Document created: 27 April 00

# Toward a History Based Doctrine for Wargaming

**by**

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Sadly both the medical and military professions get to bury their mistakes. Because the cost of errors can be so high student doctors are now using simulated patients to learn from their mistakes before treating real patients. For the same reason the military have used wargames for centuries. Ever more powerful computers appear to promise ever better wargames. Yet is the Emperor wearing clothes? Or to use a more contemporary expression, is the validity of "garbage in garbage out" independent of computing power? Will future wargames enlighten or mislead us?

Yes. Throughout history wargaming has provided life saving insights and fatal mirages. If these outcomes were random there would little use in studying their history. However, history provides the raw material for anticipating cause and effect. By learning this history we will be able to devise ways to maximize wargaming's benefits while minimizing its dangers. This history also provides insights into historic decisions, and will suggest a connection between the spread of wargaming and of democracy. Finally, its an interesting story.

## What's in a name?

First, what do we mean when we say "wargame?" The word, "wargame" is simply a translation of the German term, "kriegspiel." Unfortunately, many in the military are simply uncomfortable with the term "wargame", perhaps feeling that war is too serious for "games". This makes researching the history of wargaming challenging as many different terms have been used in lieu of "wargame". These include; Map Maneuver, Chart Maneuver, Field Maneuver, Exercise, or increasingly, "modeling and simulation."


Some say, "Modeling, Simulation and Wargaming," as if it were one term. Each are not only distinct; they build on each other. Models are simply proportional representations of reality. A painting is not a model but a blueprint is. Models vary in abstraction; a physical model of an aircraft, a blueprint of that aircraft, or a mathematical equation representing that aircraft's characteristics are all models. Simulations are proportional representations of reality over time. For example, a small wing that is proportional to a full sized wing is a model, put that wing in a wind tunnel and measure the effect of various wind speeds and you have a simulation. As for wargames, while the earliest wargames were multi-sided abstract representations of combat, modern wargames require multiple sides that compete within a simulation of an armed conflict.[1]

An exercise may or may not also be a wargame depending on whether or not it fits the above criteria. Typically the deciding factor is the presence or absence of a thinking opponent. Hence a Red Flag exercise with its aggressor force is a wargame while a mobility exercise is not.

## In The Beginning

Wargames emerged among the rulers of all early civilizations.[2] Cultures separated by thousands of miles and hundreds of years felt the same necessity, preparing their future rulers to out think other rulers. Though games like "Go" and "Chess" are abstract depictions of war, they did (and do) teach "down-board" thinking. That is, anticipating the consequences of your possible moves and your opponent's possible responses, an essential skill in the deadly game of war.

## 1664 – 1800 On the Brink

As the modern era dawned change began to accelerate, changes that would impact and be impacted by wargaming. Maps grew more accurate[3] and chess[4] grew less abstract. In late 1781 a Mr. Clerk of Great Britain developed a method of using model ships to gain tactical insights.[5] He used his ships to step through battles, analyzing the influence the geometry of the combatants had on their combat power. While a military simulation, Mr. Clark's work was not a wargame.

Yet fundamental changes in society would soon produce fundamental changes in wargaming. In the New World Benjamin Franklin, had the audacity to say that all men should play chess, as it would help them learn how to look after their own defense. In

Europe too, Voltaire encouraged the common people to play chess. The nobility was scandalized. If mere commoners played chess where could it lead?

Well… such thinking lead to the French Revolution, and to Napoleon. Today we think of Napoleon as a great military genius,[6] true, but not the full explanation. The French Revolution produced a meritocracy. Previously, only children of officers could become officers. Now, half of Napoleon's marshals had once been common soldiers. Also, a democracy could field a far larger army then a similar sized royal state. Genius, meritocracy and numbers, Prussia would invent modern wargaming while endeavoring, successfully, to overcome all these French advantages.

## 1811 – 1824 The Birth of Modern Wargaming

Modern wargames were ushered in by a Prussian named Reisswitz.[7]

In 1811 the Herr von Reisswitz, the Prussian War Counselor at Breslau invented an innovative wargame. First, he constructed a table with a model actual terrain. He then represented units by blocks. Each side would give their orders to an umpire who was required to update the terrain table, resolve combat and tell each sides only what they would know. To determine casualties umpires first consulted complex tables that indicated a envelope of likely attrition based on range, terrain and other factors. The exact attrition was determined by a die role, to depict the uncertainties of the battlefield!

Arguably, not since Gutenberg had one man made so many interlocking breakthroughs at the same time. Yet many historians do NOT credit Herr von Reisswitz with initiating modern wargaming. Why? Because for all its innovation Prussia used Reisswitz's invention in the same old way – educating princes in war.

But times were changing. To counter Napoleon's advantage in numbers the crowned heads of Europe turned to nationalism. Even after defeating Napoleon, dynastic rivalries encouraged, and the industrial revolution permitted, armies to continue to grow. Prussia soon found it had too many soldiers for only the sons of officers to command. Faced with this officer shortage even conservative Prussia began allowing the sons of mere bankers, industrialists and government officials to become officers!

One of these new officers was Lt von Reisswitz Jr.. He soon realized that he and his fellow, "outsiders" simply did not know as much about war as those who had been taught it on their father's knee. He believed ***his*** father's game could help. In 1824 he adapted his father's game so it could be played on topographic maps. At a stroke he made wargaming cheaper, more convenient (you cannot roll up a sand table) and more flexible.

Lt Reisswitz soon demonstrated his innovation to the Prussian Chief of Staff, General Karl von Muffling. After initial bored skepticism General Muffling became increasingly excited. Finally he exclaimed, "It's not a game at all, it's training for war. I shall recommend it enthusiastically to the whole army." Actually, he soon **ordered** all garrisons to conduct wargames.

This was the beginning of Lt Reisswitz's problems. His fellow officers resented the time these cumbersome wargames required. Finding his isolation intolerable, in 1827 Lt Reisswitz took his own life.

## 1825 – 1871 Wargaming Comes of Age

Of course not all officers hated wargaming. As early as 1828 Lieutenant Helmuth von Moltke advocated the use of wargames.[8] He even founded the Magdeburg (Wargaming) Club.[9] In 1837 now ***General*** Moltke became Chief of Staff of the Prussian Army and order an increased use of wargaming. Though he meet initial resistance Moltke understood what motivated his subordinates and he soon devised a strategy to increase the use of wargaming.

While Prussia has used nationalism to overcome France's advantage in recruiting, adopting a meritocracy was more difficult. Prussia's solution was to pare commanders selected for their nobility with chiefs of staff selected by merit. As the only chance even members of the petty nobility had of attaining high rank was selection for the staff corps virtually all officers wanted to be selected. However, only graduated of the War College were eligible. Moltke now required each application package include a letter from the applicants commander, evaluating his performance as the senior umpire for a wargame. It worked.

When the successful applicants became War College students Moltke saw to it that they did a great deal more wargaming. Wargaming appears to have always been part to the curriculum at the War College, but Moltke added several innovations collectively called the Staff Ride.

Periodically Moltke would take the entire student body of the War College to one of the actual invasion corridors into Prussia. Moltke would then describe the most likely first clash between invading and Prussian forces. He would then turn to the most junior student present and ask for his plan of battle. He would then ask the second most junior, then the third and so on. Why? If the most senior spoke first would any disagree?[10]

After arriving at a consensus battle plan they then played a map-based wargame. Moltke would then name the senior ranking general (aside from himself)[11] to command the invading forces and the second ranking general to command the Prussian forces. He continued thus until they were split into two equal teams. Why? Moltke believed that if their plan could succeed against some of their smartest strategists it would probably also succeed against any enemy strategist. Also, with two equal size teams more officers could participate meaningfully. The next day he would contact the local garrison. (This ***was*** an actual invasion corridor.) He would direct the garrison commander to march a few hundred soldiers where the plan called for thousands to

march. This was done to test the marching times and other details of the plan. When all this was done the plan went on the shelf as the ***actual*** plan for an invasion along that corridor.

Now let us think about all this for a minute. Moltke started with an "off site". He then brainstormed to reach a consensus. Moltke then tested the resulting plan against a world-class adversary, and finally tested the results with a field exercise. Essentially he used many smart people and effective procedures to create a plan worthy of a genius, eliminating Napoleons final advantage. With all our technology are we really this conceptually sophisticated today?

## 1872 – 1913 Wargaming Becomes Global

Oddly enough Moltke and Prussia won a series of wars, usually against opponents with larger forces that were technologically equivalent. Not surprisingly the rest of the world started coping Prussia's (now Germany's) wargaming methods.[12] While there were local variations the pattern was strikingly similar. A young officer would translate German manuals, often improving some aspect in the process, he would meet initial opposition, but in time the use of wargames became institutionalized.

## 1776 to 1912 Coming to America

Like so much about America, our wargaming is partially home grown and partially acquired from overseas.

Most credit Major W. R. Livermore, of the Corps of Engineers with bringing modern wargaming to America.[13] Published in 1883, Livermore freely admitted he started by simply translating German rules. However, he then went on to the compare their attrition tables to actual statistics from the Civil War and Prussia's own wars in 1866 and 1870-1871. He found that the German attrition tables usually predicted lower casualties then the historical record indicated, and he adjusted his tables accordingly.

Despite this historical foundation when Major Livermore sought official acceptance of wargaming he was blocked by the Army's then Chief of Staff, General William T. Sherman. He disapproved Major Livermore's proposals stating, wargames depict men as if they were blocks of wood, they are not blocks of wood but human beings who are seized by fear and sustained by leadership.[14] His basic objection, Major Livermore's wargame, like all up to that time, only depicted attrition, that is, units always fought to the last man. Sherman knew better.

While one living legend blocked wargaming in the Army another was advancing it in the Navy. William McCarty Little is one of those historical anomalies who have shaped the world far more than rank or title would suggest. McCarty Little had been medically retired for dubious cause in the middle of a promising Naval career. Instead of being bitter, he went on to help found the Naval War College and to father naval wargaming in America. For years he did so as a volunteer, receiving no pay beyond his retirement stipend.[15] Among these tasks in 1887 he wrote and delivered the first lecture on

wargaming given to a professional audience in the United States. While he drew on his conversations with Major Livermore and the writings of Captain Sir John Phillips Colomb, Royal Navy,[16] many of the insights were his own. Also in 1887 he and Major Livermore conducted the first joint Army-Navy wargame-driven field exercise. The Army high command promptly forbade any future joint exercises. In 1889 McCarty Little ran a wargame at the Naval War College. Wargames has been conducted at the Naval War College each year since.

McCarty Little selfless labors gradually paid off. As early as 1894 and 1896 wargames influenced the Navy's budget.[17] In 1895 a wargame played a decisive role in convincing Congress to fund the Cape Cod Canal. In 1899 the Army set up a War College and McCarty Little did what he could to ensure their curriculum included wargaming. From 1899 to this day it has. Soon it became the Army's turn to innovate; turning to transparent overlays instead of blocks, so that a permanent record of each move was made. Also, to standardize the input of moves to the umpire they devised a format for an operations order,[18] the father of the joint format still used today and of map overlays.[19]

While success was gradual, we can use a remarkable 1912 article in ***Proceedings*** to declare victory.[20] In this visionary article McCarty Little describes concepts that are considered new today. He argued wargaming had and should shape national policy, that they were the cure for peacetime "stove pipe" mentality, and that it could not only produce better plans but could condition its practitioners to think, hence react, quicker then their enemy hence gaining a important advantage.[21] The clarity, persuasiveness and confidence of this remarkable article clearly indicated wargaming had come to America – and like earlier immigrants had truly become American.

## 1872 – 1905 German Wargaming, innovation and decline

While wargaming was spreading throughout the world it was not standing still in Germany. Unfortunately, (for Germany) not all of wargaming's movement was in a forward direction.

The combat experience Prussia/Germany gained during their wars of unification had a powerful influence on their wargaming. One of the first things they learned Sherman could have told them, units do not fight to the last man. In 1877 a Saxon Captain named Naumann published rules to cover what today we would call **break points**, that is, the rules provided criteria for determining at what casualty level units would cease function.[22]

The second innovation came to be called Free Kriegspiel.[23] A series of books published between 1873 – 1876 argued persuasively for a radically different type of wargame. The concept was simple, wargames has always been unpopular due to the cumbersome, time-consuming adjudication rules. Combat experienced officers could substitute their military judgement for many of these rules. This would result in games that were faster, hence more popular, hence more often played.

At first Free Kriegspiel seemed to work well. At its best the professional judgement of experienced combat veterans could produce ***more*** accurate outcomes in less time. There were two problems though. First, Germany's veterans of 1871 gradually aged, retired, and died. Their replacements could not adjudicate with the same authority. The second, problem is today called command influence. When one of the players outranked the umpire, that player tended to value his professional judgement over that of the umpires.

Nowhere was this problem more visible or more damaging then in the case of Kaiser Wilhelm II.[24] Thinking himself a great military genius, Kaiser Wilhelm never missed a staff ride. The rides still started on a hill overlooking a possible invasion corridor. Just when Moltke would have asked the most junior officer for his opinion the Kaiser would immediately announce the "perfect" battle plan. You can imagine the level of debate. Then during the actual wargame, instead of evenly splitting, everyone wanted to be on the Kaiser's team. The results were predictable. The Kaiser's side always won. It was Germany's loss.

## 1890s – 1913 The Birth of Second Generation Civilian Wargames

While many of the citizens of the Western Democracies had played Chess since the time of Franklin and Voltaire they had missed out on the second generation of simulation wargames initiated by Reisswitz.[25] Perhaps not surprisingly the "technology transfer" that led to the civilization of wargaming started with a couple of reservists, one British one German.

Spenser Wilkinson began his crusade while still attending college. In 1873 while on summer vacation in Germany he was glancing through a pamphlet on the military balance and was shocked to learn Britain's Army was among Europe's smallest. Among the many initiatives Wilkinson organized England's first wargaming club.[26] Presumably through Wilkinson's efforts in 1900 one member of Parliament listed wargaming as a hobby.[27]

The German reservist's contribution to civilian wargaming was more indirect. Before civilians would be interested in complex simulation wargames they needed to be motivated to study war. Hans Delbruck provided that motivation. His family had advised Prussian Kings on matters of war for generations. "It was vital that the King understood war for it is on the outcomes of war that the nation prospers or dies," he said. "Now Germany is evolving toward a democracy, the people are becoming the sovereign, and it is just as important that they understand war." To help the people study war he became the foremost military historian of his time.[28] A prolific and influential author, he founded the first chair of military history at a civilian university, and edited the first defense affairs journal aimed at a civilian audience.[29]

Interestingly both the first modern navel and land wargames, intended for a civilian audience, were published in England.

Our first Brit published detailed rules for naval battles that required very detailed ship profiles. Data on only four ships were included with the game, and customers were soon clamoring for more. A game supplement with the needed profiles for all British ships soon followed. Still, playing a wargame between British ships was a little like kissing your sister. His next offering provided the needed data for the entire German Navy. What happened next? There was an uproar in the press – the Germans are our friends, how dare he imply our navies may someday fight! Wiser Mr. Janes next published - All the World's Warships. So the entire Jane's Group, that has contributed so much to the reference sections of libraries, and to the British balance of payments, started with a wargame.

Finally, a ground combat simulation wargame was published for civilian use. The author's avowed purpose in designing the wargame was to help civilians to better understand how terrible war was. He predicted that if the peoples of democracies truly understood how terrible war was they would make sure their governments would never again start one. While the author, H.G. Wells, made many correct predictions in his long career, this one was, at best, premature – his book of rules called, Little Wars, was published in 1913.

While both works were fairly popular, the number of civilians playing simulation wargames would remain modest for many decades. While the fairly complex rules deterred some, the main problem was the cost of the metal soldiers or ships. Only the well to do could afford full sets of such "miniatures" around the turn of the last century. Still, this is not to say early civilian simulation wargames did not have an impact. One young British aristocrat enjoyed wargaming with miniatures well into his adult years, his name, Winston Churchill.

## 1905 – 1918 Wargaming and the Great War

Arguably the most decisive wargames of all time were played in 1905.

That was the only year Count von Schlieffen's plan for a wide turning movement through neutral Belgium and Holland was wargamed before his retirement. Virtually all present were on the Kaiser's (German) team while two 1st Lieutenants played the armies of France, Britain, Belgium and Holland. The wargame concluded with the destruction of the France Army, so quickly that the British did not have time to come to her aid.[30] The Kaiser was pleased.

In the same year at Wilkinson's urging the British played a wargame examining the consequences of a new war between Germany and France. The British game also envisioned a German turning movement through Belgium. Like the German wargame the British game also indicated the Germans would destroy the French Army before a British Expeditionary Force (BEF) could intervene. Wilkinson and his fellows were not nearly so pleased with that outcome. This wargame led to a host of actions, in no small part due to Wilkinson's ensuring the results of the wargame came up on the floor of Parliament. Repercussions ranged from reworking mobilization and cross channel plans to informal staff talks with the French.[31]

Ironically, British wargaming was short lived. Wargames dropped in popularity as it became evident wargames of the period could not address the psychological and political dimensions of the Boer War.[32] Still, as the Germans lost the key first campaign of World War I because the BEF was in the wrong place at the right time, the impact of Britain's brief flirtation with wargaming on world history would be hard to exaggerate.

One wargame that did not shape history, but should have, took place in Saint Petersburg in April 1914.[33] The same two generals who would command Russia's two most modern armies in the event of war directed the Russian side in the war game. Both armies advanced into East Prussia against little opposition. When the Russian armies entered an area of lakes that made cooperation between the armies difficult. The German side placed a thin screening force in front of the Russian army to the North then shifted the bulk of their forces to the south, surrounding and destroying the Southern Russian army.[34]

Just four months later the same two Russian generals commanding the same two armies implemented what appears to be the exact same plan. Once again both armies made good initial progress. Once again they reached the area of lakes that made cooperation between the armies difficult. Now the real Germans placed a light screening force in front of the Russia's Northern Army and shifted the bulk of their forces to surround and destroy Russia's Southern Army – near the town of Tannenberg.

In Germany in the decade before the First World War something of a wargaming renaissance was underway, due to Moltke the Younger. This Moltke has received much abuse over the years for "ruining" Schlieffen's master plan. While the wisdom of decisions he made during execution can at best be called debatable, he clearly did much to improve planning methods before the war.[35]

Moltke started by going to the Kaiser, a childhood friend thanks to his famous uncle. Moltke privately told the Emperor that his strategizing during the Staff Rides was closing off rigorous debate. The Kaiser agreed to desist.

Next Moltke examined the wargames themselves. He discovered machine guns were not depicted. He was told there was insufficient data to predict their impact on attrition precisely. Moltke saw to it that data was acquired from the Russo-Japanese War. He then asked why logistics were not included. When told wargames could not account for logistics he pointed out that the Italian wargames had included logistics for decades.

Moltke then used his more objective and comprehensive wargame to test the Schlieffen Plan. The game indicated the two armies on the outside of the great wheel would run out of ammunition two days ***before*** the campaign ended. Moltke saw to it that Germany organized the first two motorized units of any army, anywhere in the world – two ammunition supply battalions.

Of course when war came the plan did not work as well as the Germans hoped. Why? Moltke's efforts to make the wargames more fully depict contemporary combat results did produce positive effects. Germany was relatively less surprised by the nature of the

early fighting. What got Germany into trouble was not what they wargamed wrong but what they failed to wargame.

They did not simulate the diplomatic and political consequences of their actions. Spontaneous efforts by Belgian civilians to destroy their own railroads caught the Germans by surprise. There were no such "units" in German wargames. Even more serious, they did not simulate the diplomatic consequences of invading Belgium. Invading Belgium brought the British Empire into the war,[36] and that Empire eventually brought in the United States, and the additional weight of US force ultimately defeated Germany. They got most of the details right, but their wargames failed to adjudicate the most decisive consequences of their invasion of Belgium - the political consequences.

These consequences were also ignored when Germany conducted wargames prior to each of her 1918 "Peace Offensive". Germany had a "window of opportunity" as its recent victory over Russia had freed up a great many forces, and few Americans were yet on the continent. But, if they failed, Germany's prospects were bleak. While they achieved spectacular advances, by World War I standards, these offensives did not reach any truly strategic objectives and hence ultimately failed.

Delbruck, writing in his defense journal ***during*** the war, criticized the General Staff. He stated that the wargames had roughly predicted the indecisive outcomes that took place – yet the General Staff went ahead. He claimed that if representatives of the Foreign Ministry were present at the wargames they would have realized that the initial advances would have caused panic in allied capitals. If before the offensives had lost momentum, he claimed, had Germany offered generous peace terms (like giving back – oh - most of Belgium) the offer might have been accepted. Now Delbruck feared Germany would not get nearly such good terms.[37] He was right.

## 1919 – 1938 Inter-War Wargaming – the Visionary and the Blind

Delbruck may have had a hand in bringing about the most sophisticated wargaming of the inter-war or any other period. Delbruck testified before a government panel that poor grand strategy was the root cause of Germany's defeat, and the General Staff's purely military analysis of war plans was a cause of this poor grand strategy. Their wargames could only show the attrition effects of invading neutral Belgium or unrestricted submarine warfare. They could not predict the political effects of these actions or the subsequent military consequences.

The German government soon established strategic level war games - not at the shadow general staff - but at the ministry of defense.[38] These wargames were truly comprehensive, with industrialists brought in to advise on the speed of industrial mobilization, attachés brought back from their assigned countries to play those country's militaries realistically, and diplomats integrating their actions with the militaries. Even journalists participated, commenting on likely world public opinion.

Limited to a skeletal military Germany could still wargame with forces she did not yet possess. In addition, the Germans took an extremely pragmatic and detailed look at the

history of the war. From this history they derived theories about what would and would not work in future wars. As the theories were rigorously compared to the historical facts, a new doctrine began to emerge. In turn this doctrine was rigorously tested in wargames - all with forces that did not physically exist. The Germans called the concept they so developed, "Mobile Operations," the rest of the world would soon call it - Blitzkrieg.

Germany's World War II preeminence in armor is all the more remarkable because at the ended World War I United Kingdom had the world's most potent armored force. Britain also produced the inter-war period's most prominent armor theorists, J. F. C. Fuller and B. H. Liddell Hart. How did Britain fall so far behind? While many factors worked against the development of British armor, wargames that did not reflect the tank's true value appear to have played a crucial role.[39]

Although not as bad as England's, the inter-war period was also the low point of US Army wargaming. Though little is written, all that is known is bad.[40] Perhaps due to the malaise born of slow promotions and low budgets, most army wargames stopped being wargames and instead became one-sided scripted exercises. The outcome was always the same regardless of brilliance or stupidity, diligence or laziness of the participants.

Some true wargaming did survive both at the Army's staff and war colleges, and in the field, though here were problems.

In 1934 six Air Corps Tactical School faculty members including Major Chennault were called to testify before a Commission on the Army's use of airpower.[41] They were originally told they would have to pay their own way as Army budget had insufficient funds to pay for their travel. At the hearings Chennault stated during Army field maneuvers airpower had not been allowed to attach enemy forces before, during or after amphibious landings but were only used in close support after trench lines had formed. The Army's response was that their learning objective was to practice trench warfare. If airpower was used to soon the trench lines might not form.

Chennault argued that these wargames needed to include airpower precisely because airpower would prevent World War I trench systems from forming. If the Army did not learn how to fight the more mobile style of future war through wargaming, they would have to learn those lessons at a far higher cost on actual battlefields.

When Captain Chennault returned from testifying he was informed his orders to attend the Army's Command and General Staff College were canceled.[42] Not seeing a chance for advancement without attending CGSC, Chennault left the service.

This was NOT an isolated incident. The faculty of the Air Corps Tactical School (ACTS) participated in Army War College (AWC) annual wargame from 1923, hoping to educate senior Army officers in the doctrinal use of airpower.[43] The results were uniformly disappointing. Despite the gradual inclusion of air officers in the planning process, the AWC restricted air participation to activities in the combat zone and not against vulnerable enemy rear-area targets. The artificial nature of the depiction of airpower

disgusted the ACTS participants, and may have actually been dis-training for the Army's future leaders.

Things were not perfect in the Army's air arm either. At Maxwell Field the Air Corps Tactical School (ACTS) was evolving the doctrine and educating the airpower leaders that would fight World War II. On the surface their teaching methods appeared outstanding. Periodically the students would apply what they learned by writing a plan to attack a real target. The faculty would then pick one of these plans and the entire student body would climb into aircraft and execute the plan. Not since Moltke's staff rides did planning receive such a fast real world confirmation. There was just one problem. ACTS was simulating actual missions - they were not wargaming them. The bombers always got through to Selma, as there was no enemy resistance. How this caused doctrine to evolve, or more likely not to evolve, can be guessed.[44]

There was one bright spot. 1n 1929 a young captain named George Kenney recognized the need for airmen to understand how airpower fit into overall theater campaigns. On his own initiative he developed an air/sea/land, wargame that took maintenance, supply, and even airfield construction, into account. Student feedback to his wargame was mixed. Immediately after execution, the wargame received a lot of criticism for being difficult to play. However, it was rated much higher in graduation surveys.[45]

Unfortunately the wargame was so complex and cumbersome that after the Kenney's departure in 1932, no other faculty member was willing to take it over. How much impact could such a short lived wargame have? Many historians believe General Kenney was the prime architect of MacArthur's Southwest Pacific air, sea, and land campaign in that theater. How much impact indeed?

Clearly the wargaming success story of the inter-war period is that of the US Navy. Both the fleet and the Marine Corps made impressive use of wargaming, with a positive impact that has seldom been equaled.

The Navy built upon the work of McCarty Little, continually refining his technique. Even before World War I the bulk of their wargames began looking at a possible war with Japan. Initially, all war games assumed the American fleet would dash across the Pacific, fight and win a big climactic battle and relieve the Philippines. However, as the Naval War College refined its methods, the logistical constraints on such a rapid advance became obvious. Soon the wargames also made clear the need for forward bases in such a campaign. As understanding increased, the time needed for the advance grew from days to months to years.[46]

Other elements were less clear. All through this period US intelligence on the specific characteristics of Japanese weapons and of their training levels was atrocious. Instead of arguing over what they did not know the Navy turned this handicap into an advantage. How they did it shows their keen insight into education and human nature.

Naval War College students certainly wanted the win their big "capstone" wargame at the end of their school year.[47] As students have always done, they asked those who

graduated before them for advice, or in the vernacular of the US military – "gouge." Graduates were happy to provide advice, "try to engage the Japanese at night, they are blind, watch out for their torpedoes though - they are killers, fortunately though their ships sink like rocks after the lightest of battering." However, when they talked to someone who graduated in a different year they learned, "avoid night engagements the Japs are incredible, and their ships are so rugged they can really close in and slug it out, at least you don't have to worry about their tinker toy torpedoes." Slowly it dawned on the students - the faculty was giving the Japanese different strengths and weaknesses in each wargame!

What were the students to do? Unable to simply learn Japanese strengths and weaknesses before the game they had to play the game in such a way that they could learn them through experience before any decisive engagements took place. Once they learned what those strengths and weaknesses were they would then develop a strategy to put US strengths against Japanese weaknesses, while protecting our weaknesses from Japanese strengths. They would then force the decisive engagements. In other words, they were "learning how to learn".

This by itself was a breakthrough, but the Navy's wargamers did more. Despite the Navy of this period being influenced by battleship admirals the Navy's aviation community was able to develop operational concepts and procedures that were ready to implement when, at Pearl Harbor, the Japanese took away our option for battleship tactics. How did they do it? The Navy was able to use wargames to cheaply, quickly and educationally try out different ideas in aviation and even ship design. For example, the circular formation used during World War II by carrier task forces was first developed during an inter-war wargame. Some of what they learned resulted in changes in ships already under construction.[48]

The United States Marine Corps carried out arguably the most important wargaming work done during this period. The Naval War College's war games had shown the importance of forward bases in any war with Japan. Yet World War I had seemed to show that, against modern weapons, amphibious assaults were problematic.

So the Marines had to solve an enduring problem, and they had to do so despite one of their traditional handicaps - a very sparse budget. Wargaming was their key.[49] Through both map wargames and live wargame exercises, they developed their doctrine of amphibious operations. They set out to make an offensive against Japan sustainable, yet what they really developed the key to Allied success in all theaters. D-Day and victory in Europe would have been impossible without the work done by the USMC during the 30s[50] - with almost no budget and all too little recognition then – or now.

## 1933 – 1941 The Storm Builds

It can be argued that the most potentially decisive wargames of World War II were never played. When Hitler came to power he quickly put a stop to the strategic-level wargames. He would make the future strategic decisions for Germany. During the war

Germany fought smart at the operational level, yet made poor decisions at the strategic level. Would these games have influenced Hitler's decisions?

Perhaps not. In 1938 General Beck, then Chief of the German General Staff, conducted a wargame of a German campaign against Czechoslovakia. While the wargame predicted a German victory, the fight would critically weaken Germany.[51] Hitler ignored these findings, as he believed the Czechs would not fight.

Still, in 1940 wargames conducted by the then obscure Lieutenant Colonel Manstein, seams to convinced Hitler to order the bolder plan.[52] The result was a French defeat far faster and more complete then would have otherwise been possible.

Wargames could also discourage. One on an air campaign against Britain, and a second of cross-Channel invasion, both predicted difficulties. When the actual Battle of Britain proved indecisive the predictions of the cross channel invasion wargame were taken even more seriously.[53]

Hence a wargame predicting disaster due to an attack on the Soviet Union may have had some effect. Such a wargame was held.[54] *Operation Otto*, was conducted over three separate occasions. At the end of the unprecedented third session, they had only wargamed through to early November. Yet no fourth session was scheduled. One reason was that the wargame predicted the destruction of 240 Soviet Divisions, with only 60 remaining, and a front line deep in the Soviet Union. Surly the Soviets could not recover.

Ironically, in the actual campaign on the actual "date" that Operation Otto ended the Germans had advanced about as far as predicted by the wargame and had actually destroyed more (248) Soviet divisions. However, instead of the Soviets being down to 60 divisions they still had 220 divisions. How could the war game be so wrong? The Soviets mobilize entire new divisions upon the beginning of hostilities. To make matters worse, beyond the time period wargamed the Soviets acquired an old ally - Winter. German forces were woefully unprepared for winter fighting. Would a fourth session of *Operation Otto* prompted preparation?

Red Army was also wargamed a German invasion.[55] Stalin's "displeasure" at the depth of German advanced in the wargame may help explain the premature counter-attacks made in the actual invasion. Stalin concede one of the reasons the Red Army did so poorly was that the young general playing the Germans had played brilliantly. This general's name? Zhukov.

At the same time these wargames were being played, the US Army was increasing the rigor of its wargaming. One reason, the Army's new Chief of Staff, George C. Marshall. Like Moltke, Marshall had liked wargames from the time he was a junior officer. Now, with the likelihood of war growing, he turned principally to the field exercise type of wargames.

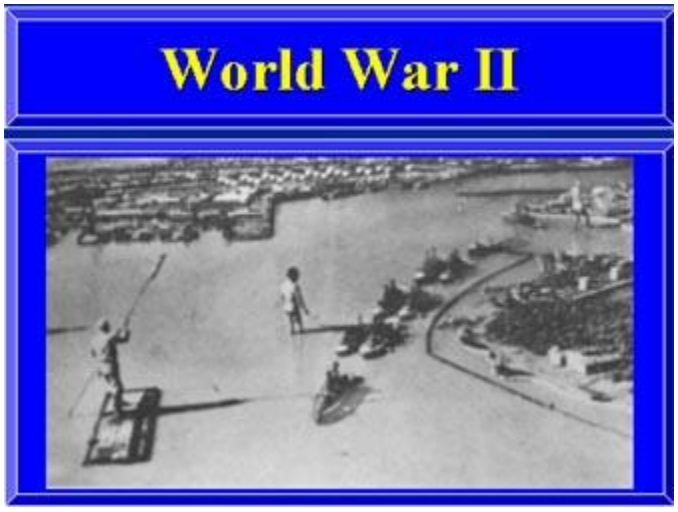
Of these, the Louisiana Maneuvers are best remembered.[56] While live play increased realism, especially in unit movement, combat used systems of adjudication very similar

to map wargames. As much equipment was new, the wargame could only be as accurate as the guesses about effectiveness.

There were some honest mistakes. The head of the tank destroyer program provided the adjudication guide for the effectiveness of tank destroyers. Later events would show these guides overstated their lethality. But until then these exercises "proved" their effectiveness. As a result, in early battles tank destroyers were used too aggressively - with tragic results[57]

Other flaws in adjudication were deliberate.[58] Efforts were made before play ever began to guarantee an outcome that would "prove" the ground officers' position on the employment of airpower. As a result the ground officers air concept prevailed.[59] Procedures were not changed until tragedies like the Battle of Kasserine Pass demonstrated the need.[60]

The Japanese also used wargames. In August of 1941 Japan's Total War Research Institute conducted a global political military wargame.[61] Paying close attention to the politics within target, neutral and friendly countries, this wargame (which did ***not*** include an attack on Pearl Harbor) predicted an Axis victory and may have encouraged Japanese entry into the war. After the decision for war each service wargamed their planned operations. These wargames could predict relative attrition with greater precision, but they did NOT include political considerations.




Some historians have maintained that Japan's wargaming of her attack on Pearl Harbor demonstrates how wargaming should be done.[62] Japan originally planned to sail her carrier force from its normal base straight toward Pearl Harbor. During the wargame the Japanese officers playing the Americans used their limited sea surveillance assets to search spot the Japanese force well out to sea. The Japanese side did "win" (i.e. they sunk more ships then they lost) but it was a Pyrrhic victory Japan could ill afford at the beginning of a long war against an industrially stronger nation. So the Japanese planners went back to their planning cell and came up with a new plan. This plan was

wargamed with much better results. Japan's subsequent victory at Pearl Harbor seemed to validate their planning methods.

Yet was Pearl Harbor a Japanese victory? Certainly it was a tactical victory by standards of attrition ratios. Shortly after his great "victory" Admiral Yamamoto said, "I fear all we have done is waken a sleeping giant and fill him with a terrible resolve."[63] The sense of purpose Pearl Harbor gave the American people far outweighed any temporary advantage it gave Japan. How could Japan have missed this? Japanese Naval wargaming did not take political impact into account.

## 1942 - 1946 World War and Eclipse

In contrast, the Japanese wargame prior to the Battle of Midway is usually cited as the best example of how NOT to wargame. During the game the American side's airpower sank two Japanese carriers. Rear Admiral Ukagi Matome, commander of their carrier force for the actual operation, unilaterally reversed the umpires. With the carriers restored to the game, and the Japanese side went on to capture Midway. Just weeks later, the Americans sank the same two carriers, plus two more. This time Admiral Ukagi could not reach into the "dead pile" and replace his ships.[64]

Meanwhile, the US Navy was reaping a rich harvest from their years of wargaming. A few months into the war Admiral Nimitz sent two lieutenant commanders back to the Naval War College. Their mission was to see if the College had ever got Japanese strengths and weaknesses right. The Commanders found the records of two wargames with Japanese values close to their current intelligence. The commanders returned with the doctrine and plans from those years.

The Marines also got to see how accurate their inter-war wargames were. Frankly, their early landings like Tarawa did not unfold as the pre-war wargames indicated. These inaccuracies had contributed to flawed doctrine and the development and purchase of not quite the right equipment.[65] But the wargames were close. The Marines learned in war it is easier to fix something that is close than to come up with a capability from scratch.

The Marines refined their wargame techniques quickly. Within a few assaults they were getting results that were so close to actual casualty count and "island secure" times that one Marine called it, "eerie." Yet the wargame for the next landing was way off on both counts. They adjudicated as before, and used the same methods to estimate Japanese strength. Why then was the game so wrong? It was due to a Japanese wargame.

The story of this Japanese wargame[66] answers a still bigger question, "after the Japanese were hopelessly outnumbered in 1944 and 1945 why did they keep on fighting?" When the Japanese ambassador to the United States and his staff returned to Japan they were taken to a secret location outside Tokyo. There they played the US side in a rare Army/Navy wargame. In that wargame Japan lost the war. Now what? Japan evolved a new strategy. Japan could not win but she could kill Americans. These Japanese leaders believed if they could kill enough Americans the nation would grow war weary and give

Japan better terms. Hence the doctrine, inflict the maximum cost on the Americans in time and blood.

This new doctrine was what had gone wrong with the Marines' wargame. The Marine Red Team had continued to follow Japan's previous doctrine. Later Japan would produce a still larger variance from the War Plan Orange wargames, using an innovation called - Kamikaze.

The Soviets evolved a unique style of wargaming.[67] Closer to Herr von Reisswitz's game than his son's, Soviet war games typically centered on terrain models. Using each sides plan for the entire operation the umpires, using incredibly detailed and cumbersome adjudication procedures, would adjudicate all the way to its conclusion. Only then would the two teams be called back and walked through the operation step by step. Essentially these were one-move wargames.

The Germans made heavy use of wargaming throughout the war. To describe all of their efforts would require a paper the length of this work. Here is just a sample.

Ironically, wargaming both improved German proportions to meet the D-Day invasion and hindered their actual response.[68]

Germans' wargame of the "Middle" Battle of the Ardennes may have been their most unusual.[69] Early in the Fall of 1944 the Fifth Panzer Army conduct a wargame of an American attack on their assigned sector - the Ardennes. While the wargame was going on the Americans actually attacked. Instead of dismissing the game Field Marshal Model sent only the commanders of units in contact back to their commands. He then directed that actual American movements be fed into the game. The Germans then wargamed out each of their orders before executing them. Finally, when it was time to commit the reserves Model called its commander over to the wargame map, personally briefed him and sent him on his way.

The defeat of the Axis Powers ushered in an eclipse of wargaming. Obviously, the Axis ceased wargaming. Within the United States the use of wargaming dropped almost as steeply. Only inside the Soviet Union was wargaming expanding and becoming more rigorous. Few knew this at the time, and few would have cared. If the Atomic Bomb has made war obsolete was not wargaming also obsolete?

## The late 1940s and 1950's: The Long Road Back

Our expectations of the future shape that future. The US expected peace guaranteed by atomic weapons and the Soviets expected continued conflict and doubted the effectiveness of atomic weapons. Because of those expectations wargaming atrophied within the US and grew in the USSR. As with the space programs, the Soviets widened their lead in wargaming because the US was standing still. Unlike space programs, Red wargaming was virtually unknown outside of the Soviet Union so their lead did NOT spur us to action.

Still, this bipolar wargaming world, quickly began to change. The seeds of wargaming's eventual recovery in the West were planted even before its post-World War II eclipse. Techniques and technologies developed during the war years would eventually support its recovery.

A lasting legacy of the war was the mobilization of the scientific community for the war effort. The Manhattan Project is the most famous example, but the Radar work at M.I.T. and countless other projects on both sides of the Atlantic contributed to allied success throughout the war.

Those who came to be called the operations research community frequently had a rapid impact. They were first employed to help win the Battle of the Atlantic, by seeking ways to use scarce Allied resources to the best effect. Due to some striking successes[70] by wars end, "OR" was being tasked to look into every type of military problem.

The war also spurred the development of computational devices for applications as diverse as code breaking and artillery tables. The continuing requirement for computational machines during the beginning of the cold war provided the seed money for what would soon take off as the computer industry.

As for the actual recovery of wargaming, the Navy again led the way. In 1947 the Naval War College increased its use of wargaming through the addition of a wargame intensive logistics course.[71] Then in 1958 when the Naval War College's computerized Navy Electronic Warfare Simulator (NEWS) became operational.[72] While later articles would admit this first computerized wargame never quite worked (aside from it's big status screen) the mere fact that the war game was computerized lent an air of modernity to what was supposed to be an antiquated procedure.

The US Air Force's initial use of wargaming came from the OR community.[73] After the war the Air Force facilitated the creation of RAND as a way to retain access to OR specialists. In 1948 RAND began experimenting with "crisis" gaming. By 1954 they launched a number innovative wargaming projects. RAND began a computer model of the Cold War competition between the US and the USSR. Input from the Air War College and the State Department prompted RAND to add political and economic factors. Thought the depiction of these factors in a December 1954 wargame were viewed as crude, the potential value of including such factors were recognized. To increase flexibility RAND later turned to a Free Kriegspiel style of play, and in so doing re-invented the German Political/Military wargame. Also in 1954 RAND attempted to game through an entire nuclear war. The next year RAND used an Air Warfare Model to

accomplish a "net assessment" at the Air War College. Given the image of OR at the time, this gave an impression of modernity to Air Force wargaming.

Wargaming also recovered some in the Army. Stung by its lack of preparedness in Korea, the Army began a continuing series of field maneuvers. Their cartoon adversaries the "Aggressors" did NOT duplicate Soviets tactics, but it was a start. The Army did realize it might have to fight the Soviets. To prepare they started debriefing officers of the last army to do so. One of the things the Army learned from these German Generals was the value the Germans derived from wargaming.

In 1953 a young man named Charles Roberts started selling a map wargame he designed called "Tactics" to civilians. By 1958 he had sold 2000 copies and had come within $30 of breaking even.[74] Encouraged, he founded the Avalon Hill Game Company to sell war, economic and sports simulation games to the general public.[75]

By the end of the decade wargaming was clearly on the rebound. In 1958 the US Marine Corps established a Landing Force War Game series at Quantico, Virginia, and even The Harvard Business Review published an article on adapting wargaming techniques to developing business strategy.[76] Talk about a comeback.

## 1960's: As Bad as it Gets

The 1960s gotten off to a promising start. While wargaming was also becoming more international[77] the main source for hope was the new Secretary of Defense, Robert McNamara. His strategy was to merge successful management techniques from General Motors with proven OR techniques.[78] His goal, effective defense at a cost the US could sustain over the long haul. At its core his concept for approving/continuing defense initiatives was elegantly simple, accomplish a life cycle cost analysis to learn what a proposal would really cost, and then use OR techniques to estimate military utility. The concept was sound, but problems would emerge during execution.

The 1960s also started well for naval wargaming, with Admiral Nimitz giving wargaming a ringing endorsement.[79] "The war with Japan had been [enacted] in the game room here by so many people in so many different ways that nothing that happened during the war was a surprise," he said, " – absolutely nothing except the Kamikaze…". The Naval War College soon began offering a course in wargaming. Later the Navy conducted the first remote war game, with the players aboard ship and adjudication accomplished at the Naval War College.[80] By mid-decade the Navy had upgraded their wargaming system to the Warfare Analysis and Research System (WARS).[81] Even so, they believed naval warfare was increasing in scope and complexity faster then they could increase the capabilities of their wargames.

Major advances were made in Air Force wargaming. Working with the Joint Staff and RAND, the Air Force started to wargame the Strategic Air Command's Single Integrated Operational Plan (SIOP) against a Red SIOP.[82] The RISOP was prepared by intelligence officers who studied not only Soviet weapons, but their strategies and tactics as well. The Air Force also wargamed the defense of North America, using a war game called Big

Stick. Big Stick was demonstrated at the Air Command and Staff College in 1961, and in 1964 became part of the school's core curriculum. Finally, in 1967, the Air Force introduced the world's first instrumented air weapons range. Established at Eglin AFB and used in Weapon Effectiveness Testing, the full impact of this innovation would become apparent the next decade.

The Army wargaming also became more effective during the 1960's. Wargaming was used by helicopter enthusiasts to develop the concept of an Air Mobile Division. In 1962 they then used wargaming to sell the concept to McNamara, who directed that the Army follow through with the idea quickly. When the Army deployed their first Air Mobile Division to Vietnam they, like the Marines before them, found that real combat was different from the wargames.[83] Also like the Marines the Army's initial concepts were close enough for field adaptation.

Joint wargaming was becoming a reality. In 1961 a Joint Chiefs of Staff-level wargaming operation was established to provide an unbiased, joint arena to conduct McNamara's wargames.[84] The next year wargame/cost study predictions helped convince McNamara to support the creation of an Air Mobile Division, while relatively low cost effectiveness predictions influenced him to cancel the Skybolt air-to-surface missile system. This caused a storm of protest from Britain, which had spent significant funds on the program. The US was blindsided by this criticism because McNamara's attrition per dollar calculations did not even consider possible diplomatic repercussions of program cancellation.

Attempts were made during the 1960's to broaden wargaming beyond attrition. After the Bay of Pigs fiasco President Kennedy had complained that his military advisers did not understand the political implications of their recommendations. This encouraged the use of Political Military wargaming at the Pentagon and at PME schools. In 1964 the Advanced Research Projects Agency funded efforts to produce a wargame that would depict all the political, psychological and economic ramifications of an insurgency.[85] This would have produced an entirely new generation of wargames capable of examining all wars in a much more comprehensive way. Regrettably, despite some interesting work in this area the defense planning community continued to use attrition based wargames.

In 1964 the JCS conducted politico-military game called Sigma I-64. This exercise depicted US strategy options for Vietnam. The exercise was repeated with even higher-level participation. In his book War Games, Thomas Allen implies these wargames predicted a US defeat.[86] However, review of the actual declassified reports on both exercises presents a different image.[87] First, the strategy executed in the wargame did not match that followed in the actual event. During Sigma II-64 the blue side immediately executed attacks on an expanded version of the JCS's 94 Target List, and North Vietnam's ports were promptly mined. Second, each exercise depicted only the first several months of US involvement. Even if they had been able to adjudicate the political consequences of US casualties the wargames did not cover sufficient time for those consequences to arise.

The most effective wargaming was done by the Communist North Vietnamese. Using Soviet wargaming methods, the North Vietnamese wargamed each of their operations. The familiarity with the plan the Soviet method produced allowed the Communists to conduct fairly complicated attacks without radios, coordination being accomplished by subordinate's memory of the plan and wristwatches.

The 1960's witnessed the steady growth of civilian wargaming.[88] While the decade started with one publisher and a few thousand annual sales it ended with a half dozen publishers with total sales of over 100,000 units per year. The sophistication of these wargames also increased due to the competition of the market place.

## 1970's To Study War

Very little was published on wargaming in the early 1970s. Perhaps this reflected the anti-military attitude of the times. It appears there was also something of a downturn in the actual use of wargaming. If so, the decline was short lived. As before, the Navy led the way, but this time they were soon overtaken - by the Air Force.

Vietnam was not going well. Among all the other problems our air-to-air kill ratio had dropped from spectacular in Korea to dismal (occasionally worse then 1 to 1, seldom even 2 to 1). A study called "Red Baron" concluded we were teaching our pilots how to fly, not how to fight. If a pilot survived his first eight missions "on the job training" would teach him to fight, and he would survive his tour.

The Navy acted first by establishing their Top Gun school in 1971.[89] The aggressor/instructor pilots flew small, nimble jets similar to those flown by the enemy. They also attempted to duplicate Soviet style tactics. It worked - the Navy saw a significant improvement in their kill ratios over Vietnam.

The Air Force response took longer to kick off but was more comprehensive. In 1974 the Air Force Established the Fighter Weapons School. The school would be similar to the Navy's Top Gun school, but different in that air to ground tactics would also be taught. Then in 1975 the Air Force initiated the Red Flag series of exercises to improve the fighting skills of all their combat pilots. Both the School and Red Flag used an electronic range like that at Eglin to allow more accurate adjudication and debriefing of engagements. Over time the Air Force created an entire enemy "nation" in the Nevada desert complete with strategic targets guarded by simulated air defenses.[90] This also provided a realistic environment for trying out new equipment and tactics.

Also in 1975 the Navy established its Command Readiness Program, an ongoing series of wargames played from the actual surface combatants. At decade's end the Navy launched a new batch of games, their Global War Game series.[91] A deliberate attempt to recapture the ability to gain valuable insights that Navy inter-war games produced, Global also started with fast climatic Naval battles. Like their earlier wargames the rigors of wargaming change their expectation of a war with the Soviets.[92]

The 1970s were good to commercial wargaming.[93] An increasing number of publishers and growing sales encouraged innovations such as depicting effects of morale, training levels, surprise, and many other supposedly "intangible" factors. Commercial wargaming was also starting to attract serious attention. In 1974 the US Army became the first service to buy a commercial style wargame, the tactical ground combat simulation – "Fire Fight". In 1975 Origins, the first civilian wargaming convention, was held. Sales rose steady during the decade, exceeding 2 million units in 1979.

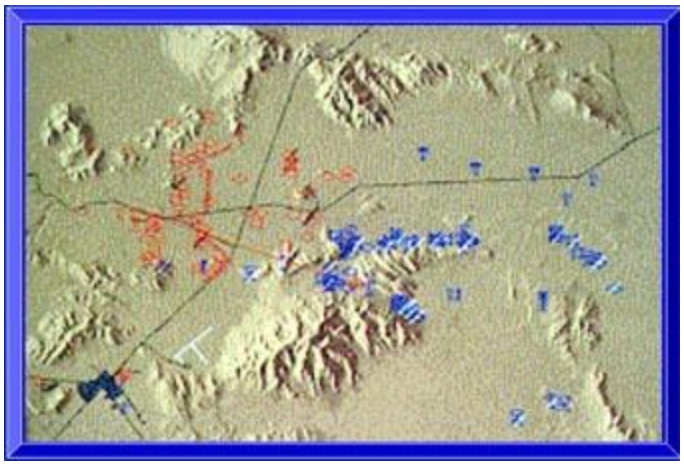
Still, the trend with the most profound effect came from within the services. As the 1970s progressed, Vietnam era company grade officers began to enter positions of greater authority. Many felt their fighting forces has been hamstrung by a failure of strategic vision and a lack of basic campaign planning. As individuals and as groups many worked to ensure that the services would be better prepared intellectually the next time. In the Air Force Lt Col Denny Drew pushed to put more "war" in the War Colleges. In the Army Lt Col Ray Macedonia pressed for more wargaming.

## 1980's Promise and Performance

Things seemed to come together for wargaming in the 80's. Each service, NATO, and commercial wargaming, made major progress.

The Army made the most important advances of the early 1980's. In 1980 the Army opened the National Training Center.[94] This "Red Flag for ground forces" employed an instrumented range, technology similar to laser tag, and a credible aggressor force to produce the most realistic ground combat environment ever. More wargaming was also being done at home station, thanks to an innovation by III Corps.[95] They simply established a wargaming center at each maneuver base. Wargaming skyrocketed when overworked commanders found the centers meant it took ***less*** of their time to setup a wargame then other types of training.

In 1981 the Navy upgraded its WARS wargaming system to produce the Naval War Game System or NWGS.[96] Sven years later they upgraded their system again to the Enhanced Naval War Game System or ENWGS. Each upgrade roughly doubled computing power. Yet the scope of Naval wargaming always seemed beyond their latest system. As in the 50's faculty filled the gape with innovation, common sense and long hours. The strain stemmed from increasing Naval War College and fleet use, and the Global exercises. As Global increased in sophistication it became increasingly evident that a war with the Soviets would likely be protracted and that in a protracted war the Soviets were doomed.[97] As Global attracted more of Washington's power hitters, that perception became wide spread, coloring not only Navy strategy but national strategy as well. As Global increased the credibility of wargaming with Congress, the Navy turned to wargaming to support their budgets.[98] In 1988 the Marines began wargaming their POM initiatives as well.[99]



In 1984 the Air Staff Director of Operations was given oversight of all Air Force wargaming.[100] In 1986 construction was completed on the Air Force's first wargaming facility, located at Maxwell AFB. Two years later this $21 million facility/computer system was declared fully operational[101] - despite continuing problems with their adjudication software. As with the early generations of Naval computer adjudication, hard working individuals came up with work-arounds.

The 80's was also a successful but transitional decade for commercial wargames.[102] Print wargame publishers saw their sales plummet. Peaking at 2.2 million units in 1980, sales dropped to less then a million at mid-decade and half a million by the decade's end. Much of the decline was due to the rise of a new (for civilians) wargame medium. Personal computers allowed the recreational software industry to take off, and with it, computer based wargames for home use.

The 80's also saw innovations in Joint wargaming. In 1982 the National Defense University finally initiated a wargaming center,[103] and the Warrior Preparation Center becoming operational in Germany.[104] The Center was specifically designed to allow senior US and NATO headquarters try war plans without having to maneuver troops. Bills for exercise damage, environmental concerns, and concerns over Soviet capabilities to monitor live exercises, all contributed to increasing support for the Center. By the late 1980's all area Commanders-in-Chief (CINCs) were using wargames. A 1989 study concluded that US Central Command was clearly ahead of the pack – a circumstance that turned out to be fortunate.

The 1980s also saw the first unclassified reports on how the Soviets wargame. This was due in part to greater openness. Articles that wanted to appear frank but revealed little began to appear in their open press. However, the real meat came from defectors from the Afghan Army. Trained in Soviet wargaming methods these officers were only to happy to provide details.[105]

Another source was watching the Iraqis during the Iran/Iraq war. The Iraqi used Soviet wargaming methods during their successful offensives during the late Iran/Iraq war.[106] However, Soviet wargaming can not adjudicate the strategic impacts of air power. So, in 1986 Iraq contracted with the US defense contractor for a computer wargame.[107]

## 1990 – 1991 War on Sand Table and Sand

To a degree, the Gulf War was a fight between Soviet and US wargaming methods.

The Iraqi invasion of Kuwait followed the pattern of Soviet wargamed operations - a fast start that petered out – at the Saudi border.

Just prior to the Iraqi invasion of Kuwait, CENTCOM played another war game called Internal Look. In this exercise only a token US force was sent "to show resolve". Iraqi forces drove south and the US had trouble getting sufficient forces in theater to slow the Iraqi advance.[108]

The morning of the Iraqi attack, Mark Herman, the designer of the commercial wargame Gulf Strike and employee of the defense contractor Booze Allen, was approached by the Joint Staff and asked to produce a wargame of the developing situation. He was on contract by lunch. By modifying his commercial wargame Gulf Strike, he was able to begin play of a now classified wargame by mid afternoon![109]

During August, a joint planning cell lead by Col John Warden and built on the Air Staff's "Checkmate" office produced the "Instant Thunder" theater air campaign plan. The plan was sent to the Air Force Wargaming Center. The resulting wargame produced no effect, as the software did not adjudicate the impact of hitting strategic targets – being designed to model Cold War attrition campaigns.[110]

As time for the Coalition counterattack approached, an element of the US government pushed for CENTCOM to occupy western Iraq with the 101st Air Assault Division. It was believed that this would prevent mobile Scuds from getting close enough to launch against Israel. CENTCOM quietly wargamed such an operation, passed on the estimated casualty figures, and the suggestion did not come up again.[111]

Many others were wargaming the Gulf War. Although outcomes varied somewhat,[112] most official wargames indicated Coalition casualties would total about 30,000 of which 6,000 would be American fatalities. Senator Sam Nunn decided to oppose the counter offensive. In his political judgement that the American people would not accept such high casualties.

As the time to attack grew closer, individual units started to wargame their own parts of the plan.[113] At least one Army unit used a commercial wargame. A soldier wrote the publisher stating a sandstorm had blown their game away and asking that a replacement wargame be sent – quickly.[114]

The superb training received during live wargames like Red Flag and the NTC, contributed much to our success. Pilots based in Turkey referred to Northern Iraq as "The Range" and a number of soldiers were taped saying, "the NTC (National Training Center) was much harder."

However, computer wargames mislead commanders. Adjudicating high casualties C-130 transport aircraft were configured for medical airlift, not to fly in the fuel that was actually needed. As the wargames indicated the Iraqis would fight to the last man, there was little preparation for POWs.[115]

As Coalition forces moved forward, they uncovered evidence of Iraqi wargaming. From the terrain modeled, it was clear the Iraqis were rehearsing to repel in amphibious invasion.[116]

Though we achieved one of the most overwhelming military victory in history, we did not achieve a proportionately positive state of peace. Why? It appears the US never wargamed through to peace. The Marines had planned to conduct such a wargame but military victory came to quickly. Even if it had been conducted it is doubtful that our attrition models would have anticipated the revolts against Saddam.

The impact of wargaming on the Gulf War was enormous, and mostly positive. Yet casualty predictions were over 20 times too high. These predictions had real political and military consequences. Did this produce yet another eclipse of wargaming?

## 1990s: The Return of Achilles

No.

More money was spent on wargaming then all pervious decades.[117] Much of this increased investment is producing excellent value for the cost. Yet the central problems that caused the bad predictions were pronounced impossible to fix, or ignored.

A RAND paper, "The Base of Sand" captured the problem well. What was needed was a more comprehensive adjudication of armed conflicts. More computing power without a more comprehensive understanding of war would simply produce the wrong answer faster and with more persuasive graphics.[118]

In 1990 the Deputy Secretary of Defense created the Executive Council on Modeling and Simulation (EXCIMS) to take a comprehensive look at wargaming.[119] They saw a maze of adjudication software - most looking at one regime, using different data, and producing different answers to the same questions. Ground and naval surface forces had

clearly played an important role during the final days of the Desert Storm campaign, yet no wargame could fully depict such a joint operation.

As a first step to bring order to this chaos, a permanent DoD level office was established. In 1991, the Defense Modeling and Simulation Office (DMSO) was established.[120] Next they establish an information clearing house so that work was not duplicated out of ignorance. Established in 1993 in 1999 it became the Modeling and Simulation Information Analysis Center (MSIAC).[121] As an interim measure, software was developed to allow existing service war games to talk to each other. Finally they funded programs to replace many one service adjudication engines with a few joint ones. JWARS, was to replace most analytical models while JSIMS, using modules developed by each service, was to replace all the models used to train CINC staffs.[122]

Increased competition for limited defense dollars and the success of Global as a analytical and lobbying tool have led all the services to conduct Global-like wargames. Collectively called "Title Ten" wargames, the Air Force's Global Engagement, and the Army's Army After Next, are now held annually.[123]

The 90s were full of surprises for Commercial wargaming.[124] Sales of print wargame continued to decline, falling to 200,000 units a year by mid-decade. The industry then stabilized, desk top publishing allowing lower sales per title to still be profitable.[125] In contrast the recreational software industry has exploded ($25 Billion in global sales in 1997).[126] However, wargaming's share of those sales have fallen from 25% when PCs began to about 10% today.[127] (Still, 10% of $25 Billion…) Most surprisingly militaries wargaming made a comeback, its proponents saying their painted figures are the ultimate "high resolution graphics."[128] Commercial Wargame has also become globally with many US titles selling well overseas and several foreign titles selling well in the US.

As the 90s ended, there are some indications defense wargaming may have reach the millennium early. In October of 1999 a well attended NATO conference on modeling, simulation and wargaming demonstrated that wargaming had indeed become international again. Earlier in the year major test of JSIMS by the US Atlantic Command demonstrated that this important $150 million system was approaching operational usefulness[129] Finally, as a fitting conclusion to a century of achievement, on 28 September 1999 the Naval War College dedicated its new $19 million wargaming facility. Most appropriately this latest attempt by the Navy to "push the envelope" is named for the selfless individual who started it all - McCarty Little Hall.[130]

Yet despite a decade of heavy investment and significant innovation all is not well with defense wargaming. In the Spring of 1999 defense wargaming received the acid test, when America again sent its people into harm's way, this time in the skies over Kosovo. How well did wargaming do? Again wargames failed to provide insights to the types of human effects and system impacts that were the main focus of NATO's air campaign.

How can these deficiencies be resolved? The history of wargaming provides proof of the importance and persistence of the problem and some clues to the solution. Describing a possible solution will require an article of its own.

**Notes**

1. As for formal definitions, Webster defines wargame as a simulated battle in military training maneuvers. While Joint Dictionary of Military Terms define war game 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.

2. There are several works on very early strategy games. Perhaps the best brief account is Alfred H. Hausrath, Venture Simulation in War, Business, and Politics, McGraw-Hill Book Company, 1971, 3-5

3. For a general study in the rise of quantification in he West see Alfred W. *Crosby's The Measure of Reality*, (Cambridge UK: Cambridge University Press, 1997)

4. John P. Young, *History and Bibliography of War Gaming*, (Department of the Army, 1957), 2-6

5. Peter P. Perla, *The Art of Wargaming*, (Annapolis, Maryland: Naval Institute Press, 1990, 19-21

6. Indeed, Napoleon *may* have invented the first operational war simulation. He would "walk through" his campaigns in advance, using colored pins on maps to help him visualize where his units and those of his enemies would be when.

7. Alfred H. Hausrath, *Venture Simulation in War, Business, and Politics*, (New York: McGraw-Hill Book Company, 1971), 5-8

8. Stepen B. Patrick, *Wargame Design*, (New York: Simulations Publications, Inc., 1977), 4

9. Young, History and Bibliography of War Gaming, 9

10. Besides the younger officers might come up with something innovative.

11. He was always the senior umpire.

12. The following list was derived from several sources but principally, Young, *History and Bibliography of War Gaming* 11-13

**1866 - Austro-Hungarian**
**1872/1883 - England**
**1873 - Italy**
**1874/1889 - France**
**1820/1875/1905 - Russia**

Secondary diffusion -Japan, Turkey, Latin America

13. However some believe Lt C.A.L. Totten was first. While advocates of both make good cases, Livermore is generally considered first because he was the first to publish. See Young*, History and Bibliography of War Gaming*, page 16 for more detail.

14. The noted author David Isby E-mailed me an equally clear though not so sucinct Sherman quote, "I know there exist many good men, who honestly believe that one may, by the aid of modern science, sit in comfort and ease in his office chair, and with little blocks of wood to represent men or even with algebraic symbols, master the great game of war. I think this is an insidious and most dangerous mistake. ... You must understand men, without which your past knowledge were vain".

15. Anthony S. Nicolosi, "The Spirit of McCarty Little", *Proceedings*, 1984 09, 77

16. Capt Colomb, RN appears to have designed the worlds first true naval wargame, see Francis J McHugh, "Eighty Years of War Gaming", *Navy War College Review*, 1969 03, 88-90

17. One indication of that influence, in 1897 Throdore Roosevelt wrote the Naval War Collage to insure his visit would coinside with, "one of your big strategic games." Perla,*The Art of Wargaming,* 66

18. William McCarty Little, "The Strategic Naval War Game or Chart Maneuver," *Proceedings*, Dec 1912, page 1223.

19. Young, *History and Bibliography of War Gaming*, 18

20. McCarty Little, "The Strategic Naval War Game or Chart Maneuver," 1213-1233

21. The similarity of some of the concepts in this article and those espoused by Col John Boyd, USAF over six decades later are striking. My suspicion is they both came to the same truth by different routs. For a tight description of Boyd's concepts see David S. Fadok, *Hohn Boyd and John Warden, Air Power's Quest for Strategic Paralysis,* (Maxwell AFB, AL: Air University Press, 1995), 13 - 20

22. In the late 1980s this author was told by a senior Air Force wargaming official it was impossible to depict break points in contemporary Air Force war games. For more information on how Germany was doing the "impossible" 110 years earlier see the 1968 book by Andrew Wilson, *The Bomb and the Computer*, (New York: Delacorte Press, 1968), 12

23. Perla, The Art of Wargaming, 31-34

24. Lt Roger Harrison (promoted to Lt Col in 1983) *The Influence of War Gaming on the Schlieffen Plan* (Washington DC: Georgrtown University Graduate School 1967)

25. During the early and mid 1800s a number of war chess war games were published in the United States but these had more in common with earlier versions of war chess than

with modern wargaming. See George Gush with Andrew Finch, *A Guide to Wargaming*, (New York: Hippocrene Books, 1980), 24.

26. The Oxford Kriegspiel Club founded in 1873, see Gush with Finch, *A Guide to Wargaming,* 24

27. Mentioned in E-mail from James F. Dunnigan, "Dean" contemporary commercial wargames designers.

28. He is considered by many to be the father of modern military history.

29. For more information on Hans Delbruck see Gordon A. Craig's chapter on him in Peter Paret's *Makwrs of Modern Strategy*, (Princeton, NJ: Princeton University Press, 1986)

30. Harrison, *The Influence of War Gaming on the Schlieffen Plan*

31. For more detail see Wilson, *The Bomb and the Computer,* 28-32

32. M.R.J. Hope Thompson, "The Military War Game," *Journal of the Royal United Service Institution*, 1962 02-11, page 50

33. The French thought they knew Germany's broad plan in the event of war, an immediate offensive against them hoping to defeat France before Russia could fully mobilize. To defeat this strategy France urged her Russian ally to focus all her mobilization efforts on her two most modern armies. As their mobilization was complete, these two armies would invade East Prussia. This would help Russia, as the Germans would be unready for such an early offensive. Even more importantly, it might help to keep France in the war by causing the Germans to divert forces from her campaign against France. Russia agreed to the French strategy and developed it into a detailed plan. The wargame would test this new plan.

34. For more detail see Wilson, *The Bomb and The Computer,* 33

35. Harrison, *The Influence of War Gaming on the Schlieffen Plan,*

36. Barbara W. Tuchman, *The Guns of August,* (New York: MacMillan Publishing Compant, 1962), 90-91

37. Paret, 349-350

38. After World War II General Manstein claimed these exercises were initiated at his suggestion. See F.J. McHugh, *Fundamentals of War Gaming*, (Newport, Road Island: Navy War College, 1966)

39. Liddell Hart, *The Liddell Hart Memoirs*, (New York: G.P. Putnam's Sons, 1965), 252 - 254

40. All I have found on Inter War Army wargaming is two brief references in articles on Naval wargaming..

41. Major H. Dwight Griffin and others, *Air Corps Tactical School: The Untold Story,* (Maxwell: Air Command and Staff College, 1995) 7

42. Claire Lee Chennault, *Way of a Fighter,* (New York G.P. Putnam's Sons, 1949) 18-19

43. Robert T. Finney, History of the Air Corps Tactical School 1920 – 1940, Center for Air Force History, 1992, pages 22-23

44. Various lectures at Air University have gone into greater depth then any published source I have found, but the bare bones of this method is laid out in Griffin, *Air Corps Tactical School: The Untold Story,* 5.

45. During work on my masters thesis on the history of wargaming I was to find any information on wargaming at the Air Corps Tactical School. The above is based on conversations I had in the early 1990s with then Major Peter Faber while we were both at the School of Advanced Airpower Studies. Now Col Faber, his PhD thesis is on the Air Corps Tactical School.

46. Michael Vlahos, "Wargaming, the Enforcer of Strategic Realism: 1919-1942," *Navy War College Review*, 1986 03, pages 7-22

47. While this was done with an early aircraft carrier wargames could also have more systematic effect on design. For example the design of the Brooklyn class light cruisers was validated through wargaming, Prodos, *Pentagon Games*, 4.

48. While the Marines wargamed at least as early as 1924 Victor H. Krulak, *First to Fight*, (Annapolis Maryland: Naval Institute Press, 1984), 89, work on developing an amphibious doctrine shifted into high gear in 1933 when the Commandant of Marine Corps Schools discontinued all classes so faculty and students could work on defining what was needed for the capability, John H. Cushman, "Maneuver From the Sea," *Proceedings*, April 1993, page 47

49. Cushman, 47

50. Many sources allude to this incident. The earliest I've found is Wilson, *The Bomb and the Computer,* 21

51. T.N. Dupuy, *A Genius for War*, (McLean, Virginia: The Dupuy Institute, 1984), 266

52. For the Sealion wargame see Wilson, *The Bomb and the Computer*, page 38 and Alfred H. Hausrath, *Venture Simulation in War, Business, and politics*, (New York: McGraw-Hill, 1971), page 27. For The Luftwaffa's wargame see James S. Corum's *The Luftwaffe, creating the operational air war, 1918 – 1940,* Lawrence Kansas: University

Press of Kansas, 1997) page 356, also see Edward L. Homse, *Arming the Luftwaffe,* (Lincoln Nebraska: University of Nebraska Press, 1972) 243

53. Again there are several accounts. While somewhat verbose the most authoritative account comes from the US Army program to learn from the German Army's experiences during World War II by producing a number of papers by the German generals themselves. See, Rudolf M. Hofmann*, German Army War Games*, (Carlisle Barracks, Pennsylvania: US Army War College, 1983), 38-44

54. Earl F. Ziemke and Magna E. Bauer, Moscow to *Stalingrad: Decision in the East*, (Washington DC: Center of Military History, US Army, 1987), 16 - 18

55. Christopher R. Gabel, *The U.S. Army GHQ Maneuvers of 1941*, (Washington DC: Center of Military History, US Army, 1991)

56. Martin Blumenson' s chapter on Kasserine ( pages 226-265) in Charles E. Heller and William A. Stofft (ed.), *America's First Battles, 1776 – 1965,* (Lawrence, Kansas: University Press of Kansas, 1986) provides a good, concise if somewhat army centric view of the battle. The lessons the battle taught about tank destroyers is summarized on page 263.

57. Comments on the depiction of Airpower during the Louisiana Maneuvers are based on research done by the then Major Mark Clodfelter while he was on faculty at the School of Advanced Airpower Studies.

58. Warren A Trest, *Air Force Roles and Missions: A History,* (Washington DC: Air Force History and Museums Program, 1998) 77

59. In fairness, the air battle over Kasserine also demonstrated the need for sufficient air base construction engineers to allow forward fields to keep up with advancing ground forces.

60. Perla, *The Art of Wargaming,* page 45

61. John Prados, Pentagon Games, (New York: Harper & Row, 1987, page 1-2

62. While this quote is often attributed to Admiral Yamamoto no where is it presented more powerfully then when it is shown on screen at the conclusion of the feature movie, Tora, Tora, Tora..

63. This morality play is arguably the most often told incident from the history of wargaming. While the above is true, it makes the argument against the Admiral more "open and shut" then was actually the case. Most authors fail to mention that the American aircraft that sank the carriers during the wargame were B-17s. In the actual battle the B-17 proved completely ineffective (they never hit an enemy ship), so, in a narrow sense, Ukagi was right. Still, Admiral Ukagi failed to address the issue the loss of

his carriers in the wargame should have brought up - what if the American's get in the first hit? Would we have enough strength to win anyway?

64. For the best brief account of Tarawa and its lessons see, Ronald H. Spector, *The Eagle Against The Sun,* (New York: Vintage Books, 1985), 259-266.

65. Dr Ronald H. Spector went into detail on this incident during a masters course he gave for the University of Alabama at the Air University. Several published sources touch on it, such as Hausrath, *Venture Simulation in War, Business, and Politics,* page 32.

66. The most detailed description of Soviet wargaming I have found was based on the debriefing of two Afghan Army colonels see, John Sloan, Ali Jalali, Gouhlam Wardak and Fred Giessler, *Soviet Style Wargames,* (Washington DC: Science Applications, Inc., June 1986).

67. Early in 1944 the Germans conducted a wargame on an Allied invasion of France that focused on German logistical preporations. The exercise prompted and clarified logistical improvements that increased the effectiveness of German resistance then the invasion came. See No author given, *World War II German Military Studies, Volume 12,* (Washington DC: Historical Division, US Army Europe, 1979) page 50. Later, German reconnaissance spotted some of the preparations across the Channel from Normandy. The Germans concluded the Allies were preparing a feint, a secondary invasion intended to trick them into thinking Normandy was the main attack. Still, they conducted a wargame of an Allied landing at Normandy and concluded that an Allied lodgment was probable! If the feint was successful the Americans might decide to make the feint their main effort. For this and other reasone Germans therefore ordered reinforcements into Normandy. The regiment that made Omaha Beach so bloody was one of those reinforcements. Ironically, while one German wargame made D-Day far more costly, another actually helped the Allied cause. When the invasion took place many key commanders were away from their headquarters, on their way to a second wargame. This wargame would test how well they could meet an invasion of Normandy when all the planned reinforcements were in place. While many sources on D-Day mention German anticipation of a faint invasion in Normandy and the final wargame, the most well known being Cornelius Ryan's, *The Longest Day, June 6, 1944,* (New York: Simon and Schuster, 1959) pages 80,81, and the Movie of the same name, I have been unable to find my source for the German's first Normandy wargame and would appreciate any leads.

68. Hausrath, page 27

69. Wilson,*The Bomb and the Computer,* pages 45 - 62

70. Peter Perla, *The Art of Wargaming,* 77

71. ibid, 78

72. The best work on specific early RAND/Air Force wargaming initiatives is Ghamari-Tabrizi's soon to be published Simulating the Unthinkable, Gaming Nucklear War in the 1950s and 1960s. For a more general history of the RAND Air Force relationship see 50th Anniversary Project Air Force, 1946 – 1996, RAND,

73. The Staff of Strategy and Tactics Magazine, *Wargame Design*, (New York: Simulations Publications, 1977), page 11

74. Martin Campion and Steven Patrick, "The History of Wargaming," Strategy and Tactics Magazine, 1972 page 12

75. G.R. Andlinger and J.R. Greene, Harvard Buisness Revirw, July-August 1958, pagrs 147-152

76. See Hausrath, *Venture Simulation in War, Business, and Politics,* page143-144 for a quick overview of UK and Canadian wargaming at that time. There were also some open source hints at Soviet Wargaming, see Ivan Boikov, "At The General Staff Academy," *Soviet Military Review*, 1967

77. Chamari-Tabrizi's paper builds a convincing picture of the level of credibility OR enjoyed at the time.

78. E.B. Potter, *Nimitz*, (Annapolis, Maryland: Naval Institute Press, 1976), page 136

79. Perla, *The Art of Wargaming,* page 83

80. ibid, 85

81. (Actually the term used was Red Integrated Strategic Operation Plan, so the acronym could be pronounced.)

82. Hausrath, *Venture Simulation in War, Business, and Politics,* page 47

83. Thomas B. Allen, *War Games,* (New York: McGraw-Hill1, 1987), 28

84. ibid, 188

85. ibid, 193 - 127

86. See, The Final Report on Sigma I-64, Joint War Games Agency, Joint Chiefs of Staff, 1964 04 15 and The Final Report on Sigma II-64, Joint War Games Agency, Joint Chiefs of Staff, 1964 10 05

87. Campion and Patrick, "The History of Wargaming," page 17

88. History of Modeling and Simulation Briefing, Staff Officers Course, Defense Modeling and Simulation Office, 1998

89. While amazingly no formal history of Red Flag has yet been written, Michael *Skinner's Red Flag, Air Combat for the '80s*, (Novato, California: Presidio Press, 1984), provides a great snap shot of what it was like going through Red Flag in the mid-80s.

90. Bud Hay and Bob Gile's *Global War Game*, (Newport, Rhode Island: Naval War College, 1993), does a great job of describing the origins and early growth of the series.

91. Bartlett, Hanry & Holman, Paul, "Global War Games & The Real World," *Proceedings*, Feb 1992, pages 25-

92. See Stephen B. Patrick, "The History of Wargaming Update," *Strategy & Tactics*, 1975 11, and Seth Owen, "The History of Wargaming 1975-1990," *Strategy & Tactics*, 1990 07

93. Anne W. Chapman, *The Origins and Development of the National Training Center, 1976 – 1984*, (Fort Monroe, Virginia: US Army Training and Doctrine Command, 1992)

94. Colonel John D. Borgman and Major Richard L. Hooverson, "The Rebirth of Wargaming," *Armor,* (September-October 1981): 44

95. Perla, *The Art of Wargaming*, page 85

96. Hay and Gile, *Global War Game,* page 52

97. Colonel Raymond A. Hord, "The Marine Corps Wargaming and Assessment Center," *Marine Corps Gazette,* (December 1989) 38-40

98. Raymond A. Hord, "The Marine Corps Wargaming and Assessment Center, *Marine Corps Gazette*, 1989 Dec, pages 38-40

99. David B. Lee, "War Gaming, Thinking for the Future," *Airpower Journal*, 1990 Summer, page 44

100. Nick Lackeos, "Military Presence Reinforces Area Economy," *The Montgomery Advertiser*, 1989, May 12, page 5H

101. Owen, "The History of Wargaming 1975-1990," pages 51 – 56. Comments also based on E-mailed comments from James F. Dunnigan and Gene Billingsley, President of GMT Games (a leading print wargame publisher) and computer wargame developer.

102. Cited in the briefing, "History of Modeling and Simulation," during the Defense Modeling and Simulation Office's Modeling & Simulation Staff Officers Course.

103. Lee, "War Gaming, Thinking for the Future," page 44

104. John Sloan, Ali Jalali, Gouhlam Wardak and Fred Giessler, *Soviet Style Wargames*, (Washington DC: Science Applications, Inc., ,June 1986)

105. During a briefing on the later stages of the Iran/Iraq war a NATO officer who served as an Air attaché in Baghdad during that war described the physical set up of an Iraqi wargaming facility. The facility matched the set up of a Soviet wargame perfectly.

106. Allen, *War Games,* page 4

107. Richard M. Swain, *"Lucky War" Third Army in Desert Storm,* (Fort Leavenworth, Kansas: U.S. Army Command and General Staff College Press, 1994), 7-8

108. James F. Dunnigan and Raymond M. Macedonia, *Getting It Right*, (New York: William Morrow and Company, 1993), page 67.

109. While Richard T. Reynolds touches on this incident in his book, *Heart of the Storm*, (Maxwell AFB, Alabama: Air University Press, 1995), page 48, the above is primarily based on my conversations with Col Reynolds.

110. Based on briefing by Col Gary Ware, (General Schwarzkopf's Chief of modeling, simulation and wargaming during the war, and previously Director of the Air Force Wargaming Center) given to the College of Aerospace Doctrine, Research and Education shortly after the war.

111. While one source (Claudio Cioffi-Revilla, "On the Likely Magnitude, Extent, and Duration of an Iraq-UN War," Journal of conflict Resolution, 1991 Sept, 91ges 387 – 411) predicted casualties in the "100,000 to low millions" range, and a few analysts like Col Trevor Dupuy (USA Ret) and James Dunnigan would later brag about being "only" an order of magnitude off, most extamated fell in the range given in the test. This is confirmed by the article "Crisis in the Gulf, Planning for the Worst, "Jane's Defense Weekly, 19 Jen 1991. Pages 83-83 and an E-mail from Mr. Mark Herman.

112. The Army Times ran a series of Division, independent maneuver regiment after action reports. About half the articles described some sort of unit wargaming. The most memorable anecdote involved a battalion commanders expressed a preference for death over wargaming it one more time.

113. Mentioned by Frank Chadwick, the publisher who received the letter, during a talk at Origins 91, an international strategy gaming conference.

114. Commercial wargame designers / military analysts, such as Jim Dunnigan and Charles Kamps, predicted far fewer Coalition casualties than the "official" estimates – mainly because they were used to "factoring in" the intangibles that old-time government hands always said couldn't be calculated.

115. A picture of the Iraqi's terrain model is in the center section of Norman *Friedman's Desert Victory, The War for Kuwait*, (Annapolis, Maryland: Naval Institute Press, 1991)

116. It is difficult to show a trend line for spending on wargaming. Estimates for the same year will vary based on what is considered a wargame. Apparently using a working

definition of any multisided simulation of armed conflict, in 1987 John Prados estimated 1 Billion was being spent annually throught the defense establishment on wargames and wargaming.. During an early 1990's conference I could not get the director of the Joint Staff's J-8 section to even guess at a level of annual spending, but he said my guess of 2 Billion was probably not far off. Recently an officer at the Air Force Doctrine center estimated spending of over 3 Billion dollars given the above definition.

117. Paul K. Davis and Donald Blumenthal*, The Base of Sand Problem: A White Paper on the State of Military Combat Modeling*, (RAND, 1991)

118. History of Modeling and Simulation, M&S Staff Officers Course

119. No author given, The Historical Background on the MSIAC, 18 June 1999

120. Ibid

121. Rick Adams, "An M & S Primer," *Defense News Marketing Supplement*, 1996, pages 9 - 10

122. William B. Scott, "Title-10' Games Shape Policies," *Aviation Week & Space Technology*, 12 Nov 1998, pages 61-62

123. Perhaps most surprising of all there has been some movement toward corporation between the military and commercial wargaming communities. See, J.R. Wilson, "Shall We Play A Game?", *Military Training Technology*, 1999, page 20 – 25.

124. Comments also based on E-mailed comments from James F. Dunnigan and Gene Billingsley,

125. Press release from the Software Developers Association during the 1998 Computer Game Developers Conference

126. Estimate by Evan Brooks, originator of an on-line index of computer wargames and former wargames editor for Computer Gaming World.

127. Based on comments made by Wilbur E. Gray, Secretary of the Historical Miniatures Gaming Society – East, to Connections 1998.

128. Paul Holtzhausen, "On Target," *Military Training Technology*, 1999, page 17

129. Jerry O'Brien, "Navy Dedicates Premier War-Gaming Center," Providence Journal – Bulletin, 28 Sept 1999

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