999, US Army War College, Carlisle, 1999, pp. 107–110.

<sup>23</sup> North Atlantic Treaty Organisation, *Code of Best Practice (COBP) on the Assessment of C2*, RTO Technical Report 9, AC/323 (SAS)TP/4, Communication Group, Inc, Hull, Que, 1999.

<sup>24</sup> Starr, Stuart H., 'Good Games, Challenges for the Wargaming Community', *Naval War College Review*, Spring 2001, Naval War College, Newport, RI, 2001.

<sup>25</sup> Public Affairs and Corporate Communication, *Force 2020*, Department of Defence, June 2002; Public Affairs and Corporate Communication, *The Australian Approach to Warfare*, Department of Defence, June 2002; Policy Guidance and Analysis Division, *Future Warfighting Concept*, Department of Defence, December 2002.

<sup>26</sup> Bracken, Paul & Shubik, Martin, 'Wargaming in the Information Age, Theory and Purpose', *Naval War College Review*, Spring 2001, Naval War College, Newport, RI, 2001.

<sup>27</sup> Haffa, Robert P. Jr., & Patton, James H. Jr., 'Gaming the System of Systems', *Parameters*, US Army War College Quarterly, Spring 1998, US Army War College, Carlisle, 1998, p. 116.

<sup>28</sup> Watts, Barry, *Clausewitzian Friction and Future War*, National Defence University Press, Washington DC, 1996, p. 105.

<sup>29</sup> Bracken, Paul & Shubik, Martin, 'Wargaming in the Information Age, Theory and Purpose', p. 118.

<sup>30</sup> Alberts, David S., Gartska, John J., & Stein, Fredrick P., *Network Centric Warfare: Developing and Leveraging Information Superiority*, Command and Control Research Program Publication Series, Washington DC, 1999, p. 71.

<sup>31</sup> Rubel, Robert C., 'Wargaming Network-Centric Warfare', *Naval War College Review*, Spring 2001, <http://www.nwc.navy.mil/press/Review/2001/Spring/art5-sp1.htm>, p. 4, accessed on 23 September 2002.

<sup>32</sup> *Ibid.*, p. 5.

<sup>33</sup> Haffa, Robert P. Jr. & Patton, James H. Jr., 'Gaming the System of Systems', p. 118.

<sup>34</sup> Wilson, Andrew, *The Bomb and the Computer*, p. 41.

<sup>35</sup> Lee, Lt Col David B. USAF, 'War Gaming: Thinking of the Future', *Airpower Journal*, Summer 1990, Air Power Research Institute, Maxwell AFB, AL, 1990, p. 4.