

WAR GAMES
AS A DECISION MAKING TOOL IN MILITARY PLANNING AND OPERATIONS

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ABSTRACT

War Games As A Decision Making Tool In Military Planning And Operations

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Submitted to the Department of Political Science on January 25, 1983 in partial fulfillment of the requirements for the degree of Master of Science.

This thesis is an examination of the use of war gaming in the planning of military operations. Two cases are examined: the Schlieffen Plan, Germany's unsuccessful deployment plan for the opening of World War I; and the Operation Hawaii Plan, Japan's successful attack on Pearl Harbor in 1941. Each case study focuses on the development of the plan and the degree to which war gaming affects the quality of the planning.

In both cases, war game usage was operational (goal-oriented) rather than systematic. While bias played a role in both, the war game testing of individual pieces of the Schlieffen Plan rather than the whole plan masked a number of problems such as the low chance of success and the difficulty of controlling a one-million man army. The orders for Operation Hawaii called for repeated attacks but the strike force commander preferred not to expose his aircraft carriers to further risk and ordered a withdrawal after the two-wave attack. More significantly, the Japanese did not bomb the oil tanks, drydocks and repair and maintenance facilities. This allowed Pearl Harbor to remain operational. Its shallow waters and the quick thinking of a number of ships' officers enabled the US Navy to salvage most of the sunken ships.

These two cases demonstrate that effective game use requires that the game examine specific questions. The failure to examine issues such as logistics or communications will not reveal whether they are important. Similarly, it must be asked whether the operational objectives are a good and complete interpretation of the strategic objectives - a task for which war games are not suited.

Obviously, a war game's capabilities are limited to those for which it is designed and the issues to which it is directed. Effective use in planning requires a good understanding of the strategic and operational objectives. All of the operational elements of the plan - logistics, communications, tactics, intelligence, etc. - have to be examined and included in the testing. The testing, through war games, must determine whether the plan is capable of meeting the operational requirements.

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INTRODUCTION

By taking into account the favorable factors, he [the general] makes his plan feasible; by taking into account the unfavorable, he may resolve the difficulties.

- Sun Tzu, 500 B. C.(1)

One of the major problems faced by any military commander is how to make the best of the troops and resources available to him in order to gain the objectives assigned him in war. While experience, an intuitive grasp of the art of war, and some study of military history may have sufficed for the victories of past generals, several factors have combined over time to demand more of military planning.

With the development of the nation-state, war became a more complex matter of far greater risk and serious consequences. A nation could be ruined by an invader to the point that it might not recover for decades its military forces in the field. On other hand, many European countries destroyed their economies when they attempted to carry on a major war for an extended period of time. Also, it became rare for an officer to participate in more than one war during his career. Those who did see more than one war sometimes found themselves in positions for which they had either no training or combat experience in.

This situation suggested that officers should train through simulated combat. Thus the post-Renaissance military intelligentsia developed several war games using chess-style boards or terrain models. The emphasis was on

training young officers in tactics.

The first true war game is not known. One of the oldest known is the game Chaturanga which was to become the basis for the modern game of chess. Chaturanga originated in north-west India; its name is a Sanskrit word meaning "the army game". This game was based on the Indian armies of the fifth century. The pieces were

the king, the minister, the elephant (which later became the bishop in Europe), the horse (knight), the chariot (rook) and the footsoldier (pawn).(2)

The board was a better representation of terrain than a chess-board. Dice were used to determine movement and this added an element of probability. Its most intriguing feature was a four-handed set-up which allowed treachery, common in Indian warfare, to come into play.(3)

The oldest known war game is said to be the Chinese game wei-chi which originated about 3000 B.C.. It is better known today by its Japanese name, go, but its Chinese name translates as "encirclement", which characterizes its emphasis on winning through the encirclement of the opponent. It is said that Sun Tzu, a Chinese general of about 500 or 400 B.C., was an avid player. Mao Tse-Tung must also have been a player, based on some of the comments and phrases he used in discussing Communist strategy in China. Some of his comments are strongly flavored with terminology from wei-chi and, at times, his argument becomes very clear if one assumes he is using a wei-chi analogy.(5)

In response to the need for teaching military tactics,

a number of chesslike games emerged in the seventeenth and eighteenth centuries. Most of these games were large and cumbersome. A Prussian, General Van der Goltz, commented on a monograph, "Rules of a New War Game for the Use of Military Schools", by the tactician Venturini, saying that

This war game is a bad product of the refined military education of the period, which had piled up so many difficulties that it was incapable of taking a step in advance.(6)

The chess-based games were not the only type that appeared at this time. During the reign of Louis XV in the early eighteenth century, two French games were created, "La Jeu de la Guerre" and "La Jeu de la Fortification." The former dealt with open warfare and the latter with siege warfare. They differed from the chess games in that they used cards to represent troops, rather than figurines and scaled-down models. The purpose of these two games was to teach students basic military facts.(7)

In 1811, Herr von Reisswitz, the inventor of a war game, was invited by the young Prussian princes Frederick and William to the palace to present his game. In place of a board or a map, his game employed "a plaster relief model representing a large stretch of country on a scale of twenty-six inches to the mile." Small wood blocks marked with colored paper represented troops and were moved by Reisswitz's rules.(8)

Within a year the King himself had his own copy of the game and had become addicted to it. By 1816, the game had

spread to Moscow, as a result of Prince William playing it with Czarevitch Nicholas.(9) However, it remained a recreational game.

In 1824, von Reisswitz's son, a lieutenant in the artillery, published a new form of his father's game which was to be the basis of modern war gaming. His game served as a prototype in the Prussian Army until 1875.

The new game rules were a much better approximation of combat. He substituted maps and sand tables for the plaster relief model. Infantry, cavalry and artillery units were represented by lead pieces, scaled to fit the map; the pieces were marked with symbols to indicate which branch of the army they were. The opposing sides were colored red and blue - a convention which is still in use.(10)

Instead of starting the game in the way a chess game might be - with the playing pieces starting from the same positions in every game - the umpire gave the players a written briefing giving the information about terrain and the enemy that each side would usually have. Each situation was based on an actual battle. All orders, reports, and information were recorded in writing and the game umpire received and controlled all written records. Time intervals were set for movements so that during his turn a player could not move his forces further than they could be expected to move in the time period. The umpire had the final say in all disputes and he decided the outcome of all engagements using dice and a set of rules.(11)

Despite the fact that, by virtue of a royal order, the

game became fashionable in Berlin and spread to Russia and Turkey, its acceptance was not universal. Its critics disliked the rigidity of its rules and the reduction of the umpire to a calculator and recordskeeper. Tacticians questioned its rigidity and argued that outcomes sometimes contradicted tactical sense. After the wars with Austria (1866) and France (1870), it was obvious that something had to be done to update and improve the game.(12)

However, some critics argue that the fault was not entirely von Reisswitz's. The basic principles of his war game were, and still are, sound: opposing teams have their own maps and there is "a separate umpire's map on which both sides' moves were recorded, with contacts and sightings reported back to the players."(13) Von Reisswitz's "neat combat system" was modified through the use of a large number of multipliers on a "standard situation". This attempt to make the game more realistic through complication increased the playing time and the number of operations needed to compute outcomes and movements.

Von Meckel, a military writer, commented in 1874 that those who continued to play the game did so in spite of its rules and most tended to ignore the rules.(14) The use of dice was abandoned, except for low echelon tactical games, in favor of "judgments given by an umpire . . . because success and criticism could be matched."(15)

Thus evolved the creation of "free" and "rigid" war games. Free games featured outcomes that were decided by an

umpire; outcomes in rigid games were computed according to the rules. All major European armies adopted the use of free games for high level games and reserved rigid games for low echelon games.(16) Within the German Army, Lieutenant von Meckel, a professor at the Hanover War School, appears to have been a force in the spread of free war games. It is he who is credited with introducing Western war games to Japan. Due to his influence "the Japanese war college only used free Kriegspiel [war games] from the outset, and military historians are inclined to attribute Japan's success in the Russo-Japanese war to this fact.(17)

Another officer in the German Army, Colonel von Verdy du Vernois, was also influential in the changeover to free games. By the 1870s it had become customary for German army officers to participate in tactical rides or staff maneuvers, according to him.(18) These maneuvers took place with imaginary troops on actual ground. Attack and defense were based on carefully written orders and messages which were marked for time and place. The umpires then used these documents to render their decisions. At no time did the umpires make use of any rule book other than their judgment and experience. Von Verdy du Vernois thought it was obvious "that the same freedom of conduct that characterized the tactical ride should obtain for the play of war on a map."(19)

In free Kriegspiel, all judgments had to be made by the umpire. His decisions could be questioned by the players and, therefore, discussion was not unusual. Two rooms were

used: in the umpire's room, the information displayed on the map was limited to that which he felt would probably be known to both sides; the two teams alternated in using the second room which contained a map on which each laid out their moves, which were then shown to the umpire on his map. Although there were no rules, some matters were generally agreed to, such as the marching speed of infantry under stated conditions.(20)

The most valid criticism of free war games that has been raised is that the umpire must be a man whose experience and knowledge make his decisions acceptable. If, however, the umpire's decisions are accepted without question, the game becomes vulnerable to capriciousness in his judgments. So long as question and discussion continue to be an essential feature of free gaming, the danger of this can be offset to some extent.

The changes which then occurred in war gaming were not substantial. It became obvious that free gaming was easier when some rules or standards were stated explicitly. This reduced the umpire's workload. Another innovation was the use of maps of actual terrain. Glass or celluloid overlays also made it easier to track movements and record them for display. These overlays could also give the umpire an accurate view of both teams' movements when they were superimposed on his map.(21) Another change was the use of maps of actual terrain rather than of imaginary land. The leap from playing out past battles to gaming-out actual plans was

obvious, once this occurred.

The use of war games and other analytical tools - mathematical and verbal - for military purposes has always generated criticism from the military itself. In general, this criticism has been directed at either the weaknesses of the methodology(22) or its misapplications.(23) It is rare that a particular method has been rejected outright without a discussion of its merits.

Most of the targets of criticism were developed or adapted specifically for military purposes. A prime example is Lieutenant von Reisswitz's war game which was created by his civilian father. Von Meckel's criticism of it was representative of most officers in the German Army. Of those who continued to play the game after 1870, few, if any, continued to make use of the rules or the dice. Those who did not make use of the game cited its lack of realism, outcomes which contradicted the experience of war, and the tedious computations needed to reckon the result of an engagement.

Despite the war game's lack of popularity with the officer corps, there were those who refused to give up on it. Von Moltke, "chief of the 4th Army Corps at Magdeburg" and later to become Chief of the General Staff (CGS), was an enthusiastic player(24). Another player was General von Verdy du Vernois, who became an advocate of the free game. With the support of officers like these two, war gaming gained a sure hold in the German Army. Von Moltke's long service as CGS (1857-1886) gave him time to impress his

concepts of military organization and the art of warfare on the army(25). Thus, tactical rides, or staff maneuvers, became a traditional part of the annual planning exercises. During his long term as CGS, von Moltke was able to elevate the General Staff from obscurity to an important element of the army. The growing complexity of warfare and Moltke's ideas combined to insure that every commander, from the regimental level up to the army, had to have a good staff under him. Coupled with the growing power and influence of the General Staff and the eventual abolishment of the position of Commander-in-Chief of the Prussian Army, this served notice to ambitious officers that staff work was one way to guarantee promotion. Since Moltke and the General Staff controlled the more important staff appointments, it was only natural that up and coming staff officers favored war gaming in all its forms:

the map exercise, conducted by a director and one side only for the purpose of training players in tactical concepts; the staff exercise, another one-party device for the education of staff officers in their functions; the training trip, an extended exercise accomplished in the field as either a war game proper or as a map exercise; the tactical walk, carried out in the field within narrow tactical limits in order to train participants for the command of small military units; the command-post exercise (CPX in American military usage), designed to employ communications systems and to familiarize commanders with the command and control system required in meeting an assumed situation; the special exercise, used for numerous purposes, each of a specific nature, such as to test the operation of a supply system . . . ; and the sand-table exercise, employed for the indoor tactical training of very small units.(26)

Despite any apparent sophistication that any war game

form may have, it cannot always give its users a final and definitive answer. For a military planner, this is especially true because a war game is only an approximation of reality. The best he can hope for is a gross approximation of reality which can be used as a jumping board for solving a problem. However, the direction that the "jumping board" points is very dependent on the assumptions made about the setting. Thus, while improvements in the methodologies employed have stilled some of the criticism against war gaming and other systematic planning tools - systems analysis, decision analysis, etc. - a great deal of criticism has arisen over the assumptions used and the ways in which they were or were not tested. Some of the complaints from military officers have cited the lack (or over-abundance) of political considerations in planning; the priority given to cost versus combat performance in weapons procurement; and the lack of sensitivity analysis (testing assumptions).

Despite the criticism against war gaming, the success of the Prussian Army during the 19th century encouraged imitation. Innovations and improvements appeared as war gaming proponents responded to the charges from critics.

Military planners found that a war game provides the best available method for testing and developing plans. Given the uncertainties of war, anything that gave a military commander an advantage was quickly put to use. By testing his plan in a war game, a planner can examine its weaknesses, revise it, and prepare for foreseeable changes in

battle.

My major concern in this paper is with the use of war gaming as an analytical tool in the development and analysis of military plans. Two cases will be examined: the Schlieffen Plan, Germany's plan for fighting a two-front war against France and Russia in 1914; and the Japanese plan for the attack on Pearl Harbor in 1941. Drawing on these two cases and a reading of the available literature, some comments will be made on the role of war games in military planning. There will also be an attempt to critique war game usage by military planners and to suggest certain improvements or changes in their use.

INTRODUCTION

FOOTNOTES

1. p. 113, Sun Tzu, Chap. VII, "The Nine Variables", verse 13, The Art of War, translation by Samuel B. Griffith, Oxford University Press, London: 1963.
2. p. 272, Elliott M. Avedon and Brian Sutton-Smith, Chapter 7, "Military Usages", The Study of Games, John Wiley & Sons, New York: 1971.
3. p. 21, George Gush with Andrew Finch, A Guide To War-gaming, Hippocrene Books, New York: 1980.
4. p. 1, Andrew Wilson, The Bomb and the Computer: Wargaming From Ancient China to Atomic Computer, Delacorte Press, New York: 1968.
5. See pp. 45-46, Samuel B. Griffith, Chap. VI, "Sun Tzu and Mao Tse-Tung", in Sun Tzu, op. cit. See also S. Boorman, The Protracted Game: A Wei-chi Interpretation of Maoist Revolutionary Strategy, Oxford University Press, New York: 1969.
6. p. 238, H. D. S. Heistand, "Foreign War Games", Selected Papers Translated From European Military Publications, (translated from Revue De L'Etranger), Publication No. XVIII, Document No. 57, US Government Printing Office, Washington, D.C.: 1898. Cited by Avedon and Sutton-Smith, op. cit., p. 273.
7. p. 273, Avedon and Sutton-Smith, op. cit. and p. 3, Wilson, op. cit.
8. p. 14, Wilson, op. cit.
9. ibid.
10. pp. 273-274, Avedon and Sutton-Smith, op. cit. and p. 5, Wilson, op. cit.
11. p. 274, Avedon and Sutton-Smith, op. cit.; and p. 5, Wilson, op. cit.
12. p. 7, Wilson, op. cit.
13. p. 23, Gush and French, op. cit.
14. von Meckel, Arbeitsung zum Kriegspiel, Berlin: 1895, cited p. 8, Wilson, op. cit.
15. p. 8, Wilson, op. cit. The quote is from von Meckel, op. cit.

16. p. 8, Wilson, op. cit.
17. p. 274, Avedon and Sutton-Smith, op. cit.
18. p.27, Sidney F. Griffin, The Crisis Game: Simulating International Conflict, Doubleday & Company, Garden City, NY: 1965.
19. ibid. Tactical rides were still in use 30 years later when Schlieffen developed his plan. Schlieffen's plan was tested in and based on the results of several tactical rides.
20. pp. 28-29, Griffin, ibid.
21. p. 34, ibid.
22. See pp. 50-58, Russell Murray 2nd, "Rising Vertically Through The Air Invulnerable to Runway Cuts," Armed Forces Journal International (AFJI), vol. 118, no. 8, April 1981; pp. 58-61, Col. R. A. Gustafson, USMC, "The Marine Corps View", AFJI, April 1981; and p. 4, David A. Arthur's letter in "Defense Forum", AFJI, vol. 118, no. 10, June 1981. These two articles and the letter focus on the debate over whether the Marine Corps should have chosen the F/A-18 rather than the AV-8B for a light attack mission (support of ground troops). One side of the argument are Defense Department systems analysts (pro F/A-18); on the other side is the Marine Corps.
23. See pp. 132-133, Lt. Col. David Evans, USMC, "Where Have All The Oarsmen Gone?", U.S. Naval Institute Proceedings (USNIP), vol. 107, no. 12, December 1981; and p. 25, Stewart S. Johnson's letter in "Comment and Discussion", USNIP, vol. 108, no. 4, April 1982. The article and the letter point out some of the pitfalls and misapplications of quantitative analysis in military affairs and force planning.
24. p. 7, Wilson, op. cit.
25. pp. 112-113, Roger Parkinson, The Encyclopedia of Modern War, Stein and Day, New York: 1977, and p. 20, Gerhard Ritter, The Schlieffen Plan: Critique of a Myth, Oscar Wolff Ltd., London: 1958. Translation by Andrew and Eva Wilson. Original German edition published by Verlag R. Oldenbourg, Munich: 1956.

The Operations: The Schlieffen Plan and Pearl Harbor

The best laid schemes o' mice an' men
Gang aft a-gley.

- Robert Burns, To A Mouse

1. The Schlieffen Plan.

From the moment that Graf von Schlieffen was appointed the Chief of the General Staff of the Prussian Army in 1891 until he turned his office over to his successor in January 1906, his main concern was how to deal with the possibility of a two-front war - France on the west and Russia to the east. In his first memorandum as CGS, Schlieffen had suggested that the army would be on the defensive on the western front because of the French fortifications on the border, and the decisive battle would take place against the Russians.(1) However, the Russians were fortifying the area most favorable for a German offensive, thus making it possible that it would be just as difficult to mount an offensive in the east as in the west.

By 1892, Schlieffen had decided to abandon Moltke's plan to divide Germany's forces between the two fronts. He now expected enemy offensives from both the east and the west, with the French attack posing the greater danger. He also believed that Austria's 28 divisions would be more than a match for Russia's 20 divisions.

Schlieffen felt that the solution to the two-front war was to defeat one enemy first and then the other. This contrasted strongly with Moltke's plan which had envisioned

a defensive war on both fronts with the objective of maintaining the status quo against the French and reaching a peace settlement if possible - but retreating no further than the Rhine - and sending as many troops as possible to protect Germany on its vulnerable eastern front.(2) Whereas Moltke had abandoned the concept of an offensive war and the possibility of complete victory, partly because of the difficulties encountered in defeating French forces in the Franco-Prussian War of 1870, Schlieffen apparently felt that a defensive strategy in a two-front war would not leave a sufficient margin of error to maintain even the status quo. He began to believe that holding the old line was not enough; total victory was necessary.

Moltke believed that the construction of the French fortress system and the growth of the French army made it too risky to attempt to invade France. The obstacles posed by German fortresses, the Rhine River and the narrow gap between the Vosges River and Belgium made Germany's western border suitable for defense. The open spaces in the east favored offensive operations. Since the open terrain of the east nullified the use of fortresses, East Prussia had to be protected in some other way from invasion. Moltke did not want to depend on Austria for aid on the eastern front. He also thought that it would not be difficult to prevent the Russian armies around Warsaw and Kovno from joining, thus making it possible to defeat them in detail. On the western front, the German Army would maintain a defensive position on the Saar River, allowing the French to begin their

offensive. The attack would be met behind the Main River between Mainz and Frankfurt and halted in a decisive battle. Due to the splitting of the German Army, Moltke did not expect total victory.

Schlieffen's basic premise was that the German Army had to mount an offensive. He eventually rejected Moltke's plan and Waldersee's (Schlieffen's predecessor) variation on it. He did so citing that the Russians had begun to fortify the area where the German attack was planned. In his next decision, he abandoned his own suggestion of a joint German-Austrian offensive from Silesia and Galicia into southern Poland. He also dropped the idea of constructing fortresses at Molsheim and Saarburg for defense in the west, probably because it went against his offensive inclinations.(3) He also noted that the Russian armies would be able to retreat across great open spaces, forcing the Germans to fight a time-consuming war with long supply-lines, thus preventing a decisive battle or the destruction of the Russian Army.

Of the two possible enemy offensives, Schlieffen saw France as the greater threat. He also believed that halving the German forces was wrong; such a move could not guarantee that either offensive would be stopped. He proposed that, first, France be defeated as quickly as possible, and then Russia.

In essence, Schlieffen viewed the war as a one-front war. As far as he was concerned a one-front war was more than enough of a problem without taking on the burden of a

second front simultaneously.(4)

At first Schlieffen considered trying to make a breakthrough across the Franco-German border, but he finally gave it up because the narrow gap formed by the Belgian border and Vosges River would have made a German advance impossible by keeping it from spreading out.

In a memorandum dated 2 August 1897 a solution was proposed in which the attack would involve a large wheeling motion through Belgium and Luxembourg across the northern French border, without regard to the violation of any neutral nation. The further development of plans based on this concept up to 1905 were "made not in detailed memoranda of the Chief of the General Staff, but in war games, General Staff rides [war games in the field] and the annual deployment plans."(5) However, Gerhard Ritter points out that

For him [Schlieffen], the theoretical exercises of the General Staff had no practical importance except as a means of testing individual problems in his tactical-strategical planning. The planning itself can only be found in the annual Aufmarschplane [deployment plan] of the General Staff, and in the preparatory operational drafts of its Chief.(6)

But in an early draft of his operational memorandum, Schlieffen himself pointed out that "How German operations should be conducted in detail against these French offensives has been shown in operational studies, war-games and staff-rides."(7)

If Ritter is to be believed, it appears that Schlieffen made little or no effort to test or examine the feasibility of his plan as a whole in the war games of the General

Staff. . The lack of a systematic critique of the concept and the plan meant that some of the assumptions which were fundamental to the plan may have been wrong but were not examined in a rigorous manner. Furthermore, while the individual pieces of the plan may have been thoroughly checked out, their interconnections were ignored or overlooked. For instance, until the younger Moltke took over as CGS in 1906, logistics were virtually ignored by the General Staff's "theoretical exercises."

The envelopment of the French army, to be accomplished by attacking through Belgium, became the essence of Schlieffen's plan after the idea of breaking through the fortress system was discarded. Initially, the plan called for a limited envelopment which was to extend no further than the area of Mezieres and Stenay. Two wing armies, composed of seven army corps and six Reserve (second-line troops which would support the Regular Army when mobilization took place) divisions, were to advance through Luxembourg and southern Belgium towards Mezieres and Stenay. Nine army corps and four Reserve divisions were to be placed in Lorraine while to their south in Alsace two additional wing armies (seven army corps and five Reserve divisions) would provide them with cover.(8) Fearing that the fortresses along the Verdun-Belfort line might split an attack to the east and west, Schlieffen argued in favor of attacking the Lille-Verdun line "because one must extend that far west in order to achieve the necessary freedom of manoeuvre."(9) The

fortresses along this line were not as difficult to deal with as those on the Meuse line. Other advantages were that

'The lines of communication would not be unfavorable. If anywhere, it is through the Belgian railways that a connection can be found between the German and French railway systems. But against these advantages are substantial drawbacks: the breadth of northern Belgium is considerable, it will take so long to cross it that the French will have time for all kinds of countermeasures. There can be no question of surprise.' Besides, the deployment area would be very wide and 'the left flank of the deploying German army (which must reach Strasbourg) will be served to the French on a platter.'(10)

The staff ride of 1904 ended with the right wing of the Blue (German) army being halted in frontal battles because it was too weak to advance further. In the meantime, the left wing defeated the Red (French) army when it came out of the fortresses. The conclusion was to strengthen the right wing without worrying about the left. The strategic plan of 1905-1906 was the first to be based on this premise(11), and Helmut von Moltke - the elder Moltke's nephew - inherited the plan when he was appointed CGS in 1906.

The plan which Moltke received called for the right wing of the German Army to advance across southern Netherlands, Belgium and Luxembourg, marching on through Belgium and across the French border to attack Paris from the west and isolate it. The attack was to take place from "the north-west, directed on the flanks at Mezieres, Rethel, La Fere and across the Oise on the rear of the position."(12) This meant that the Franco-Belgian frontier west of the Meuse River had to be taken along with "the fortified towns

of Mezieres, Hirson and Mauberge, three small barrier forts, Lille and Dunkirk."(13) This in turn meant that the neutrality of the Netherlands, Luxembourg, and Belgium would be violated.

Schlieffen expected that if the French were to defend against such a move they would have to transfer corps and armies from the Franco-German frontier and replace them with reserves from the rear. He hoped they would not be fully successful in doing this, but, even if they managed it, he did not expect a major battle until the German troops reached the border between Mezieres and Dunkirk, regardless of whether the French chose to attack or defend. He went on to say that

. . . the Germans' task is to muster the greatest possible strength for this battle. Even if it should not take place and the French remain behind the Aisne, a strong German right will still be of the greatest value for the operations to come.(14)

According to the plan, 23 army corps, 12 1/2 Reserve corps, and eight cavalry divisions were to be assembled on the Metz-Wesel line. These troops would advance and then wheel left against the Verdun-Dunkirk line.

During this the Reserve corps of the northern wing will cover the right flank, particularly against Antwerp, and the Reserve corps of the southern wing the left wing, against an enemy advance left of the Moselle from the line Toul-Verdun.(15)

Three and a half army corps, one and a half Reserve corps and three cavalry divisions were to remain east of the Moselle River. Their tasks were to cover the left flank or reinforce the right, as needed.

Metz, fortified mainly by field works and manned by a strong garrison and Landwehr troops (Third-line troops used to back up the active army), and armed with heavy artillery would be the strong point for covering the left flank.

The right wing was to advance as follows: Eight army corps and five cavalry divisions were to cross the Meuse River below Liege by five routes, proceeding towards Brussels-Namur. A ninth army corps was to join them after crossing the Meuse north of Liege and neutralizing Huy. The nine corps were to be followed by seven Reserve corps. The majority of the Reserve corps were to be used to invest Antwerp and the remainder would be used initially to cover the right flank. Additional reinforcement would be provided by two of the army corps positioned on the east bank of the Moselle River as soon as the requisite railway lines had been secured and put into service. It was expected that the lines could handle no more than two corps within a reasonable period of time should reinforcement be necessary. The sector from Mezieres to Namur along the Meuse River would be allotted six army corps and one cavalry division, followed by one Reserve division. In all, 15 to 17 army corps would be west of Meuse River when these units crossed.

Eight army corps and two cavalry divisions were to advance against the area from Mezieres to Verdun along the Meuse River. Five Reserve corps would cover the left flank of the right wing, pivoting about Metz.

Ten Landwehr brigades will follow them north of the Meuse, six south; six will be in the war garrison of Metz, three and half will be on the

Upper Rhine and one in Lower Alsace.(16)

After breaking through the French fortress system west of the Meuse River, the German right wing was to move against the left flank of French positions at Mezieres, Rethel and La Fere. By this time, French forces in the fortresses along the Mezieres-Verdun line, and the secondary lines on the Aisne River and between Rheims and La Fere would have been repositioned or set in motion to make a counterattack.

If the French forces in positions along the Aisne River, the Rheims-La Fere line and the Oise River remained in place and did not attack, or retreated behind the Marne River or the Seine River, one part of the invading German army would have to attack or pursue them while the other part enveloped Paris from the south and invested the fortress.

[. . . We shall therefore be well advised to prepare in good time for a crossing of the Seine below its junction with the Oise and for the investment of Paris, initially on the western and southern front. Make these preparations how we may, we shall reach the conclusion that we are too weak to continue operations in this direction.] We shall find the experience of all earlier conquerors confirmed, that a war of aggression calls for much strength and also consumes much, that this strength dwindles constantly as the defender's increases, and all this particularly so in a country which bristles with fortresses.(17) [Brackets indicate an addition by Schlieffen in the draft.]

When the German right wing reached the Oise River, Schlieffen expected their lines of communication to reach to the French coast and as far south as the Seine River. The

rest of the lines of communications area would extend through Luxembourg, Belgium, part of the Netherlands and northern France.

Seven and a half Reserve corps and 16 Landwehr brigades were to besiege, invest or observe the fortresses east of the Moselle River. Of them, two and a half Reserve corps and two Landwehr brigades were given the tasks of reinforcing the front and covering the flank and the rear of the main army. The other five Reserve corps were allotted to the investment of Antwerp, but Schlieffen suspected that more might be needed. The remaining 14 Landwehr brigades were to be used to observe cities and towns in Belgium and France. Railroad security would be provided by Landstrum troops (Fourth-line troops to be used in Germany and on lines of communication).

To strengthen the enveloping right wing, Schlieffen proposed that eight army corps be formed using Reserve battalions and available reservists. If necessary, Landwehr units could be used to fill out the new corps. Ersatz (substitute or replacement) batteries would be the artillery units for these corps.(18)

This allocation of forces did not leave the right wing with a reserve capable of dealing with an English landing. Therefore, should the English land and advance, the right wing would have to stop, "defend themselves if necessary, detach an adequate number of corps, defeat the English and continue the operation against the French."(19) This

undoubtedly would cut into the seven week period that Schlieffen had designated as the maximum for the entire operation from invasion to the decisive battle.

At the start of the war the three army corps, one Reserve corps and three cavalry divisions left on the east side of the Moselle were to attack Nancy with the object of tying down as many French units as possible. This would place a total of 25 army corps on the right wing, an amount which Schlieffen considered to be the required minimum. This would have left one army corps, one Reserve corps, one Reserve division, possibly two of the newly formed corps, Landwehr brigades on the upper Rhine - from Metz (if not attacked) and from the lower Alsace - and six Jager (light infantry) battalions in the Vosges. They could be reinforced by fortress garrisons and Landstrum units from south Germany assigned to protect the area east of the Rhine and the southern portion of the Franco-German border.

A new army must be formed with the task of advancing on the Moselle between Belfort and Nancy, while the five Reserve corps of the left wing and two Landwehr brigades invest Verdun and attack Cotes Lorraines.(20)

As the right wing began to wheel to its left, Schlieffen hoped to augment it with two and a half Reserve corps and six of the newly formed corps. This would raise the total number of corps on the right wing to 33 1/2. The six new corps and six army corps would be used to invest Paris. The other 21 1/2 corps would be used primarily to attack French units and positions on the east bank of the Oise

River.

The left wing would consist, initially, of seven and a half Reserve corps, three army corps, two new corps, 16 Landwehr brigades, six Jager battalions, three cavalry divisions, one Reserve division, and some Landstrum units. The plan assigned six and a half of the Reserve corps, as many as two army corps and all of the Landwehr brigades to positions or tasks in support of the right wing.

As far as logistics were concerned, the Schlieffen memorandum of December of 1905 discussed it primarily in terms of troop movements. Two of the primary reasons for the plan's deployment of the right wing at the start of the war were the limitations on rail transport and the need to save time. "The railway system obliges [the right wing of] the German army to deploy mainly on the line Metz-Wessel."(21) The existing road network would not allow more than one corps to travel on a road at a time without jamming the road, thus separating the elements of a corps from each other, and halting, in effect, the supply train from the railheads. Since the marching routes of the corps needed to be as secure as possible from attack, Schlieffen thought it worthwhile to march some of the corps through the Maastricht Appendix (southern Netherlands) in order to avoid passing too closely to the fortress at Liege, particularly since it might also give the right wing access to the railroads in southern Netherlands.

To bring the right wing's strength up to an acceptable level, at least two army corps would have to be sent by

railway through Germany and Belgium, once the lines in Belgium had been put into service. However, it should be noted that in an earlier draft of the memorandum, Schlieffen had warned that

The Belgian railways west of the Meuse will have to be the principal lines of communication for the German army. Reliance should not be placed on the railway in the Meuse valley, which is blocked by the two fortresses of Givet and Mezieres and can be obstructed by the demolition of its many tunnels. East of the Meuse a number of rather inefficient but adequate Belgian railways run near the river, but not across it. The main line via Montmedy will probably be rendered useless by the demolition of the tunnel there. . . . It is estimated that the construction of a bypass railway will take six weeks. Until it is ready the only connection between the Belgian and French systems in the area is by the inefficient narrow-gauge railway between Bouillon and Sedan. A railway from Thiaucourt to St. Mihiel, to be constructed after the reduction of the Meuse forts, would open up a connection between Metz and Paris. Between Saales and St. Die's a mountain railway could be built with some difficulty. But it would only connect Germany with France right of the Moselle. There Frouard, Pont St. Vincent and Epinal form a barrier which cannot immediately be overcome. Lines of communication must therefore be sought mainly through Belgium north of the Meuse.(22)

Despite his concern for how the right wing was to be deployed, Schlieffen made no mention of how the six new corps were to be transported to the right wing to be used as reinforcements. He also omitted any serious discussion of the vulnerability of the Belgian railway system to sabotage: with its many bridges and tunnels the Belgian system had many built-in jugular veins which could be used to cut off entire lines or sections long enough to seriously hamper German supply efforts or the transportation of troops by

railway. While the final draft of his operational memorandum to the younger Moltke made no mention of it, he gave the French and Belgian railway systems low grades.

A result of Schlieffen's thoughts on French and Belgian railways was that the corps of the right wing were expected to live off the land. The agriculture of Belgium and northern France was believed to be ample enough to supply the right wing and the population was thought to be dense enough to provide housing for the troops.

Other than his one comment that the defender's strength would increase as the attacker's decreased, Schlieffen made almost no mention of the advantage the French would have over the Germans by being able to operate from short lines of communication. The French railway system gave the French army the ability to move their troops fairly rapidly within the country. Schlieffen also neglected to consider that Paris was the hub of the French railway system and, as such, was easily accessible by rail. Therefore, even if the right wing managed to march into position to attack Paris, the attacking force could find itself pitted against a superior force. Given the acknowledged strength of the French fortress system on the Franco-German border, once the French saw the threat to Paris, they could safely strip the eastern border fortresses of all non-essential troops and send them to Paris.

Revisions By The Younger Moltke.

One of Schlieffen's initial assumptions, based on his

assessment of the French Army, was that the French would not mount any offensives. However, the removal of the French Chief of the General Staff, Michel, in 1912, indicated a snift in French policy. Michel had advocated a defensive posture in a war with Germany, based on the premise that the German right wing would advance through Belgium with the aim of giving the French Army a death-blow.(23) General Michel was replaced as a result of pressure from officers who favored an aggressive strategy. Moltke concluded that it would not be safe to leave the left wing at the level of strength set by Schlieffen. A more offensive-minded French Army posed a great danger to the left wing and the lines of communication of the right wing. Therefore, the left wing had to be strengthened and it would have to go on the offensive in Lorraine.

Moltke also ruled out the idea of having portions of the German right wing advance through the Netherlands. It had become apparent that the Dutch could not be counted on to remain neutral if invaded. Estimates of the forces needed to defeat the Dutch Army set a minimum of two corps, more than could be spared. A hostile Netherlands would also reduce the number of trade routes available to Germany during the war. Another possible danger was that the English might land in the Netherlands where they would not be as easy to bottle up as in Antwerp.

An important result of this decision was that the right wing would have to move through an area smaller than in the

original plan. Therefore, the roads and railways would be heavily used for supply as well as troop movements.(24) Since the Belgian railways were not of a very high quality, it would not be possible to send more than two army corps to reinforce the right wing. The eight newly formed corps would all have to be used on the left wing where they were needed. The transportation limits of the right wing made it impossible to strengthen it beyond 27 1/2 corps.

This meant that the envelopment by the right wing could no longer include Paris. Without the additional eight corps the right wing would exceed its capabilities if it also had to invest Paris. The younger Moltke ordered that the German right wing turn inwards north of Paris, a move which Schlieffen had also contemplated making if sufficient troops were not available for investing Paris.(25)

Critique.

For all intents and purposes, Schlieffen did not account for a number of problems in developing his plan. In the area of politics, the decision to invade Belgium guaranteed that the English would enter the war. He made no practical provisions for that contingency. If the German right wing failed to execute its orders within the allotted seven weeks, the entry of the English would tip the balance against Germany and prolong the war. The German Army most likely would then have to be split between the eastern and western fronts in a prolonged war which Schlieffen had not planned for.

The assignment of approximately one-eighth of the German forces to the left wing of the western front meant that Lorraine and Alsace were vulnerable to a French attack. Schlieffen ignored the possible political repercussions of this, considering it to be a military necessity. Moltke and Ludendorf were worried that a French breakthrough in Lorraine would break or threaten the right wing's lines of communication. According to Ludendorf, Moltke was concerned about the political problem of the vulnerability of Alsace-Lorraine, the industrial area near the Saar River, possibly the whole left bank of the Rhine River down to Coblenz and the provinces of Baden and Wittenberg between the Main and the Iller.

The decision to concentrate on defeating the French before dealing with Russia left East Prussia open to the Russian Army. The reorganization and enlargement of the Russian Army and contemporary domestic politics indicated that it was not very likely that the Russian Army would be allowed to retreat as Schlieffen suggested it might. An invasion of Russia would have destroyed the Czarist government's tenuous hold on the population. The Russian Army would be numerically superior to the German forces on the eastern front. It is significant that Moltke was concerned enough to detach two corps from the task of reinforcing the right wing on the western front to reinforce the eastern front at the outbreak of the war. As it was, the Russian advance was not halted until the Battle of Tannenberg, well into East Prussia.

The second set of problems comes under the heading of logistics with the sub-title of troop movements. In the 1905 version of the plan, the First German Army (located on the far right tip of the right wing) would have been required to march a total of 400 miles within seven weeks (about 8 miles per day) and still fight in any battles which occurred on the way. Moltke's version, which had the right wing turning in north of Paris, reduced that distance by 100 miles.

While Moltke did reduce the marching distances for the right wing, his decision to avoid violating the Netherlands' neutrality meant that the twelve corps of the Second and First Armies would be traveling over only three roads leading "to the formation of huge columns some eighty miles long and, inevitably, congestion and a loss of contact between combat units and their logistic support"(26) and delaying them by three days. Also, since the First Army would be entering Belgium from the southeast rather than the northeast, it was highly possible that the Belgian Army would be able to avoid being trapped by it and would escape into the fortress of Antwerp, as it actually did.

In the original plan, Schlieffen decided to supply the sixteen corps and five cavalry divisions operating north of the Meuse River, followed by Landwehr units which were to invest fortresses and secure the lines of communication in the rear, by three double-tracked railways. Moltke's revisions reduced this to one line, because two of the lines ran

through Dutch territory. Thus, no more than 12 corps could operate and be supplied in this area, at least in the beginning. This did not prove to be a problem since Moltke managed to invest Antwerp with only two corps (Schlieffen had planned on five) and did not have to allocate any to contain the Dutch Army (90,000 men) which would have required at least two corps.

Reinforcement of the German right wing was to be accomplished by transporting two corps by railroad from the Metz-Diedenhofen area of the left wing to Aix-La-Chapelle (Aachen). Once there they would probably be sent to the far right. During this stage the one railway supplying the First and Second Armies would be able to handle only 24 trains per day and four of them were for the operation of the line itself. Transporting a corps required 120 trains and, therefore, it was impossible to send a corps to the far right by rail. Since sufficient quantities of motorized transport did not exist, reinforcements would have had to march to the front. Thus, had the two corps been sent as planned, they probably would have arrived too late for the first Battle of the Marne.(27) While Schlieffen had stressed the need to use six of the newly-formed corps on the right wing, neither he nor Moltke made any provisions for the transportation of more than two corps.

Given the supply difficulties the right wing experienced, it is likely that reinforcements could not have been able to live off the land - already foraged by the preceding troops - and would have had an insufficient supply of

ammunition. Moltke's studies of the logistical problems of the right wing (none were done by Schlieffen except for the movement of two corps to the right) may have been responsible for the lack of an effort to create a reserve for the right wing and the exclusion of Paris from the envelopment by the right wing. In any case, the right wing was not reinforced before being defeated at the Marne.

The lack of a reserve may have been the primary reason the Germans lost the Battle of the Marne. A 30 mile gap between the First and Second Armies was exploited by the French; had a reserve force existed, the gap could have been filled. Also, the effectiveness of many German battalions had been seriously degraded by casualties, illness, the detachment of troops to guard the lines of communication and sheer exhaustion. Fresh troops would have been a great help.

A closely related problem was that of supplying the right wing with food and ammunition. Schlieffen had already decided that the troops would rely primarily on the countryside for provisioning; supply efforts would concentrate on ammunition and hardware. No plans were made for supplying the cavalry divisions and artillery units with fodder for their horses. As a result, many horses died from starvation or became sick when fed with green corn. Since artillery pieces were horse-drawn, they became separated from the corps they were attached to. Cavalry units lost their effectiveness in reconnaissance missions and suffered from

increased casualties because their horses were too weak to get their riders out of danger quickly enough.

Schlieffen proved to be correct in assuming that the right wing would be able to live off the land. On those occasions when food was not available, the troops were able to fall back on the iron rations which they carried.

Ammunition was not an impossible problem. No combat unit was ever unable to perform because of a lack of ammunition. However, this was in spite of the supply system, not because of it. During the Battle of the Marne, the railheads from which the armies of the right wing were being supplied were anywhere from 15 to 100 miles behind an army but the supply dumps themselves were scattered along the railway lines.

The job of repairing sabotaged railway lines was too much for the military railroad units. Civilian railroad crews had to be brought in to help out the military, something which Schlieffen could have foreseen easily. Some lines were virtually untouched but were temporarily unusable because the signal gear had been removed or destroyed by the Belgians or even the Germans themselves.

Operating the railway lines was no easy task. In general, Belgian railways could not support a fully loaded German military train. Also, because of demolition or the presence of fortresses not yet taken, jams would occur on certain lines as trains waited for their cargo to be unloaded and carried around an obstruction. Supply dumps were usually located along a railroad line rather than at the

railhead supplying the troops, thus making resupply a logistical nightmare when the railhead could not keep pace with the front lines.

The rates of ammunition expenditure had been underestimated. Also, the artillery pieces in use were more vulnerable to damage than their predecessors and had to be replaced if struck by artillery fire. It was no longer possible to merely remount the cannon on a new carriage. Food and fodder, in terms of percent of tons, were now the smaller portion of supplies, although they did not decrease. These and other logistical problems placed definite limits on the ability of a modern army to move freely. Even if the Germans had won at the Marne, the exhaustion of their troops and their logistical constraints probably would have prevented the right wing from continuing its turn for more than a short while.

Except for playing out the logistics of moving two corps to reinforce the right wing, Schlieffen made no effort to study the logistical aspects of his plan. Moltke, however, was quite concerned about them. After he succeeded Schlieffen, he ordered that the logistics of the plan be studied through games and staff rides. The changes made to the plan by Moltke reflect a clear understanding of the logistical problems which he would encounter, particularly after deciding not to march across Dutch territory. Having participated in the development of the Schlieffen Plan, he was aware of its deficiencies and his revisions indicate

that he was more realistic about the right wing's chance of success; the possibilities of reinforcing it, the ability of the left wing to defend against a French offensive and the difficulties facing the German Army on the eastern front. In view of his intimate understanding of the plan's weaknesses, it is surprising that he chose to retain its basic concepts rather than junking it for something less risky. One can surmise that he, like Schlieffen, was willing to risk a stalemate in order to win the war quickly.

A review of the drafts of the operational memorandum on the plan which Schlieffen wrote to Moltke shows that at least Schlieffen was aware that the plan had a low chance of success. Despite Schlieffen's warning that "we shall reach the conclusion that we are too weak to continue operations in this direction,"(28) Moltke made virtually no provisions for the failure of the plan nor is it apparent that he considered an alternate plan.

The sheer size of the entire operation posed two crucial problems for the German General Staff. First, the German Army had no practical experience in the handling of a one-million man army. Second, there existed no communications system which was flexible and quick enough to allow for centralized control of the entire operation. Thus army and corps commanders had to rely primarily on themselves to make decisions, just as they had under the older Moltke. However, the major difference here was that the size of the operation and the inherent delays in communicating information and changes in orders reduced the margin of error

within which a commander could operate. Coordination with other corps and armies was quite important, as evidenced by the need for at least one corps to shift its positions from side to side several times during the Battle of the Marne in order to cover the gaps between itself and its neighbors.

However, the most serious defect of the Schlieffen Plan was that it was a plan for an entire war. War gaming the plan should have shown all involved that there were a large number of points in the plan where it could be delayed or stalemated. Schlieffen himself had serious doubts about the chances of success, realizing that Germany would have only a slight advantage in numbers - insufficient for guaranteeing success. The scheme demanded that everything proceed as planned. A lengthy delay or a serious failure could lead to the failure of the operation and would greatly increase the chances of defeat on both the eastern and western fronts. Should the plan be thwarted, there existed no contingency plans by which the objective - the defeat of the French - could be achieved within the seven-week limit set by Schlieffen. The only possible result would be a static war characterized by trench warfare, as predicted by Captain Auger, a French army engineer, shortly after the Franco-Prussian War.(29)

It is significant that war games were used to test individual pieces of the plan rather than the plan as a whole. A "full rehearsal" of this type would have made it difficult to ignore the problems just discussed and might

have exposed others. It might also have shown the great risk that would be taken in basing Germany's national security on Schlieffen's insistent demand for an offensive-minded plan.

Under normal circumstances the General Staff's piecemeal approach might have been appropriate. However, in this case it deprived the staff of the opportunity to examine the dynamics of the plan. This masked some of the problems that Schlieffen had noted in his memorandum to his successor. The reluctance to examine the plan as a whole may have arisen from a desire to avoid having to face the hard facts of reality.

THE SCHLIEFFEN PLAN

FOOTNOTES

1. p.22, Gerhard Ritter, The Schlieffen Plan: Critique of a Myth, Oscar Wolff Ltd., London: 1958. Translation by Andrew and Eva Wilson. Original German edition published by Verlag R. Oldenbourg, Munich: 1956.
2. pp. 17-18, *ibid.*
3. pp. 22-23, *ibid.*
4. pp. 73-76, Reicharchiv, Kriesrustung und Kriegurrtschaft, I, Anlageband: 1930, cited by Ritter, *op. cit.*, p. 33, n.34.
5. p. 41, Ritter, *op. cit.*
6. p. 33, *ibid.*
7. Excerpt from Schlieffen's Draft III of his memorandum to his successor, "War Against France", undated, in Ritter, *op. cit.*, "Part II: Texts", p. 155.
8. p. 42, Ritter, *op. cit.*
9. Schlieffen memorandum, cited p. 44, *ibid.*
10. pp. 44-45, Ritter, *op. cit.* The quote is from a Schlieffen memorandum.
11. p. 45, *ibid.*
12. From Schlieffen memorandum, "War Against France", December 1905, final draft. Full text in pp. 134-148, Ritter, *op. cit.*, "Part II: Texts".
13. p. 135, Ritter, *op. cit.*
14. Schlieffen, *op. cit.*, final draft.
15. *ibid.*
16. *ibid.*
17. *ibid.*
18. See Schlieffen, "On a War With France and Russia", 12 December 1912, in pp. 167-176, Ritter, *op. cit.*
19. Schlieffen, "War Against France", final draft.
20. *ibid.*

21. *ibid.*
22. Schlieffen, "War Against France", Draft IV, from "Excerpt From Draft IV", pp. 156-157, Ritter, *op. cit.*
23. p. 7, B. H. Liddell-Hart, "Introduction", in Ritter, *op. cit.* and W. A. Stewart, "Lanrezac, Joffre, and Plan XVII", P-3627, RAND Corporation, Santa Monica: July 1967.
24. See Martin Van Crevald, Supplying War: Logistics From Wallenstein to Patton, Cambridge University Press: 1977.
25. p. 8, Liddell-Hart, *op. cit.*
26. p. 120, Van Crevald, *op. cit.*
27. pp. 134-138, *ibid.*
28. Schlieffen, "War Against France", final draft.
29. See Captain L. Auger (French Army Engineers), La Guerre de secession, Paris: 1895, cited pp. 319-321, William McElwee, The Art of War: From Waterloo to Mons, Indiana University Press, Bloomington and London: 1974. Auger's book is an analysis of the American Civil War of 1860-1865 in which he concluded:

" . . . that the main reason for the domination of American battlefields by entrenchments was the mere fact that the growing firepower of modern weapons made all movement in the open increasingly costly and unrewarding. Since 1865, he pointed out, this situation had been immensely intensified by new inventions and the massive output of modern armaments factories; and he drew a grim and all too accurate picture of the European fronts of the future: congested armies in shell-torn countrysides, crowded into trench lines which would become continuous. . . . Auger's conclusion was that the defensive was 'the true method of combat of the future'. It was even the only one possible in face of the 'probable hetacomb' of the next European war; and when the opportunity came for attack, it would not be an affair of 'numbers and elan' but slow and cautious, with every gain immediately and powerfully consolidated. . . ." (p. 319, McElwee, *ibid.*)

2. The Raid on Pearl Harbor: 7 December 1941.

Since the early 1920's, the Japanese Navy had made its plans on the basis that the United States would be its most dangerous enemy in any forthcoming war. Based on the assumption that the US would be the only opponent in that conflict, the Japanese Navy's strategy was to eliminate the American naval presence in the Orient and achieve control of the Western Pacific by attacking the US bases at Guam and the Philippines. Afterwards the navy would concentrate on protecting sea trade and harrassing the enemy fleet as it came across the Pacific. The superior speed of the new fleet Type 6 submarines and long-range oxygen torpedoes would be used to wear down the American fleet as it approached and reduce its numbers. When the US fleet came within range, it would be attacked by Mitsubishi Type 96 long-range bombers armed with torpedoes. Finally, somewhere between the Marshall Islands and the Philippines the Americans would meet an advance fleet. The advance fleet would launch a massive torpedo attack just as the sun fell. The next morning Japanese aircraft carriers would launch air strikes against the American aircraft carriers, aimed at damaging their flight decks so that no planes could be launched for reconnaissance. The combined Japanese advance and main fleets would then attack at long range, using long-range torpedoes, and then closing to within cannon range.(1)

Having deduced that the American naval plan called for the Pacific Fleet to go to the relief of the Philippines, the plan appeared to have a good chance of success, although

it did rely heavily on battleships to win the final decisive battle. There was also that chance that the United States' superior industrial capability would enable it to produce enough military hardware to enable it to outlast the Japanese.

Studies and Pre-Planning.

Like many other naval officers, Yamamoto was strongly opposed to going to war with the US. However, once the decision was made to go to war if negotiations were unsuccessful, he used his position as commander-in-chief of the Combined Fleet to argue in favor of a raid on Pearl Harbor.(2)

Yamamoto's thesis was that the superior industrial capability of the US would give it the strength to defeat Japan in a long war. Therefore, in order to give Japan time to reinforce its hold on the territories it planned to conquer, he proposed that the US Pacific Fleet be attacked at Pearl Harbor where it had been stationed by order of President Roosevelt (it had been operating out of San Diego). The destruction of the Pacific Fleet would leave the Japanese Navy free to cover the Army's operations in South Asia. Paul Dull suggests that Yamamoto

firmly believed that a short war was the only kind of war that Japan could hope to win - a stunning initial victory which would lead to a divided and discouraged United States, faced with a two-ocean war, to negotiate a peace settlement on terms that would preserve Japan's newly won territories.(3)

After observing the success of carrier-based aviation

in the 1940 spring fleet maneuvers, Yamamoto apparently became convinced that a successful raid on Pearl Harbor was possible.(4)

The effectiveness of a carrier-based torpedo-plane raid against warships at anchor in a harbor was tested in the Japanese naval war games in April and May, 1940. As in most war games, there were disagreements in part with referees' arbitrary decisions. But Rear Admiral Shigeru Fukudome, a senior naval aviation officer and Yamamoto's chief of staff, concluded that the games had proved that such an engagement would be a decisive victory, because the surface vessels would have no means of evading the torpedo-planes. Admiral Yamamoto also concluded that a massed torpedo-plane attack, if it were a surprise, would be successful. When a similar attack was actually carried out in the British naval air raid on the Italian fleet at Taranto on 12 November 1940, the results confirmed the evidence of the Japanese war games, since twenty-one planes sunk three Italian ships, with only two planes lost. Yamamoto ordered detailed studies of the Taranto raid to be done by Japanese naval attaches in London and in Rome.(5)

After the Combined Fleet completed its annual maneuvers in late autumn, Yamamoto discussed with his former chief-of-staff, Fukudome, the possibility of continuing the training program into the next year, with a greater emphasis on air warfare tactics. He also mentioned his desire to have Rear Admiral Onishi study "a Pearl Harbor attack plan" and to include the "problem" in the fleet training program after studying Onishi's report.(6)

Yamamoto, a field commander, was attempting to design Japan's naval strategy - a job ordinarily the responsibility of the Operations Section of the Japanese Naval General Staff. If he had not proposed, supported and followed

through on the idea, it is highly unlikely that the Imperial Japanese Navy would have altered its original strategy of attrition.

As part of his effort to lay the groundwork for his plan, on 7 January 1941 he wrote a letter to the navy minister, Admiral Koshiro Oikawa, outlining his operational concepts. Yamamoto wrote to him rather than to the Chief of the Naval General Staff because "he himself wished to command the Pearl Harbor striking force" and "Oikawa controlled personnel appointments".(7)

On 1 February 1941, he wrote an official letter confirming another letter sent in January, to Onishi, then chief of staff of the Eleventh Air Fleet(8). The letter outlined the plan and requested that he "carry out a secret study of its feasibility"(9) and reply promptly. The letter was followed by a conference on January 26 or 27 between the two officers on board Yamamoto's flagship, Nagato, anchored in Ariake Bay in southern Kyushu.(10) Upon the night of his return to his own headquarters, Onishi began work on the study. He summoned Commander Kosei Maeda, his senior staff officer and an expert on aerial torpedo warfare. Questioned about the chances of success of a torpedo attack on Pearl Harbor, Maeda declared that it was "virtually impossible" given the shallow water of the harbor and the lack of a torpedo capable of being launched successfully in shallow water. The restricted airspace in Pearl Harbor made it even more unlikely. High-altitude bombing had the advantage of penetration of the deck armor of ships, but Onishi preferred

the more accurate tactic of dive-bombing.

It was already known to the Japanese that Pearl Harbor was too shallow for a conventional torpedo-bomber attack. Even if the planes came in at extremely low altitudes, the torpedoes would lodge in the bottom. Whereas the minimum depth for a torpedo run in the British attack against Taranto had been about 66 to 72 feet, the maximum depth in Pearl Harbor is 30 feet, except in the channels where it is 40 feet.(11)

Sometime in early February Onishi requested Commander Minoru Genda, the aviation staff officer for the Eleventh Air Fleet, to see him about an urgent matter. After giving him an oral presentation of Yamamoto's idea, he gave Yamamoto's letter to Genda and waited for him to read it. "When he finished the letter, he met Onishi's challenging regard and said calmly, 'The plan is difficult, but not impossible.'"(12)

In the ensuing discussion, Onishi explained that Yamamoto's intent was to cripple the US Pacific Fleet and lower the morale of Americans by sinking as many battleships as possible. Like the Japanese, most Americans considered battleships to be the mightiest ships on the sea and the sinking of one or more would be seen as an unprecedented disaster. Yamamoto also played with the idea of a oneway air strike by torpedo bombers in which the planes would be launched "500 to 600 miles from Oahu - a distance well beyond their radius of action." The advantages of this were

that: the striking range of the aircraft would be increased; and the carriers could be moved quickly out of the area and be on the way home soon after the aircraft were launched. After attacking their targets, the pilots would ditch their planes in the ocean and be recovered by destroyers and submarines. Yamamoto assumed,

with rare naivete', that in the face of this type of attack the American people might think the Japanese people such a unique and fearless race that it would be useless to fight them.(13)

Genda was quite critical of this scheme. He saw the oneway attack as a defeatist approach, something which ran counter to his nature.

'To obtain the best results, all carriers must approach as close to Pearl Harbor as possible,' he emphasized. 'Denuding them of planes and departing the scene of action minus their scoring punch would invite disaster in case the Americans launched a counterattack.' And Genda noted that Yamamoto's plan would in no way allow for repeated attacks to make the action decisive. 'To secure complete success, we must stay within effective bomber and fighter range of the target until we accomplish our mission,' he pointed out.(14)

The plan was also weak in that it depended on only one type of attack: torpedo bombing. Not only was it the most difficult form of naval warfare but Pearl Harbor posed the problems of shallow water and restricted airspace for any aircraft making the necessary low-level torpedo attack. Bad weather, poor visibility or an alert enemy would seriously reduce the chances of success. A one-way attack might affect the aircrews' performance. Also, ditching at sea would be a waste of planes and would unnecessarily risk the

lives of highly trained pilots. Finally, the primary target should be the American aircraft carriers, not the battleships.

In concluding the conference, Onishi stressed the need for secrecy and surprise in order for the plan to succeed. He also pointed out the need to use every carrier capable of steaming to Hawaii. He then asked Genda to make a preliminary study "with special attention to the feasibility of the operation, method of execution, and the forces to be used." (15)

Genda's study emphasized nine points:

"1. The attack must catch the enemy completely by surprise." Without surprise, the task force would end up sailing into a trap and suffer heavy losses.

"2. The main objective of the attack should be U.S. carriers." Elimination of US naval air power and the survival of the majority of Japan's own aircraft carriers would give her a double advantage. Japan would be able to sink the other major combatants of the US Navy without any great difficulty. Battleships were important targets, but carriers had higher priority in Genda's eyes.

"3. Another priority target should be U.S. land-based planes on Oahu." This would guarantee control of the air over the target and prevent the US from launching an air strike against the task force.

"4. Every available carrier should participate in the operation." Yamamoto had suggested one or, at the most two carrier divisions (two carriers per division). Genda felt that "The stronger the carrier force, the better chance the Japanese would have of a successful attack and the better they would be prepared to face unexpected developments at the scene of action."

"5. The attack should utilize all types of bombing - torpedo, dive, and high-level." Genda favored torpedo bombing, since it appeared to be the aerial weapon with the highest yield. But due to the shallow water of Pearl Harbor and the possibility of antitorpedo nets, his next preference was dive bombing if hard training and US countermeasures did not make torpedo bombing

feasible. High-level bombing was low on his list because of the Japanese experience in China.

"6. Fighter planes should play an active part in the attack." A fighter escort would cover the bombers to and from the target and keep enemy planes out of the air. Other fighters would protect the carriers during the attack.

"7. The attack should be made in daylight, preferably in the early morning." Japan did not have the precision instruments needed for night attacks by aviation. The next best alternative was to launch all aircraft before sunrise, timed to reach Pearl Harbor at dawn.

"8. Refueling at sea would be necessary." Most Japanese warships did not have enough range to reach Pearl Harbor without refueling. Therefore, at-sea refueling techniques would have to be studied and practiced.

"9. All planning must be done in strict secrecy." The US must not even be able to guess that the attack was being prepared.(16)

The essence of Genda's draft and his discussions with Onishi was that he saw the Pearl Harbor attack as a knockout punch - the destruction of the enemy's forces in one blow. Yamamoto held to a limited strategy - the temporary containment of the enemy; he was hoping for a knockdown punch.

Onishi used Genda's draft as the basis of his report to Yamamoto. He retained most of the points but with certain additions and modifications.

The admiral agreed that carriers should be the number one target, but he added cruisers as a close second, to unbalance the U.S. Pacific Fleet. Onishi originally was inclined to emphasize torpedo bombing, . . . but the adverse reaction of his torpedo expert, Maeda, probably cooled his ardor considerably. He also feared that this technique . . . would cost Japan heavily in pilots and planes. . . . Onishi now had second thoughts about dive bombing. The pilots would have to plunge down to a very low level, probably straight into withering antiaircraft and machine-gun fire. He knew that this type of bomb did not carry the momentum to penetrate the deck armor of capital

ships. Thus by process of elimination, Onishi placed his priority on horizontal bombing.(17)

He also suggested using merchant ships as scouts and decoys for the task force rather than destroyers or submarines. Merchant ships would not arouse the suspicions of the enemy. To further safeguard the force, he pointed out that the route to Hawaii should be designed to give the greatest chance of surprise.

The report which Onishi handed to Yamamoto on or about March 10 was a compromise between Onishi's ideas and "those of the Navy's most original thinker on air power." As the plan went through analysis and revision, many of Onishi's changes were dropped. The final product was the work of Genda.(18)

. . . The admiral was by then discussing the attack with his own operations officer, Captain Kameto Kuroshima. . . . Kuroshima closeted himself in his cabin for several days and finally emerged in a cloud of garlic, incense and cigarette smoke with a detailed plan entitled Operation Kuroshima.

Success rested on two precarious assumptions: that the Pacific Fleet (the United States Fleet had been so renamed on February 1) would be anchored at Pearl Harbor at the time of the attack; and that a great carrier force could be moved halfway across the Pacific Ocean without being detected. . . (19)

In all the studies and revisions of the plan, one thing is evident: the objective was the US Pacific Fleet and the military planes at Hawaii. No mention was made of the oil tank farms, the dry docks, the submarine base, the machine shops, and various repair and maintenance facilities. It appears that it was not until after the Battle of Midway

that the Japanese Navy corrected this tendency.(20) However, Genda did want to include the dry docks, at least, in the target list.

Yamamoto's strategy was contradictory. He wanted to inflict enough damage to keep the Pacific Fleet out of the war for six months and also achieve demoralizing effects on the US population. It was unlikely that Yamamoto's minimal approach could have attained his goals, since the US Congress had already given its approval for a major stepup in naval shipbuilding. As it was, the US Navy was not able to mount any major operations in the Pacific Ocean until May 1942 in the Battle of the Coral Sea.(21)

Yamamoto officially presented the idea of an attack on Pearl Harbor on 7 January 1941 in a nine-page document entitled "Views on Preparation for War" which was intended "For the eyes of the minister alone: to be burned without showing to anyone else." This was a follow-up to the talks he had had with Navy Oikawa in November while his ship was anchored at Yokosuka.(22)

It appears that Yamamoto's own staff had been studying the problems of an operation against Pearl Harbor since mid-January of 1941. Kuroshima, the senior staff officer, had put Commander Akira Sasaki, the staff air officer, to work on studying three possible alternatives. In the first, it was assumed the US would be on the alert. The Japanese task force would launch its planes 350 miles from Pearl Harbor; only carriers would be hit and fighters would guide the bombers. The second case called for all aircraft to be

launched at a range of 200 miles. The third was a one-way bomber attack with no fighter escorts; submarines would pick up the aircrews as they ditched in the sea.(23) This was in addition to the study Kuroshima was doing.

In late March, several weeks after Onishi had turned over his report to Yamamoto, Fukudome showed the Onishi-Genda report to Kuroshima and Commander Yasuji Watanabe, a staff officer. Within several days the rest of Yamamoto's staff knew of the plan and had been divided up into

four preliminary study groups: (1) Operations and Supply; (2) Communications and Information; (3) Navigation and Meteorological Conditions; and (4) Air and Submarine Attack.(24)

On April 10, the heavy carriers were organized into one operational unit, a move which greatly facilitated the Pearl Harbor operation and indicated a change in Japanese naval strategic thinking. The First Air Fleet was to consist of the First Carrier Division (Akagi and Kaga), the Second Carrier Division (Soryu and Hiryu) and the Fourth Carrier Division (Ryujo).(25) They would later be augmented by the Fifth Carrier Division (Shokaku and Zuikaku).(26)

On the same day, Fukudome was made head of the First Division of the Naval General Staff. The head of the First Section (Operations) was Captain Sadatoshi Tomioka. The air staff officer was Commander Tatsukichi Miyo. About a week later Onishi gave Fukudome a copy of the report he had given Yamamoto, who had ordered him to do so.(27) In their discussion of the plan, Fukudome pointed out that there were

still serious problems in it. He also voiced his personal disapproval of the idea.

At the end of April, Yamamoto sent Kuroshima to Tokyo to discuss the Pearl Harbor plan with the Naval General Staff's Operations Section, which normally was responsible for designing and developing war plans. They talked the plan over, and Tomioka and Miyo were both opposed to it. Tomioka saw it was an overextension of the Navy's resources. He noted that many Japanese warships had a fairly limited radius of action and none of the carriers had ever refueled at sea. Miyo was afraid that without some of the carrier-based planes, it would not be possible for the Japanese Army to carry out its tasks in Southeast Asia. He also believed that the Navy should concentrate its efforts on the planning of the South Operation rather than on an impossible mission.(28)

In the same meeting, Tomioka discussed the Naval General Staff's overall plan with Kuroshima. The main objective was the seizure of Southeast Asia's resources. He stressed that this had the highest priority. He also mentioned the General Staff's attrition-based plan for dealing with the US Navy. Kuroshima was unimpressed by the plan. He requested that the Pearl Harbor concept be included in the Naval General Staff's planning, but it was clear from the opposition of Fukudome and the other two general staff officers this was not likely.

While those opposed to the plan tended to stress the difficulties in implementing it and the uncertainties of the

assumptions, the real cause for their concern must have been the possibility of losing a large portion of Japan's heavy carriers. Most officers assumed that some American aircraft would survive the attack, and would be able to find the Japanese task force and attack it. About 60 per cent of the US planes would make it through the fighter air cover and sink "one-third of their force." (29) In turn, the Pearl Harbor attack could not be expected to reduce the strength of the US Pacific Fleet by more than one-fifth, perhaps one-fourth. (30)

By June 1941 planning had progressed to the point that Pearl Harbor was included in the map maneuvers against the US held by the Combined Fleet command. One assumption in these war games was that only one small training carrier, Hosho, would be used in the invasion of the Philippines. For those officers who had served with the Naval General Staff or were otherwise acquainted with its plans for naval operations, the assumption of the June war games contrasted strongly with the conventional naval strategy set by the Naval General Staff. (31)

In the same month, training for the plan was included in the training exercises of the First Air Fleet. The pilots were not told for what specific targets they were practicing for and there was much speculation among them. The targets on which they practiced were set up to simulate the problems they would encounter at Pearl Harbor, but apparently no one connected the two. They also had to

learn Morse code in order to communicate with their carriers beyond the 100-mile range of the radiotelephone with which their planes were equipped.

High-level bombing tactics had been improved substantially by this time. Training was upgraded to include the new tactics and the bombing leaders of the First Air Fleet were taught the new method in June. The only operational requirements now left were a torpedo capable of working in shallow water, a bomb which could penetrate the deck armor of US ships when dropped from a sufficiently high altitude, a longer range Zero (for use in the Southern Operation), and workable refueling techniques for ships underway in the rough waters of the northern Pacific.

In early August, Kuroshima suggested to Yamamoto that it would be helpful if the Naval General Staff held its yearly map maneuvers in September rather than in late November and early December as normally done. If the Pearl Harbor plan was included in the war games, it would aid in the coordination of naval operations, give the responsible general staff officers an opportunity to review the plan, and give the planners an extra chance to further debug the plan.

Yamamoto also felt this was an opportunity to argue the case for the Pearl Harbor plan. Therefore, he sent Kuroshima to Tokyo to present his request and discuss "the Pearl Harbor air strike and operations against the Philippines and Russia" (32) on August 7. Commander Arima, Yamamoto's torpedo and submarine officer, accompanied him.

Kuroshima, in addition to his request for rescheduling the annual war games of the Naval General Staff, also asked for rooms and equipment in the Naval War College. He asked for one room to be set aside solely for the Pearl Harbor exercise. He also requested all the available information needed for realistic war games: intelligence on the Pacific Fleet, the number of American planes, etc. Tomioka, the responsible general staff officer, approved these requests, but was still strongly against including Yamamoto's plan in the general staff's plans.

Kuroshima argued that the most important task of the Japanese Navy was to defeat the US Pacific Fleet at the beginning of the war. Tomioka responded by listing the Naval General Staff's objections to the plan. First, its success depended heavily on surprise and that could not be guaranteed. Even if the fleet managed to cross the Pacific without being detected, it would surely be detected when it came into range of air patrols operating out of the Hawaiian Islands. Also, if the war broke out elsewhere before the attack, the Americans would be on the alert.

Second, refueling at sea could prove to be an insurmountable problem. Third there was no way of being sure that the American ships would be in port on the day of the attack and the strike force would not have enough scouting forces to find the enemy. Fourth, any of the American ships which were at sea during the attack could attack the Japanese strike force with the aid of land-based planes. Fifth,

the weather could cause Nagumo, the strike force commander, to cancel the air raid, but it would not be possible to postpone other operations. Sixth, the raid was not expected to yield much in view of the expected difficulties such as anti-torpedo netting, the shallow water of Pearl Harbor, the poor accuracy of horizontal bombers, and the ineffectiveness of dive bombers. Finally, the inadequate range of land-based aviation meant that carrier-based planes would be needed to support the Southern Operation.(33)

After responding to Tomioka's points, Kuroshima agreed to reconsider the Naval General Staff's plans. Curiously enough, the general staff did not take this chance to kill the plan by taking their objections to Nagumo, chief of the Naval General Staff.

A study with the aim of developing a plan was carried out by a team made up of key staff officers of the First Air Fleet in early September 1941.(34) Commander Tamotsu Oishi, a senior staff officer, assisted Genda and maintained relations with Vice Admiral Nagumo, commander of the First Air Fleet and soon to be commander of the Pearl Harbor Striking Force, and Kusaka, Nagumo's chief of staff. Genda was responsible for planning the attack itself; Rear Admiral Ryonosuke Kusaka handled the problem of bringing the strike force within air range of Pearl Harbor without being detected.(35) Commander Mitsuo Fuchida was chosen to coordinate the training of pilots and the operation of planes in the attack. Lieutenant Commander Kenjiro Ono, communications officer, was given those tasks related to

communications: ship-to-ship signals while underway; messages from Japan; radio silence; and all other matters dealing with communications security. Lieutenant Commander Otojiro Sasebe, staff navigation officer, who also had a good understanding of meteorology, was given "navigation and weather forecasting - distances to be covered, schedule of cruise, sea conditions, task force formation, and the like." Nagumo's engineering officer, Lt. Commander Goro Sukagami had the job of figuring out the fuel requirements of the strike force and how the ships were to be refueled in the rough waters of the north Pacific. Kusaka was also involved in the problem of refueling because he considered it to be second in importance only to secrecy. Genda, in addition to being the chief of this study group and planning the air attack, was also responsible for determining the fleet's point of departure and its route to Hawaii.(36)

Genda spent most of his time writing the report on the possible routes which the strike force could take to reach the Hawaiian Islands. Before the staff study had started he had already decided on the route which he preferred. His report, however, could not be limited to that one route. As a staff officer, his responsibility was to discuss the viable options and leave the decision up to his superiors. Therefore, he wrote his study in a manner which favored the route he thought to be best.

His report discussed three possible approaches: southern, central, and northern. In the first, the strike

force would depart from either of two points and rendezvous in the Marshall Islands, where all ships would refuel. This would enable the carriers to "complete the voyage without a transfusion from the tankers if necessary." (39) From the Marshall Islands, there were two possible routes. The "direct approach" called for the strike force to steam to the northeast out of the Marshalls, turn east south of Johnston Island and then angle to the north until the attack launch point 200 to 250 miles south of Pearl Harbor was reached. This approach offered a reduced fuel problem, "relatively calm seas, and proximity to Japanese bases" in case of emergencies. However, the fairly clear skies of that route would not hide the force. Also, the US Navy used the area southeast of Hawaii for naval exercises. (38)

The second southern route called for the task force to travel along the equator before turning north and launching the attack at a point 200 miles southeast of Oahu. This route had all the disadvantages of the first, plus a greater refueling problem. Also, if the strike force was spotted by the US it could be prevented from retreating to the Marshalls by the Pacific Fleet. An attack from the southeast would be an absolute surprise but would be practically impossible to carry out without being detected.

In the central route, the ships of the task force again left from either of two ports and rendezvoused at the island of Chichi-Jima, 700 miles southeast of Tokyo. However; the harbor there would not be able to hold the entire force and it would be open to submarine surveillance. From the meet-

ing point the strike force would go northeast to about 500 miles north of Midway Island. Here they would change their heading to a southerly one in order arrive 450 miles directly north of Oahu. Here they would turn south and launch aircraft when appropriate.

This route avoided the stormy seas of the northern route and the exposure of the southern route. However, it had the disadvantages of a rendezvous point with an inadequate harbor, the danger of detection by American submarine, surface and air patrols north of Midway, and the need to flank the Hawaiian chain to the north. Neither Genda nor anyone else gave this route any serious consideration.

For the northern route, the one favored by Genda, any of the Inland Sea anchorages was suitable for a departure point. He found it difficult to decide on a rendezvous point and put off that decision until later. As with the southern route, he came up with two options. The first involved steaming along 42 degrees north latitude, far enough to the south to avoid commercial shipping. When the strike force was 1000 miles north of Oahu, it would turn south and head for the launch area.

The second was rather more elaborate: Nagumo's ships would follow the first track until due north of Oahu; then they would continue southeast until they had reached a point 800 or 900 miles northeast of Pearl Harbor, where the task force would shift course southwest and approach Pearl Harbor on a straight line.(39)

Genda assumed that air and surface patrols out of Oahu would not pay much attention to the northeast. Thus a swing

to the east would put the force out of reach of the patrols out of Oahu while still avoiding the patrols from the American mainland. This would also leave the strike force between any reinforcements from the mainland and Pearl Harbor. Genda considered this a necessity if his suggestion of landing an invasion force was accepted. The weakness of this approach was that the task force would be exposed to discovery by commercial ships and planes travelling between the West Coast and Hawaii. Eventually Genda discarded this route for the simpler one.

Genda was not the only staff officer who studied the problem of the task force's route to Hawaii. Sasabe, Nagumo's navigation officer, and Watanabe of Yamamoto's staff, also worked on it. In their reports they considered weather, visibility, the condition of the sea, and shipping routes. Thus when Genda submitted his report to Kusaka, the chief of staff voiced his approval of the northern route. Despite the problems which the rough seas of north would present, the need for surprise dictated that this route be used. The bad weather in the north during late autumn and winter "reduced the possibility of detection, and it made patrol activity by the American Navy more difficult." (40) Also, intelligence reports from Hawaii informed the Japanese that the area north of Pearl Harbor was the region least patrolled by the US. Despite this report, Kusaka assumed that the full circle around Pearl Harbor would be patrolled and the strike force would have to thread its way through.

Despite Kusaka's support, Genda had to work hard to sell the idea of a northern route to Nagumo. Nagumo assumed that the force would be detected by the Americans no matter what approach was taken. He also did not want to deal with the difficulties of refueling in the rough waters of the northern Pacific. Therefore, he preferred the southern route. He felt this would allow him to retain the maximum striking power available.

On August 5 the Japanese Navy issued orders for units to begin preparing for a possible war. The beginning of October was set as the target date for the completion of all preparations. In response the Combined Fleet discontinued all training and operations in China and issued orders for war preparations within a month. Yamamoto's headquarters ordered the initiation of a "complete wartime organization" on September 1. Also, despite its official disapproval of Yamamoto's plan, the Naval General Staff continued to cooperate with the Combined Fleet in its planning efforts such as re-scheduling the annual war games and making a model of Oahu.

War Games and Rehearsals

The annual war games began on September 11. Yamamoto presided over the games which followed the Combined Fleet's war plans.

In simulating combat conditions he divided his warships into task forces allocated to the numerous operations. These groups in turn split into Blue Forces representing Japan and Red Forces simulating the Americans and British. The chief of staff of each fleet usually acted as its Blue

Commander. Ugaki headed all the Blue forces, while Vice Admiral Shiro Takasu, Commander in Chief of the First Fleet, ran the Red Forces.(41)

The Blue team was to carry out its operations as planned by the Combined Fleet. The Red team was to follow plans which had been submitted prior to the game by their commander. The umpires, headed by Rear Admiral Seiichi Ito, changed operational conditions in cooperation with the Red team in order to make the games as realistic as possible and to keep the Blue commanders from knowing the Red Forces' plans. Many of the officers on the Red team had been chosen because of their specialized knowledge of the country in question.

Once he was satisfied that the games for the Southern Operation were well on the way to a conclusion, Yamamoto turned his attention to the Pearl Harbor war game. On Tuesday, September 16, he took Ugaki, Kuroshima, Watanabe, Sasaki and Arima to one of the rooms set aside for the Hawaii exercises.

Approximately thirty officers, handpicked by Yamamoto, met in the room. Only those who were to judge the plan, had helped plan it or were to execute it were present. The room itself had a long table; the walls were hung with maps of the Pacific. Nagumo was there, accompanied by members of his First Air Fleet Staff.

The representatives from the Naval General Staff were Fukudome and Tomioka and his assistants, Miyo and Sanagi. Tomioka was to serve as chief umpire for the exercise.

Commander Uchida, whose assignments included operations against the US was also present. Several officers from the Intelligence Bureau had also been invited. Rear Admiral Ito and Admiral Nagano, Chief of the Naval General Staff, did not appear although they had been invited.

The war game dealt with the questions of whether the operation was technically feasible and whether secrecy could be maintained. The aim was to come up with a better estimate of the probabilities involved. Before the game began, however, Genda and others had to convince Nagumo that the northern route was the best approach. Genda also had to argue for his advice against aerial reconnaissance.

The proposed X-Day (the Japanese version of the American D-Day) was set for November 16. The submarines left first on October 16. They arrived at Wotje on the 20th, departing between the 28th and the 30th in order to arrive on November 15 to encircle Oahu at a distance of 300 miles. In the meantime, the task force met at its rendezvous point before sailing across the Pacific. It consisted of the First and Second Carrier Divisions (four carriers total), two battleships, three cruisers, destroyers and tankers, but no submarines. Nagumo set speed and course at 12 knots easterly, gradually turning south as the target area neared. Refueling was to take place on November 8 and 13. On the 12th, four destroyers deployed to each of the four sides of the task forces to keep an eye out for fishing vessels.

On the 14th, Nagumo received word that, as of the 11th, the Red fleet had been sighted in Pearl Harbor. The same

day the Red team was sending out air patrols before sunrise, during the day and after sunset. One patrol appeared to have spotted a submarine south of Oahu. Two days later oil was seen on the surface. Surmising that it may have leaked from a submerged submarine, the Red team extended air reconnaissance to 600 miles. Late in the afternoon an air patrol spotted the task force but was apparently destroyed before it got off a message. This was after the task force had increased its speed to 24 knots. A report was received from the Japanese submarines around Oahu that 10 US cruisers had been spotted heading towards the strike force. Nagumo continued on to the launching point 200 miles north of Oahu.

The patrol plane which had been shot down had managed to get off a warning before going down. Thus the Blue team encountered the heavy resistance it had expected. Incidentally, the Red team was headed by a Japanese officer who "witnessed at least one American exercise during the 1930's of just such an attack against Pearl Harbor."⁽⁴²⁾ The first wave was met by US interceptors over Oahu. The attackers could not bomb effectively because of the American fighters. Ship guns and shore batteries also brought down some Japanese planes.

The second wave, an hour behind the first, experienced the same difficulties. Half of the aircraft returned to the carriers after inflicting only minor damage.

Red bombers attacked the task force and sank two aircraft carriers. The other two carriers and some of the

support units were slightly damaged. Losses were roughly one-third of the force, matching previous Japanese estimates.

The lessons of this war game were that the Red air patrols could be efficient and the task force had timed its arrival poorly. To solve both problems, the plan for the next exercise called for the task force to arrive at a point 450 miles north of Oahu at about sunset the day before the attack. On the assumption that air patrols could not go more than 600 miles from Hawaii, this would give the task force a margin of safety. The Japanese calculated that by sunset the Red air patrols would be on the way back to their bases. Some element of risk remained since it would not be easy to stay in the safety zone. However, from intelligence reports that Japanese knew that American patrols could effectively cover only a radius of 180 degrees. They also knew that patrols were concentrated in the areas south and southwest of Pearl Harbor; the area north of Oahu was poorly patrolled.

In the second war game everything went smoothly. The attack was a complete surprise. Four battleships were sunk and one was severely damaged. The carriers Lexington and Yorktown were sunk; the Saratoga was severely damaged. Three cruisers were also sunk "and three others [were left] with their fighting capability sliced in half." Red air strength on Oahu had been virtually broken, including fifty fighters shot down and eighty destroyed.(43) The Blue team lost one carrier on the second day. Another was damaged. The cover-

ing Japanese fighters shot down an additional 50 Red planes. The task force escaped, with the aid of a squall, without serious damage.

Although Genda and Sasaki had argued in favor of repeated attacks against Pearl Harbor, Nagumo's plans in both war games called for a quick getaway. Many of those involved in the planning preferred to make sure the carriers returned safely rather than risk them in an extended attack against Pearl Harbor. There they would be vulnerable to attacks from land-based aircraft and any ships which escaped the attacks. It was possible that the American carriers would be at sea on the day of the attack. If so, the task force might have to contend with those planes.

The war games did not settle the question of how many carriers and battleships should be assigned to the strike force. This was because the Southern Operation still had priority in the minds of the Naval General Staff. However, the small number of ships sunk in the second game supported the arguments of those who wanted to increase the number of carriers in the strike force.

In the general discussion after the war games, Kusaka asked for "the exact air scouting radius of the enemy and location of his ships, together with the general situation within Pearl Harbor." (44) He also requested a destroyer squadron of 16 ships for the task force. He suggested that the Sixth Fleet (submarines) be put under the control of the strike force commander and that the airspeed restriction of

280 knots on the Zero be rescinded.

Like the Europeans the Japanese seemed to have preferred the form of war game known as the free game. In this form, rules were used to determine the outcomes in combat, but the umpires were not required to follow those rules. If, in their judgment, the outcome produced by the rules was not realistic enough or did not agree with their knowledge and experience, they were free to declare what the outcome should be.

The weakness of this type of war gaming is that it is open to bias from the umpires. Until after the Battle of Midway, Japanese naval war gaming was characterized by a tendency for "shortsighted, self-indulgent thinking." The umpires underestimated US strength and biased their decisions in the Blue team's favor. Activities of the Red team were arbitrarily restricted if they interfered with the planned movements of the Blue team. Acts of nature such as the squall in the second Pearl Harbor game were used to help the Blue team.(45) This worked in reverse, apparently, during the annual war games of 1941 because the bias of the head umpire against the Pearl Harbor plan tested the plan severely in the first war game. The expectations of sure disaster also played their part in producing a bias against the Blue team.

Despite the problem of bias, the war games at least served the purpose of galvanizing the Japanese. It was estimated that there was enough oil for about 18 months of fighting, but if war was delayed beyond December there would

not be enough to supply military needs. Therefore, if there was to be a war, all preparations had to be finished before December.

In the case of Pearl Harbor, the bias in the war games seemed to balance the expectations that some Japanese had of American preparedness. Admiral Kimmel, CINCPAC (Commander in Chief, Pacific), despite a war alert in the spring of 1941, allowed his ships to follow a regular training schedule, making it easy to predict when a ship would be in port. The Japanese believed that anti-torpedo nets had been put in around at least the battleships. Kimmel, however, had decided against doing so because of the difficulty of maneuvering that it would have led to. Also, he found it difficult to believe that any known torpedo could be used successfully in the harbor's shallow water. Many of the commonsense precautions which the Japanese expected the US to take were never instituted.

During the summer of 1941, the development of a bomb capable of penetrating the decks of US ships had been completed. At about the same time the accuracy of Japanese high-level bombers was being improved with changes in tactics. By October, the accuracies achieved were satisfactory enough to make it worthwhile to keep high-level bombing as one of the elements of the attack.

In October, beginning on the ninth, the Combined Fleet held another rehearsal of its plans for the upcoming war. The few days were reserved for the Southern Operation. On

October 12, Operation Hawaii was played out. This time submarines would accompany the strike force and serve as scouts. Because of Nagumo's concern that the advance submarines might be spotted, all submarines within 600 miles of Oahu would surface only at night. Also, a rendezvous had been agreed upon. However only three carriers would be in the force - the result of a compromise plan worked out after the September war games.(46) In this game

The First Air Fleet theoretically sailed from the Inland Sea, rendezvoused in Hitokappu Bay, and took the northern route to Hawaii. There, approximately 200 miles north of Oahu, the carriers launched two attack waves at dawn. The umpires ruled the air strike a success, with 'moderate damage' inflicted on the United States ships and the task force escaping without serious losses.(47)

One of the questions brought up by the exercise was how the Pearl Harbor attack was going to be synchronized with the Southern Operation. After much discussion, it was finally decided that the invasion fleet needed for Malaya was not to fire on any Allied scouts which might spot it. If it was spotted, it was to head back towards Japan in order to deceive the British.

The details of submarine operations were still not decided after the rehearsal, especially with regards to the midget submarines. Several officers vented their discontent over the decision to reduce the number of carriers in the strike force. They blamed the "moderate damage" achieved in the war game on an insufficient number of planes and pushed for the addition of more carriers to the operation.

The Naval General Staff continued to oppose Operation Hawaii. However, in the face of Yamamoto's threat to resign, it agreed to end its opposition if certain conditions were met. Only six carriers would be used in the operation; "the Combined Fleet would make no further demands on Japan's naval air strength;" and the six carriers would support the Southern Operation as soon as possible after attacking Pearl Harbor.

The Chief of the Naval General Staff approved the plan with only two conditions: it must not interfere with the Southern Operation; and the naval air strength assigned to the south would not be reduced.

As this went on, the First Air Fleet continued to practice and rehearse. To save fuel, the dry runs held in October originated from land bases rather than carriers. On November 4, 5, and 7, dress rehearsals were held. The task force sailed to a point 200 miles from Saeki, the practice target. In the first rehearsal, only 40 per cent of the torpedoes leveled off at the correct depth. The rest went deeper. The next day, in the second rehearsal, the attackers were met by fighter interceptors. Although the rehearsal ended successfully, the accuracy of the horizontal bombers was unsatisfactory and the torpedoes still tended to run too deeply. It was also noticed that the pilots tended to concentrate on the outboard ships, those nearest the attackers. In the third rehearsal, the attacking planes concentrated on the airfield rather than on the ships because of dense fog. Genda's assessment of this dry run was

that, except for the bombing runs made against the ships, the bombing tests were "very poor".

The Attack.

Operation Hawaii commenced when submarines began to leave on November 11 to take their positions around Oahu, and reconnoiter Lahaina Roads (to see if the US Pacific Fleet was anchoring there), the Aleutian Islands and certain points in the South Pacific. Those with the shortest radius of action left first in order to refuel in the Marshall islands. The rest left on or after the 15th. The strike force left port on November 17 and headed for the rendezvous point.

On the morning of November 23, Nagumo announced the mission of the task force and handed out copies of the orders for the operation. Task Force Order No. 1 included the statement that:

When the attacks have been completed the force will quickly withdraw. Upon returning to Japan the force will be re-equipped and supplied and then assigned a task in the Second Phase Operations. (48)

This re-affirmed Nagumo's view of the attack as a hit-and-run raid. He and his chief of staff believed that a two-wave attack with 350 aircraft would be enough to deliver a fatal blow. However, apparently in concession to Genda and Fuchida, Operation Order No. 3 stated that after the planes returned from the attack, preparations would be made for the next attack. The planes were to be armed with

torpedoes. If land-based air power was completely eliminated, repeated attacks were to be made. If an enemy force was steaming to attack the strike force, any subsequent attacks would be directed against the American ships at sea. Judging from Nagumo's behavior in war gaming the operation and the concerns he voiced to others, it does not appear that he considered it worthwhile to risk exposing his aircraft carriers to attack in order to carry out multiple attacks on Pearl Harbor.

The purpose of the operation was to prevent the US Pacific Fleet from operating for at least six months. The primary operational objective was to destroy all US carriers, at least four battleships, and US air power on Oahu. Initially all planes would concentrate on major fleet units in order to make it more difficult to salvage damaged ships.

The first wave was to consist of fighters and all types of bombers. The second wave would be made up of fighters, and horizontal and dive bombers. It was to finish off the ships damaged by the first wave and attack the air fields not touched by the first wave. Upon the planes' return to the carriers, the task force would begin preparing for a possible counterattack. Horizontal bombers would be armed with torpedoes. If a sea battle did not develop, another strike against Pearl Harbor was possible. In that case, torpedo bombers would be used as horizontal bombers.

For information on the US fleet the task force would rely on reports from the consulate relayed by the Naval General Staff and the scout submarines. The task force

reportedly had two plans for scouting Pearl Harbor. The plan which was put into effect made use of the seaplanes from two of the heavy cruisers to fly over Pearl Harbor and Lahaina Roads, and confirm the US fleet's presence at either anchorage or both. These planes were to depart one hour before the first wave.

Finally, 54 fighters would fly carrier air patrol on the day of the attack.

In the afternoon session Genda presented the five possible plans that would be used depending on which one assumption was true on X-Day:

1. The U.S. Pacific Fleet would be in Pearl Harbor.
2. The U.S. Pacific Fleet would be in Lahaina Roads.
3. Part of the U.S. Pacific Fleet would be Pearl Harbor and part in Lahaina Roads.
4. The U.S. Pacific Fleet would be at sea, and the task force would find it.
5. The U.S. Pacific Fleet would be at sea, but the task force would not find it.(49)

In Plan No. 1, the one actually used, the 189 planes of the first wave were timed to hit Hawaii at approximately 0800. This wave was made up of 50 horizontal bombers, 40 torpedo bombers, 54 dive bombers and 45 fighters. The torpedo bombers would launch their torpedoes at low attitude while the horizontal bombers would drop their bombs on the decks of the torpedoed capital ships. The fighters were to take control of the air and strafe the air installations. The dive bombers were to hit the Hickam, Wheeler and Ford Island air fields to prevent retaliation against the task

force.

In the second wave 54 horizontal bombers would be used against Hickam, Kaneohe and Ford Island. 36 fighters would strafe the same three air fields, as well as Wheeler. Assuming that the torpedo bombers of the first wave had done their job well, 81 dive bombers were to attack the torpedoed carriers and damage them beyond repair.

In the discussion of the mechanics of the attack, the pilots were encouraged to sink ships in the channel if any attempted to escape to sea. This would make it impossible to use Pearl Harbor until the sunken ship(s) had been removed.

In the event that antitorpedo nets had been put in around the aircraft carriers and battleships, several of the torpedo bomber pilots were to create openings in the nets by crashing their planes into them. These orders were disguised so that Nagumo was not aware of their true purpose.

After the pilots were briefed on the four alternative plans, Genda added several remarks. If the US ships could not be located, the task force would recover the planes 50 miles south of Oahu after the attack. It would then search the area south of Oahu for the enemy ships on the basis of intelligence reports that the US Navy trained there. If the ships were still not located at this point, the task force was to head for the Marshall Islands for further orders without making another attack.

As the task force steamed towards Hawaii, daily rehearsals were conducted on the flagship of each carrier divi-

sion.(50) Beforehand, every detail of the plan had been covered for all the pilots. The pilots were broken up into 20 groups for this presentation to make it easier to handle questions since it was to be the only opportunity for them to question Genda and Fuchida.

Despite the bias of the umpires in the war games, many officers expected that at least two carriers would be lost. They did not believe that surprise would be so total that counterattacks would not be made. There were so many uncertainties in the assumptions the planners had made that it would take little to thwart the attack.

Critique.

At this point, it becomes necessary to consider the composition of the strike force in light of its mission. The First Air Fleet was made up of six heavy carriers, one light cruiser and nine destroyers. It was supported by two battleships and two heavy cruisers. Three submarines were used for ship lane reconnaissance, and the strike force was accompanied by eight tankers and supply ships. 25 submarines were stationed around Oahu and five mini-submarines were to attack the fleet in the harbor.(51)

With only 14 major combatants, other than the carriers and the submarines, the force was not capable of putting up a great deal of antiaircraft fire. If the force had a direct confrontation with US ships, its major combatants would not be enough for a major battle.

In contrast, Admiral Kimmel had about 90 of the ships

under his command in port on the day of the attack, with one carrier in Puget Sound for repairs and two more at sea with their escorts. The ships in port were made up of eight battleships (one in drydock), two heavy cruisers, six light cruisers, 29 destroyers (two in drydock), three seaplane tenders, five submarines, ten minesweepers, nine minelayers and various auxiliary craft, including the battleship Utah, in use as a target ship. There were also a total of 390 navy and army planes.(52)

It is apparent from the composition of the strike force and the makeup of the forces it faced that it was not capable of carrying out more than a hit-and-run mission. Sustained operations in the Hawaii area would mean risking attack from any of the ships and land-based bombers that might survive the attack. The Japanese were also uncertain about the number of aircraft carriers which were then at Pearl Harbor and whether they would be in port during the attack. They hoped that as many as six would be there but estimated that no more than four were likely to be in port. Japanese intelligence discovered that Saratoga was on the West Coast, but was unaware that both Hornet and Yorktown had been stationed in the Atlantic Ocean. Only Enterprise and Lexington were actually operating out of Pearl Harbor during the time period of the attack.

Operation Hawaii was only one facet of a huge plan coordinating simultaneous operations throughout the Pacific. Thus the resources that could be allocated to it were

limited. The high risk that most Japanese naval officers assigned to the attack also made them reluctant to release ships or planes which they wanted for their own operations, present and future. Thus, even though the preliminary plans approved by Nagumo, the strike force commander, called for repeated attacks against Pearl Harbor and the American airfields, he had openly expressed his preference for a hit-and-run attack. His conduct of the attack in war games followed that pattern and his chief of staff agreed with that position. Yamamoto's orders gave Nagumo the power to decide whether to follow up the attack; the order to make repeated attacks left the decision up to Nagumo. Yamamoto's lack of insistence on this point, and his refusal to give the strike force more battleships or destroyers, coupled with his stated objective of delaying the entry of the US into the war for six months - as opposed to crippling its navy - were not a source of encouragement to Nagumo. Therefore, when the strike force did not find the US aircraft carriers in Pearl Harbor, it was inevitable that Nagumo ordered a withdrawal in spite of the tremendous success of the attack and its few losses: 29 planes, five midget submarines and one I-class submarine versus the American losses of nine battleships (including Utah), three light cruisers, three destroyers, and three auxiliary craft either sunk, capsized, or damaged (general to heavy), 85 navy planes destroyed, 77 army planes destroyed, 128 army planes damaged (20 per cent beyond repair) and a number of navy and marine planes shot down by American gunfire.(53)

Naturally, since the Japanese did not expect the attack to be an overwhelming success, they had not made plans for such a contingency. However, Genda did come up with four plans if the two-wave attack succeeded:

Plan I. Remain in the area about 200 miles north of Oahu for several days after the attack and exploit whatever situation arose. This might call for aerial searches to find and destroy U.S. fleet units not at Pearl Harbor. Or deliver repeated attacks against the remaining ships in Pearl Harbor as well as its installations. Then, satisfied that they had completed all possible damage, return to Japan via the far northern route that Nagumo had already chosen for his homeward voyage.

Plan II. In general the same plan as No. I, but return to Japan on a route not as far north as the one Nagumo had selected.

Plan III. The same as Nos. I and II, but return to Japan along the Hawaiian chain, passing only a short distance north of Midway. This would enable the task force to attack whatever U.S. Fleet units might be sailing in or near that area.

Plan IV. The same as the others, but return to Japan by sailing southward, passing Oahu, on the west en route to the Marshalls. . . . it would enable Nagumo to launch a second two-wave assault against Pearl Harbor on Kimmel's ships at sea on Sunday, December 7 (local time). Then, too, such a plan would allow Nagumo to launch repeated attacks against Oahu as the task force moved southward within easy striking distance of U.S. targets on Monday, Tuesday, or Wednesday of that week. Genda hoped that if Nagumo operated according to this plan - all else being equal - the Japanese could destroy the U.S. Pacific Fleet and put themselves in a position to take the Hawaiian Islands.(54)

While not one of these plans was designed specifically for the situation that developed, any one of them could have been adapted to fit it despite being based on the assumption that the Americans would counterattack and damage or sink some of the carriers. The successful execution of attacks

on the submarine pens, drydocks, repair facilities, and the oil tanks would have given the strike force a strategic victory beyond compare. The damage inflicted was fairly insignificant: of the 18 ships hit, most were salvaged; many of the damaged aircraft were also salvaged. The US Pacific Fleet was able to mount offensive surface operations in just six months, although not of a substantial nature.

The Japanese Navy did not have any experience in preparing and executing a naval aviation operation of this size. A total of 355 planes had to be coordinated to hit ships and airfields in two separate waves. With no recent combat experience since the Russo-Japanese War (1904-1905) other than the invasion of China (primarily an army operation), the navy had to depend on its ability to plan, test and train.

It is worth noting that when Japan modernized its armed forces in the 19th century, its navy was British-trained.(55) Its army was trained by Germany. While both the British and the Germans had a war gaming tradition, it was from the Germans that both the Japanese Army and Navy derived the basis for their war gaming.

On the basis of reports by Japanese naval officers, it appears that Japanese naval war gaming favored the free game over the rigid game. The general tendency of Japanese umpires to bias the games towards the Blue team (Japan) certainly suggests this, as do references to the gaming of the Midway plan which point out that an admiral officiating a game overruled the umpires and allowed the Blue team to

continue to use two carriers which had been "sunk".

Despite the tendency to bias in its war games and the vice of not including a follow-through in their attack plans(56), the Japanese Navy did not make the mistake of overestimating itself. Most of its higher-ranking officers recognized the futility of fighting Britain, the US and the Netherlands simultaneously. Japan lacked the resources to fight a war for a long period of time. However, it had the capability to at least match the best that the Allies could throw at it for a while. Most of its naval pilots were experienced, and all of them had logged far more flying time than their American counterparts. The Japanese Navy had trained in night-fighting tactics and surprised the US by its success in night battles, even when ambushed.

However, at times the Japanese Navy made serious strategic mistakes and compounded them with tactical errors and vice versa. Pearl Harbor was a tactical success which became a strategic failure because a follow-up attack was not made.(57)

Like the Schlieffen Plan, Operation Hawaii was an ambitious attempt to start, fight and win a war. The risks were great and the potential payoffs were tremendous. However, the attack on Pearl Harbor was only a part of Japan's opening moves. The resources for it were available and ready, but limited. The planning was realistic, although the war games were biased; all of the officers involved were aware of the low chances of success. The attack itself was an

operational and tactical success. But, like the Scnliefen Plan, it became a strategic failure out of proportion of its planners hopes.

The Raid On Pearl Harbor.

FOOTNOTES

1. pp. 34-39, Stephen E. Pelz, Race To Pearl Harbor: The Failure of Second London Naval Conference and the Onset of World War II, Harvard University Press, Cambridge, Mass.: 1974.
2. "The [Japanese] Navy consisted of nine naval stations in the homeland area, the China Area Fleet, and most importantly, the Combined Fleet. The Combined Fleet was the mobile or 'mission' force encompassing the main body of the Navy. Because its strategic area was confined largely to the Pacific Ocean, it was roughly equivalent to the U.S. Pacific Fleet but at the beginning was considerably larger than the latter. In early 1942, the Combined Fleet consisted of five mobile fleets comprising the principal striking forces and three localized or area fleets serving in a particular region. The ones most concerned with South Pacific operations were mobile fleets: First Fleet (battle-ships and cruisers), Second Fleet (cruisers), Sixth Fleet (submarines), First Air Fleet (carriers), and Eleventh Air Fleet (land-based aircraft). Each fleet possessed escort and support vessels in addition to the major types of warships. The one localized fleet [in the South Pacific] was Fourth Fleet, based in the Mandated Islands. It consisted of a mixture of light cruisers, destroyers, submarines, auxiliary vessels, base forces, and an air flotilla." (p. 7, John B. Lundstrom, The First Pacific Campaign: Pacific Fleet Strategy, December 1941-June 1942, Naval Institute Press, Annapolis, Maryland: 1976.
3. p. 7, Paul S. Dull, A Battle History of The Imperial Japanese Navy (1941-1945), Naval Institute Press, Annapolis, Maryland: 1978.
4. p. 150, John Toland, The Rising Sun: The Decline and Fall of the Japanese Empire, 1936-1945, Random House, New York: 1970.
5. p. 8, Dull, op. cit.
6. p. 15, Gordon W. Prance, At Dawn We Slept: The Untold Story of Pearl Harbor, McGraw-Hill Book Company: 1981.
7. p. 16, ibid.
8. p. 18, ibid.
9. p. 151, Toland, op. cit.

10. p. 19, Prange, op. cit.
11. p. 369, Roberta Wohlstetter, Pearl Harbor: Warning and Decision, Stanford University Press, Stanford, Calif.: 1962.
12. p. 20, Prange, op. cit.
13. p. 21, ibid.
14. ibid.
15. p. 22, ibid.
16. pp. 25-26, ibid.
17. p. 27, ibid.
18. p. 28, ibid.
19. p. 152, Toland, op. cit.
20. See pp. 62-69, Saburo Toyama, "Lessons From The Past", US Naval Institute Proceedings, vol. 108/9/955, September 1982.
21. pp. 29-28, Prance, op. cit. and pp. 115-131, Dull, Chapter 8, "Battle of the Coral Sea", op. cit.
22. pp. 219-220, Hiroyuki Agawa, The Reluctant Admiral: Yamamoto and the Imperial Navy, translated by John Bester, Kodansha International Ltd.: 1979.
23. p. 98, Prange, op. cit.
24. p. 100, ibid.
25. p. 101, ibid.
26. p. 200, ibid.
27. pp. 222-223, Agawa, op. cit. and pp. 103-104, Prange, op. cit.
28. p. 105, Prange, op. cit.
29. p. 113, ibid.
30. p. 133, ibid.
31. p. 218, Agawa, op. cit.
32. p. 182, Prange, op. cit.
33. p. 182-183, ibid.

34. p. 215, *ibid.*
35. p. 155, Toland, *op. cit.*
36. pp. 215-216, Prange, *op. cit.*
37. p. 216, *ibid.*
38. pp. 216-217, *ibid.*
39. p. 219, *ibid.*
40. *ibid.*
41. p. 223, *ibid.*
42. p. 228, *ibid.*
43. p. 229, *ibid.*
44. p. 231, *ibid.*
45. p. 234, *ibid.*
46. pp. 281-282, *ibid.*
47. p. 282, *ibid.*
48. Cited p. 374, Prange, *op. cit.*
49. p. 377, Prange, *op. cit.*
50. p. 387, *ibid.*
51. pp. 11, 14, Dull, *op. cit.*
52. pp. 393-393, Prange, *op. cit.* and pp. 16,18-19, Dull, *op. cit.*
53. pp. 539-540, Prange, *op. cit.*
54. pp. 426-427, *ibid.*
55. p. 473, John B. Rae and Thomas H. D. Mahoney, The United States in World History: From Its Beginnings to World Leadership, McGraw-Hill Book Company: 1964.
56. See Toyama, *op. cit.*
57. In the Battle of Midway, the conflicting objectives of capturing Midway Island and luring the US Pacific Fleet into a trap, coupled with the assumption that the US Navy was not in the area, led to a series of tactical decision which resulted in the sinking of four Japan's

precious carriers. Yamamoto's decision to hold his battleships in reserve 300 miles west of the carrier force deprived it of some antiaircraft capability. His reason for doing so was that the battleships were to be used in a night battle against US ships after the island had been attacked, showing that he also suffered from the battleship mentality prevalent in most of the navies of the time. Thus the Pacific Fleet actually faced only the four carriers and their escorts at Midway.

War Games and Military Planners: Conclusions

Now if the estimates made in the temple before the hostilities indicate strength it is because calculations show one's strength to be superior to that of his enemy; if they indicate defeat, it is because calculations show that one is inferior. With many calculations, one may win; with few one cannot. How much less chance of victory has one makes none at all! By this means I examine the situation and the outcome will be clearly apparent.

- Sun Tzu (1)

In examining the case studies and drawing conclusions, several elements emerge which are common to both. Despite the strategic nature - or perhaps because of it - of both the Schlieffen Plan and Operation Hawaii, both are typical examples of the tendency of military planners to be operational rather than systematic. In both cases the planners focused on a pre-conceived goal and the means to achieve it rather than examining a variety of strategic goals and the best way to attain the preferred goal. The planners made use of some of the tools of systematic planning - war games, staff studies, etc. - but remained goal-oriented. However, the Schlieffen Plan's goal of a seven-week war with France would have been almost impossible to achieve, whereas the goal of Operation Hawaii - a short war with the US - was not completely translated into concrete objectives.

The case study of the Schlieffen Plan shows that there were several crucial, but weak, assumptions in it. First, that the French Army would not be able to detect and react to the envelopment by the German Army's right wing in time

to counter it. Second, the left wing would be able to defend against a French offensive despite its low level of strength. Third, the French would be so offensively-minded that they would not take advantage of defensive positions such as waiting for the invasion behind the Marne River. Fourth, the right wing could march through Luxembourg and Belgium and still defeat the French without a reserve. Fifth, Schlieffen believed

that 'one cannot defeat the enemy without attacking him'; and [finally], that a real victory is achieved only by completely destroying the enemy's striking power.(2)

The last two and the knowledge of how a long war could wreck a nation's economy were the basis of Schlieffen's argument for an offensive against France. The first four assumptions had to be true if the envelopment was to succeed; most were proven to be wrong. The French managed to meet the envelopment at the Marne River. The younger Moltke was concerned enough about the left wing's low strength that he assigned extra units to it in his revisions. While the French did mount an offensive against the left wing, Joffre gathered together a reserve army east of Paris and waited until the Germans made enough mistakes before he counter-attacked with a numerical advantage of four to three at the Marne.(3)

We therefore find some war game writers claiming that the assumptions behind the Schlieffen Plan were never tested in the war games used to develop it. A few go so far as to

accuse the General Staff of basing the war games on the assumptions. If this took place, it is only natural that the war games would give positive results.

. . . all the assumptions which he [Schlieffen] made in the plan were also made in the game, and the games dutifully confirmed that the plan was splendid, a process known to computer programmers as 'garbage in, garbage out'.(4)

If the assumptions had held true, Schlieffen and Moltke would have been justified in the risk they took. It is clear that they could not have retained the objective of attacking and defeating the French in seven weeks if they had not believed or hoped that the assumptions would come true.

Pearl Harbor presents a different case. Most Japanese officers conceded that if the technical problems of refueling at sea, developing a shallow-water torpedo, etc. were overcome, a successful attack might be possible but only at the loss or damage of some aircraft carriers. Even those who supported the operation expected to be met by an alert American defense. Optimism existed only among those who thought it possible to fulfill the objective in spite of the certainty that losses would be incurred.

However, assumptions of the possible difficulties and losses appear to have affected the translation of the objective into operational terms and the actual execution of the plan. Yamamoto's stated objective was to force the US into signing a peace treaty with Japan. Failing that, he wanted to delay the entry of the Americans into the war by six

months. His strategy was to launch a surprise attack against the US Pacific Fleet at Pearl Harbor and destroy it.

While Yamamoto was convinced by Genda and Onishi that aircraft carriers, not battleships, should be the priority target, he apparently was not totally convinced that the strike force should remain in the area to conduct repeated attacks against Pearl Harbor. Also, neither he, his staff, Nagumo nor Nagumo's staff thought the oil tanks and repair facilities were important enough to make them priority targets in the first attack. Genda at least wanted to see the drydocks hit in the second attack. On top of all this, the Japanese estimated that they would destroy or damage no more than one-fourth of the ships at Pearl Harbor.

In order to carry out a successful war against Japan, the US needed Pearl Harbor. With the passage of a large naval ship construction bill by Congress in 1940, it was obvious that sinking or damaging 20 to 25 ships would not necessarily keep the US out of the war long enough to make a difference. Also, the Japanese could not be sure that the American aircraft carriers would be in port because their training schedules were irregular. To accomplish the objectives of either forcing the US out of the war or delaying its entry, the Japanese Navy could not count just on attacking American ships. The operations should have sought to render Pearl Harbor useless as a naval base by destroying its repair facilities and the oil tanks. This would have forced the Pacific Fleet to use San Diego as its base of operations until Pearl Harbor was operational again.

Yamamoto's decision to leave the final decision on whether to mount a second up to Nagumo, the strike force commander, and the small size of the support force (14 surface combatants) combined to put the final touches on limiting Operation Hawaii to a hit-and-run raid. Nagumo had already displayed his preference for withdrawing as soon as possible. With only nine destroyers, the support force could not provide the carriers with sufficient protection from submarine attack. The three cruisers and two battleships could provide some antiaircraft fire but not enough to protect all six carriers, even when assisted by the destroyers. The carrier aircraft gave the Japanese a tremendous offensive capability, but if they had to be split between defending against American surface ships, land-based aircraft and possibly carrier-based aircraft, the strike force would be at great risk. Thus, Nagumo felt justified when he decided against a second attack.

Because of Pearl Harbor's shallow water and the heavy armor of the battleships (six of eight were salvaged), most of the 18 ships sunk or damaged were back in use within a year. The aircraft were another matter since some of them were very scarce and the European theater had been given priority by the Roosevelt administration. However, Pearl Harbor remained operational and the long war dreaded by Yamamoto began.

In both of these operations, the staff studies and war games were directed towards supporting the basic concept of

the plan. The studies and games were used to improve the weaknesses in the plans and to spark ideas on how to deal with them. Schlieffen's decision to concentrate his forces on the right wing, for instance, was based on the results of a war game in which the left wing beat back a French offensive while the right wing was defeated. Yamamoto's belief that his idea was feasible was based on the performance of carrier-based aircraft in the 1941 spring fleet maneuvers and the success of the British naval air raid on Taranto.(5)

It was only natural that the staff studies for the Schlieffen Plan might have been slightly biased in its favor. In Operation Hawaii, Genda's study on the possible routes was deliberately designed to favor the northern routes and is a prime example of the operational (goal-oriented) nature of military planning. The emphasis is not on a systematic search for the best objective and the best way to achieve it. Instead, it is on the support of a pre-conceived idea and then on the development of a means of carrying it out.

The history of the evolution of the Schlieffen Plan indicates that Schlieffen wanted to make Germany's war plans more offensive from the beginning but that it was not until the annual exercises of 1904 that he actually began to test out the idea of using an envelopment against France. The common element throughout the development of the Pearl Harbor was the idea of a carrier-based attack.

Once the basic idea was grasped, there was no attempt to seek for an alternative. The principle actor in each plan argued strongly for his idea. Yamamoto threatened to

resign; Schlieffen neglected to warn his civilian superiors properly about the great risks involved in his plan. The members of the respective staffs improved on the concept where possible and warned their superiors of the potential dangers that they were aware of. When staff officers made crucial suggestions, such as Genda's recommendation that the drydocks and the oil tanks be bombed in the second attack, flag, or higher-ranking, officers such as Nagumo tended to ignore their ideas or to reject them outright. Since all of Pearl Harbor's oil had to be shipped in, the destruction of its fuel supplies would have rendered it virtually useless until the oil tanks were rebuilt and refilled. The destruction of the drydocks would have made it only marginally useful as an operational base.

At times, the flag officers lost sight of the strategic objective and replaced it with the plan's operational concept. We see Schlieffen pushing for an offensive, without reducing the risk of failure, for the sake of mounting an offensive. On the other hand we have Nagumo forgoing a second attack in order to preserve his carriers without seriously considering whether he had truly fulfilled his operational objectives.

In both cases the operational objective became more important than the strategic objective. Schlieffen refused to give up the idea of attacking France; Nagumo thought it was enough to sink or damage the battleships. Schlieffen realized that his plan was a great risk and could be stale-

mated, but he ignored his own warnings and the evidence of the war games, and, probably, of staff studies. Nagumo assumed that the risk of losing one or more carriers did not make it worthwhile to remain near Oahu to finish off Pearl Harbor. He thereby missed a golden opportunity to cripple the US Pacific Fleet.

Nagumo appears to have deceived his superiors and his staff about his true intentions by launching a second attack or otherwise following the plan in the war games. The German General Staff is accused of having rigged its war games to favor the Schlieffen Plan.

Finally we see that the German General Staff carefully tested each facet of the Schlieffen Plan. However, that testing was restricted to each piece. The plan as a whole was not tested. This, of course, meant that the dynamics of the plan were not examined. In direct contrast, the Japanese made sure to test the parts and the whole.

This suggests that several steps have to be taken to avoid the problems that Schlieffen/Moltke and Nagumo put themselves in. First, to prevent substituting the operational objectives for the strategic objective, the strategic objective should be clearly stated so that the operational commander can determine whether his operational objectives correspond it.(6) Also, he has to understand that failure to achieve the strategic objective means that the operation has failed, even if all the operational objectives are attained. For Schlieffen/Moltke this would have meant that the high risk of attacking the French should have led to

going back to a defensive strategy against France. For Nagumo and the Combined Fleet, the failure to execute a second attack specifically against the oil tanks and repair facilities at Pearl Harbor meant that although the one attack was a tactical success, the operation was a strategic failure.

The second point is that although the nature of military planning tends to prevent it from being truly systematic, military planners can make much better use of systematic planning tools than they have to date. Admittedly, war presents the planners with a multitude of uncertainties which he cannot always prepare for. However, tools like war gaming, if properly used, can help the planner to explore several of situations, to become more aware of unforeseen problems, and to develop solutions to these problems. War games and staff studies should have indicated to Schlieffen and Moltke that the Schlieffen Plan had a great deal of problems. If they had pursued the problems with an open mind they might have been able to go back to the elder Moltke's strategy satisfied that they had ended up with the best available solution. They might even have been able to adapt Moltke's defensive strategy to accommodate their offensive desires.

However, one must keep in mind that the capabilities of a war game are limited to those it was designed for. The questions which it is used to answer also set limits on war gaming. The effective use of war games in military planning

requires a good understanding of the strategic and operational objectives and the relationship between them. Also, all the operational elements of the plan - tactics, logistics, communications, control, intelligence, etc. - have to be explored and included in the war games. The testing, through war games, must determine whether the plan is capable of meeting the operational requirements.

Finally, military planners must remember that the results of war games do not necessarily prove or disprove anything. Both of the case studies show that war games are used for decision support, not for decision making. They merely reveal possibilities and the validity of the possibilities is heavily dependent on the assumptions made in the war games. In the end the military planner must rely on his own judgment and hope that he has done his best.

War Games and Military Planners: Conclusions

FOOTNOTES

1. p. 71, Sun Tzu, Chapter I, "Estimates", verse 28, The Art of War.
2. pp. 47-48, Gerhard Ritter, The Schlieffen Myth.
3. pp. 44-45, H. Stewart Hughes, Contemporary Europe: A History, Prentice-Hall, Englewood Cliffs, New Jersey: 1976.
4. p. 17, Nicholas Palmer, The Comprehensive Guide to Board Wargaming, McGraw-Hill Book Company, 1977.
5. For an account of the attack see p. 102, Richard Hough, Death of The Battleship: The Tragic Close of the Era of Sea Power, McFadden-Bartell, New York: 1963.

The planes used in the attack were Swordfishes, slow (maximum speed of 130 mph), unreliable, antiquated and short-ranged. The torpedo the Royal Navy used was inaccurate and unreliable. pp. 101-102, *ibid*.

6. See the discussion of the relation between objective and criteria - which are similar to strategic objective and operational objectives, respectively - in Wesley W. Posvar, Criterion Problems in Modern Strategy, C/64-11, Center for International Studies, Massachusetts Institute of Technology, Cambridge, Mass.: January 1964.

BIBLIOGRAPHY

- Ackoff, Russell L., The Art of Problem Solving, Accompanied by Ackoff's Fables, John Wiley & Sons, 1978.
- Agawa, Hiroyuki, The Reluctant Admiral, Yamamoto and the Imperial Navy, translated by John Bester, Kodansha International Ltd., 1979.
- Avedon, Elliott M. and Brian Sutton-Smith, Chapter 7, "Military Usages", The Study of Games, John Wiley & Sons, New York: 1971, pp. 271-277.
- Barton, Richard F., A Primer on Simulation and Gaming, Prentice-Hall, Englewood Cliffs, NJ: 1970.
- Beaufre, Andre', Strategy of Action, translated by R. H. Barry, Frederick A. Praeger, 1967.
- Best, John B., "Possible Difficulties in the Interpretation of Simulation Outcomes", Simulation & Games, vol. 9, no. 4, December 1978, pp. 445-460.
- Boorman, S., The Protracted Game: A Wei-Chi Interpretation of Maoist Revolutionary Strategy, Oxford University Press, New York: 1969.
- Brewer, Garry D., "Scientific Gaming: The Development and use of Free-Form Scenarios", Simulation & Games, vol. 9, no. 3, September 1978, pp. 309-338.
- Brewer, Garry D. and Martin Shubik, The War Game: A Critique of Military Problem Solving, Harvard University Press, Cambridge, Mass.: 1979.
- Brooks, Leon P. Jr., "The Impact of Technology on Fleet Structures," US Naval Institute Proceedings (USNIP), vol. 107, no. 2, February 1981.
- Buell, Thomas B., "The Education of a Warrior," USNIP, vol. 107, no.1, January 1981.
- Choucri, Nazli and Thomas W. Robinson (eds.), Forecasting in International Relations: Theory, Method, Problems, Prospects, W. H. Freeman and Co., San Francisco: 1978.
- Chi, Wu, Appendix I, "Art of War", in Sun Tzu, The Art of War.
- von Clausewitz, Karl, War, Politics and Peace: Selections from "On War" and "I Believe and Profess", translated and edited by Edward M. Collins, Henry Regnery Company, Chicago: 1962.
- Collins, John M., Grand Strategy: Principles and Practices,

Naval Institute Press, Annapolis, Maryland: 1973.

- The Editors of Consumer Guide with Jon Freeman, The Complete Book of Wargames, Simon and Schuster, New York: 1980.
- Cushen, W. Edward, The POLEX-DAIS Games: Game Analysis Techniques, C/66-7, Center for International Studies, Massachusetts Institute of Technology, Cambridge, Mass.: April 1966.
- de Leon, Peter, "The Analytic Requirements for Free-Form Gaming", Simulation & Games, vol. 12, no. 2, June 1981, pp. 201-231.
- Duke, Richard D., "A Paradigm For Game Design", Simulation & Games, vol 11, no. 3, September 1980, pp. 364-377.
- Dull, Paul S., A Battle History of the Imperial Japanese Navy (1941-1945), Naval Institute Press, Annapolis, Maryland: 1978.
- Dun, R. A., letter on 'The Education of a Warrior', in "Comment and Discussion," USNIP, vol. 107, no. 2, February 1981.
- Dupuy, T. N., Numbers, Predictions and War: Using History to Evaluate Combat Factors and Predict the Outcome of Battles, The Bobbs-Merrill Co., New York: 1979.
- Easterly, "Simulation Game Design - A Philosophic Dilemma", Simulation & Games, vol. 9, no. 1, March 1978, pp. 23-28.
- Eccles, Henry E., Military Concepts and Philosophy, Rutgers University, New Brunswick, New Jersey: 1965.
- Etheredge, Lloyd S., "Government Learning: An Overview" in Samuel Long (ed.), Handbook of Political Behavior, Plenum, New York: forthcoming.
- Evans, George W., II, Graham F. Wallace, and Georgia L. Sutherland, Simulation Using Digital Computers, Prentice-Hall, Englewood Cliffs, NJ: 1967.
- Fisher, Roger, "To Gain a Peace in the Nuclear Age", Technology Review, vol. 83, no. 5, April 1981, pp. 65-71.
- Fuchida, Mitsuo and Masatake Kuniya, Midway: The Battle That Doomed Japan. The Japanese Navy's Story, edited by Clarke K. Kawakami and Roger Pineau, Naval Institute Press, Annapolis, Maryland: 1955.
- Gilbert, Felix, "From Clausewitz to Delbruck and Hintze: Achievements and Failures of Military History", The Journal of Strategic Studies, vol. 3, no. 3, December

- Gohagen, John Kenneth, Quantitative Analysis for Public Policy, McGraw-Hill Book Company: 1980.
- Gooch, John, "Clio and Mars: The Use and Abuse of History", The Journal of Strategic Studies, vol. 3, no. 3, December 1980, pp. 21-36.
- Greenblat, Cathy S. and John H. Gagnon, "Further Explorations on the Multiple Reality Game", Simulation & Games, vol. 10, no. 1, March 1979, pp. 41-58.
- Griffin, Sidney F., The Crisis Game: Simulating International Conflict, Doubleday & Co., Garden City, NY: 1965.
- Griffith, Samuel B., Appendix II, "Sun Tzu's Influence on Japanese Military Thought", in Sun Tzu, The Art of War.
- Guetzkow, Harold, "Simulations in the Consolidation and Utilization of Knowledge about International Relations" in Harold Guetzkow, Philip Kotler, and Randall L. Schultz (eds.), Simulation in Social and Administrative Science, Prentice-Hall, Englewood cliffs, NJ: 1972. Originally appeared in Dean G. Pruitt and Richard C. Snyder (eds.), Theory and Research on the Causes of War, Prentice-Hall, Englewood Cliffs, NJ: 1969.
- Guetzkow, Harold, "Some Correspondences Between Simulations and 'Realities' in International Relations" in Guetzkow, Kotler and Schultz (eds.), Simulations in Social and Administrative Science. Originally appeared in Morton Kaplan (ed.), New Approaches to International Relations, St. Martin's Press, New York: 1968.
- Gush, George with Andrew Finch, A Guide To Wargaming, Hippocrene Books, New York: 1980.
- Handel, Michael I., "Perception, Deception and Surprise: The Case of the Yom Kippur War", Jerusalem Papers on Peace Problems Paper No. 19, The Hebrew University of Jerusalem, The Leonard Davis Institute for International Relations, Jerusalem: 1976.
- Hartley, David A., George N. Ritchie, and E. Anne Fitzsimons, "The Design of Large-Scale Training Games", Simulation & Games, vol. 12, no. 2, June 1981, pp. 141-152.
- Hausrath, Alfred H., Venture Simulation in War, Business, and Politics, McGraw-Hill Book Co., 1971.
- Heiss, Klaus-Peter, Game Theory and Human Conflicts, Research Memorandum No. 80, Econometrics Research Program, Princeton University: March 1966.

- Helmer-Hirschberg, Olaf, Multipurpose Planning Games, Working Paper WP-17, Institute for the Future, Menlo Park, Calif.: December 1971.
- Holding, Dennis H., "The Holding of Chess Positions", Simulation & Games, vol. 10, no. 2, June 1979, pp. 207-221.
- Hough, Richard, Death of the Battleship: The Tragic Close of the Era of Sea Power, McFadden-Bartell, New York: 1965.
- Jacobsen, H. A., and J. Rohwer, Decisive Battles of World War II: The German View, translated by Edward Fitzgerald, G. P. Putnam's Sons, New York: 1965.
- Koreisha, Sergio and Robert Stobaugh, "Modeling: Selective Attention Institutionalized," Technology Review, vol. 83, no. 4, February-March 1981.
- Lederman, Linda Costigan and Brent D. Ruben, "Construct Validity in Instruction Communication Simulations", Simulation and Games, vol. 9, no. 3, September 1978, pp. 259-274.
- Liddell-Hart, E. H., Strategy: the Indirect Approach, Faber and Faber Limited, London: 1967.
- Lundstrom, John B., The First Pacific Campaign: Pacific Fleet Strategy, December 1941-June 1942, Naval Institute Press, Annapolis, Maryland: 1978.
- von Manteuffel, Hasso, "The Battle of the Ardennes 1944-5", in Jacobsen and Rohwer, Decisive Battles of World War II: The German View, translated by Edward Fitzgerald, G. P. Putnam's Sons, New York: 1965, pp. 391-418.
- McElwee, William, The Art of War: Waterloo to Mons, Indiana University Press, Bloomington: 1974.
- Montgomery, Bernard L., A History of Warfare, The World Publishing Company, Cleveland: 1968.
- Nicholson, Michael, "Games and Simulation", The Journal of Strategic Studies, vol. 3, no. 3, December 1980, pp. 72-90.
- Palmer, Nicholas, The Comprehensive Guide to Board Wargaming, McGraw-Hill Book Co., 1977.
- Pasteris, Arthur, "Book Review of Wargame Design: The History, Production, and Use of Conflict Simulation Games by Staff of Strategy and Tactics: The Magazine of Conflict Simulation," Simulation & Games, vol. 9, no. 2, June 1978, pp. 235-244.

- Paxson, E. W., "War Gaming", in Elliott M. Avedon and Brian Sutton-Smith, The Study of Games, John Wiley & Sons, New York: 1971. Originally appeared as War Gaming, Memorandum RM-3489-PR, RAND, Santa Barbara, Calif.: February 1963.
- Pelz, Stephen E., Race to Pearl Harbor: The Failure of the Second London Naval Conference and the Onset of World War II, Harvard University Press, Cambridge, Mass.: 1974.
- Posvar, Wesley W., Criterion Problems in Modern Strategy, C/64-11, Center for International Studies, Massachusetts Institute of Technology, Cambridge, Mass.: January 1964.
- Prange, Gordon W., At Dawn We Slept: The Untold Story of Pearl Harbor, McGraw-Hill Book Company: 1981.
- Ritter, Gerhard, The Schlieffen Plan: The Critique Of a Myth, translation by Andrew and Eva Wilson, Oscaar Wolff Ltd., London: 1956.
- Schlieffen, Graf von, "War Against France", final draft (January 1906) and excerpts or fragments from preceding nine drafts. English translation of final draft, et. al., in Ritter, The Schlieffen Plan, Oscaar Wolff Ltd., London: 1956.
- Singleton, Robert R., and William F. Tyndall, Games and Programs: Mathematics for Modeling, W. H. Freeman and Co., San Francisco: 1974.
- Smith, L. Dale, "Degrees of Naval Warfare", USNIP, vol. 106, no. 12, December 1980.
- Steinbrunner, John D., Report on an Experimental Configuration of the PME: An Approach to the Problem of Validity, paper prepared for the Joint Meeting of the Operations Research Society and the American Astronautical Society, June 1969.
- Stewart, W. A., Lanrezac, Joffre, and Plan XVII, P-3637, RAND Corporation, Santa Barbara, Calif.: July 1967.
- Stockfisch, J. A., Models, Data, and War: A Critique of the Study of Conventional Forces, R-1526-PR, RAND Corporation, Santa Barbara, Calif.: March 1975.
- Stokey, Edith and Richard Zeckhauser, A Primer For Policy Analysis, W. W. Norton & Company, New York: 1978.
- Tashjean, John E., "Review of Werner Hahlweg (ed.), Carl von Clausewitz: Vom Kriege, Neuzehte Auflage, Duemmler,

- Bonn: 1980", The Journal of Strategic Studies, vol. 4, no. 2, June 1981, pp. 209-211.
- Toland, John, The Rising Sun: The Decline and Fall of the Japanese Empire, 1936-1945, Random House, New York: 1970.
- Toyama, Saburo, "Lessons From the Past", USNIP, vol. 108/9/955, September 1982.
- Tzu, Sun, The Art of War, translated by Samuel B. Griffith, Oxford University Press, London: 1963.
- U.S. Department of the Army, the Office of the Chief of Military History (Kent Roberts Greenfield, general editor), Command Decision, Harcourt, Brace and Co., New York: 1959.
- Van Crevald, Martin, Supplying War: Logistics From Wallenstein to Patton, Cambridge University Press, 1977.
- Wells, Linton, II, "Maneuver in Naval Warfare," USNIP, vol. 106, no. 12, December 1980.
- Wilson, Andrew, The Bomb and the Computer: Wargaming From Ancient Chinese Mapboard to Atomic Computer, Delacorte Press, New York: 1968.
- Wilt, Alan F., "The Summer of 1944: A Comparison of Overlord and Anvil/Dragoon", The Journal of Strategic Studies, vol. 4, no. 2, June 1981, pp. 187-195.
- Woodward, J. F., "Strategy by Matrix", The Journal of Strategic Studies, vol. 4, no. 2, June 1981, pp. 196-208.
- Wylie, J. C., Military Strategy: A General Theory of Power Control, Rutgers University Press, New Brunswick, NJ: 1967.
- Zook, David H., Jr and Robin Higham, A Short History of Warfare, Twayne Publishers, Inc., New York: 1966.