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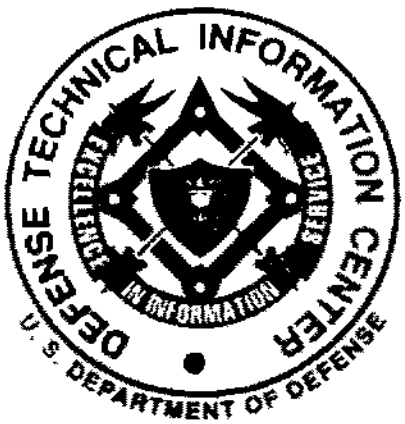

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UNINTENDED CONSEQUENCES OF STRATEGIC GAMING

By

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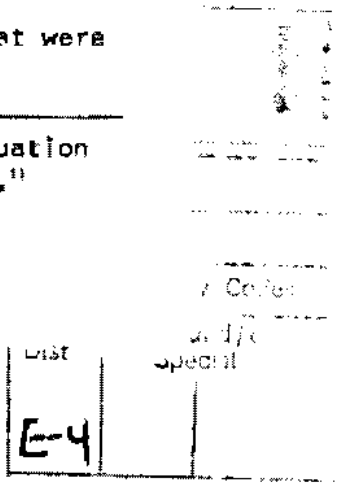
UNINTENDED CONSEQUENCES OF STRATEGIC GAMING

Strategic planning is an essential element of modern defense. It synthesizes the doctrine, politics, weapons and occasionally even the philosophy of the nation state. Because a country embodies its program for continued existence and the destruction of its opposition in it, strategic planning can directly affect many hundreds of millions of people.

While difficult to either define or evaluate before implementation, superior strategic planning can be recognized. A subjectivist would argue that because its value is impossible to compute in an academic fashion, ex-post facto success is the only true measure of strategic planning. But this argument fails to consider the historical cases where strategic planning was clearly a decisive contribution to success.

Examples of such decisive contributions are particularly apparent where "quick wins" occur. The quick win in modern war (see Figure 1) would seem by its very nature to require superior strategic planning.[1] The scheduled coordination of modern forces in several dimensions is a task that at first appears impossibly complex. Yet on some occasions this orchestration was so successful that the adversary was able to offer only quite limited opposition for a brief period of time. Many important issues are raised by such observations. Were there common factors involved in the quick wins? What methodologies were employed? What were

[1] An examination of quick wins may be found in Historical Evaluation and Research Organization, "A Survey of 'Quick Wins' in Modern War," Dunn Loring, Virginia, 1975.



the important bureaucratic relationships present during the planning process? Are there lessons relevant to quick wins in thermonuclear war?

Figure 1

PLANNING QUICK WINS IN MODERN WAR

Megiddo	1918
Flanders	1940
Malaya	1941
Manchuria	1945
Israel	1967

In each quick win cited the superior manipulation of a complex of factors, ranging from psychological shock to strategic surprise, enabled one side to score a decisive win against its adversary. But consideration only of quick wins would provide a very incomplete picture of strategic planning. A number of historical examples could be categorized as almost quick wins. The existence of almost quick wins, such as the Marne in 1914, and the Invasion of the Soviet Union in 1941, may contain lessons of their own. Quick collapses, of which the most notorious example is France in 1940, are also important. There are also instances wherein the absence of a strategic plan was more characteristic than its presence. Each of these categories could easily be the subject of a detailed study.

A related development also deserving attention is the systematic analysis of strategic planning. The increasing employment of operations research, mathematical modeling and programming, systems analysis, and computer simulation has had a generally unrecognized impact. Perhaps this omission follows from the attention attracted to great generals and statesmen. Historians naturally continue to do what they have traditionally

done--analyze the prominent men involved in a crisis. Yet another reason for the lack of attention to the study of systematic military planning is the low visibility of most practitioners of this art. In part this is because of the tendency for the planner's story to be lost in the shadow of the more famous leaders whom he serves. The small statistical section attached to the British Admiralty during the First World War may at first appear to merit only historical note with respect to the birth of operational research. But the fact that this group was relied upon by Prime Minister Lloyd George for estimates and information concerning shipping losses caused by the German U-Boats could make a study of their influence on strategic decision-making very worthwhile. There has been a rather limited amount of scholarly research into the organizational, bureaucratic, and social dynamic problems of strategic planning. But almost no attention has been given to the consequences of using the various planning methodologies themselves. Naturally, such effects must be considered in an organizational and social context. The increasing sophistication[1] and widespread use of certain methods suggests that greater attention could be fruitfully given to their contextual importance.

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[1]A good contemporary example of the increased sophistication in the methods used in strategic analysis is the targeting problem. The strategic bombing plans of the Royal Air Force in World War II were quite simple, giving little attention to optimization, collateral damage constraint sensitivities, intertemporal phasing, etc. Targeting of strategic forces today involves the methods of nonlinear programming and game theory, along with the notions of dual variables and generalized Lagrange multipliers. After fairly brief study any strategist or political scientist of the 1940s or early 1950s could achieve a good intuitive grasp of what a strategic campaign might look like. Today, however, probably not more than a tiny fraction of those scholars studying strategy and arms control have the faintest awareness of the subtleties and sensitive assumptions of nuclear force targeting. Recognizing this potentially dangerous

Preliminary indications concerning the relationships between planning experts with their methodologies and decision-makers suggest several fundamental questions. These include the role of advocacy versus scientific analysis, the use of "black boxes" by decision-makers, and the analysis of unintended consequences arising from the planning process. The general subject of the role of the expert advisor in strategic planning is one that is dangerously neglected. Even the few cases of unintended consequences of strategic gaming contained in this paper suggest that the subject can be avoided only at great peril. In the nuclear age, this is not merely to the nation concerned, but to the many states that could potentially be drawn into alliance or adversary relations. For there is an interlocking character to strategic plans. Through the mechanisms of either extended deterrence or assured retaliation, many parties could be drawn into war whether they deem it desirable or not. The unintended consequences of strategic gaming could be enormous.

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gap one commentator writing on the subject of superpower confrontation and limited nuclear options states:

> "Assuming that a crisis develops to the point where it is decided to use nuclear weapons, at what juncture will the experts on nuclear options be brought into the deliberations--from the outset of the crisis, or only at the nuclear stage? (The later their appearance, the more difficult it will be for them to offer useful recommendations.) Secondly, cabinet level officials tend to rely on a small number of close advisers in a crisis. Would nuclear planning specialists be included in the circle of confidants as the crisis unfolded? If they are not (as seems likely), how reasoned and responsible would the decisions be on whether and how to use nuclear weapons?"

See Lynn Etheridge Davis Limited Nuclear Options, Deterrence and the New American Doctrine, Adelphi Papers, Number One Hundred and Twenty-one (London: The International Institute for Strategic Studies, 1976), p. 18.

Strategic Gaming

The term 'gaming' is here used in its broadest sense to include the many sided analysis of a conflict relationship. Incorporated in this are the quantitative models and simulations undertaken to achieve particular objectives, even if opponents are imputed rigid reactive or operational characters. The informal verbal gaming which is often among the more important varieties of war gaming is specifically included. Although this might be considered an overly broad extension of the war gaming notion, experience shows that such free form verbal gaming does not occur in a vacuum. They are greatly influenced by the more quantitative games which serve as a context, stage, or standard for them. The distinction between informal verbal gaming and the more formal officially run games certainly exists. But defining the precise nature of the distinction may be exceedingly difficult. It is the non-independent relationship between the two gaming methods that is of interest. Frequently the informal verbal games played by decision-makers provide the real insight into the bureaucratic dynamics and true strategies of the more official game.

A further delimitation of the subject derives from the restriction to the consideration of actual strategic[1] games which have occurred in this century and which are in some sense important. The latter requirement is purely subjective. It includes games that have affected the

[1] A 'strategic' game involves gaming that deals with an enemy at the sources of his military, economic, or political power. This compares with tactical gaming which possesses a more limited intention, especially with regard to immediate objective. Furthermore, strategic gaming may emphasize planning, implementation, testing or other aspects of strategic operations.

existence of states or that have resulted in the threat to a large number of people. However, this essay is not intended as a history of strategic war games. All of the modern quick wins cited were associated with strategic war gaming but none are discussed in the present essay. A systematic history of strategic war gaming with analysis of the bureaucratic, operational, and political contexts in which they occurred is an important study that has yet to be undertaken.

The purpose of this essay is to illuminate some of the forms of the unintended effects of contemporary strategic gaming. Because so little has been openly written on this subject it is necessary to invoke historical material. Historical cases wherein unintended consequences occurred will demonstrate the existence of this phenomenon and give some indication of its character. Given this, it should not be surprising that similar events could occur today. The scheme for analysis is divided into the three classes of unintended diversion, suppression, and learning. Broadly speaking, these classes include most of the important phenomena of concern. However, they are not mutually exclusive. Strategic gaming almost invariably has more than one intention because more than one individual participates or contributes to the game design. So too can there be a multiplicity of unintended consequences that involve a mix of diverting, suppressing, or learning. The unintended consequences of dominant importance have been selected for analysis.

I. UNINTENDED DIVERSION

A. Maginot Line, 1919-1940

Although French strategists between the wars seldom resorted to free-form gaming, plans for the Maginot Line entailed the modeling of German

attack. These were much like the many closed, seminar map games played by contemporary military planners. Here, a single team executes the moves of the two opponents.

Two alternative German scenarios were analyzed. Attacks through northeastern France and Belgium were considered in map exercises and led to the notion that a large fortified zone should block the enemy. This engineering solution eventually turned into a strategy that possessed an engineering simplicity. Its sheer size and cost alone forced all other strategies out of consideration. Diverting attention as it did from a host of important issues, the Maginot Line itself ironically performed exactly as originally envisioned. But by the time this occurred, the cumulative omissions and diversions were too great to be overcome.

The original concept of the Maginot Line developed from a series of studies undertaken in the 1920s (see Figure 2). Appalling losses experienced during the 1914-1918 war caused planners to devise strategies which would be less attrition intensive. A future war must not be fought with French manhood but was instead to rely on the economic strangulation of Germany. This would require that no French soil fall to the enemy for only costly offensives could win it back. By rapidly mobilizing her army, France would be able to meet an advancing German Army in Belgium, before any of France herself had been occupied.[1] However, the northeastern sections of France, from the Swiss border to Luxembourg, would provide an enemy with the geographic avenues in which to launch a surprise attack

[1]See Vivian Rowe, The Great Wall of France (New York: G.P. Putnams, 1959).

Figure 2

MAGINOT LINE CHRONOLOGY

1919	Preliminary studies by the General Staff	EXPLORATORY STUDIES
1920	Higher War Council studies the problem	
May 22, 1922	Commission for the Study of Fortified Areas formed	STRATEGIC MODELS OF GERMAN ATTACK
1925	Commission issues final report	
December 5, 1925	Higher War Council adopts recommendations and creates a Frontier Defense Commission	
December 6, 1926	Frontier Defense Commission issues final report	
September 30, 1927	Organizing Commission for Fortified Regions created	ENGINEERING DEVELOPMENT AND CONSTRUCTION
December 29, 1927	Siting and basic design work begun on Line	
February 17, 1928	Prototype construction authorized	
December 28, 1929	Full scale construction begun	
1933	Intentional leaks to press for deterrent purposes begun	
1934	Political discussion of fortifying the northern frontier	MYTH OF INVINCIBILITY
1935	First section of Line completed (Haguenau Fortified Sector)	
October, 1936	Belgium proclaims neutrality	
1938	Film of Line released	
November, 1938	All forts completed	
August, 1939	Forward zone population evacuated	
June, 1940	Battle of France	

directly into the French heartland, as had occurred in the Franco-Prussian War.

The construction of fortified regions promised to solve the problem of the vulnerability of northeastern France while providing precious mobilization time for the Army. A German sweep through Belgium would require much greater execution time than would a direct assault through the northeast, thus giving France ample time in which to mobilize. Moreover, this increased mobilization time would be used to deploy the French Army into Belgium.

The protection of northeastern France, the Alsace and Lorraine region, while the Army deployed to Belgium, was the intention of every plan from 1919 to 1936. Never was there any intention of fighting an entirely defensive war from fortified lines. Every plan was quite clear about the need to dispatch the Army to Belgium in time of war as in the map games of the early 1920s. The Maginot Line was to be a shield designed to protect northeastern France from invasion, granting the needed mobilization and deployment time. Should the Germans actually attack the Line, then so much the better. For, in this situation, the German Armies would be wasted in the assault of fortified trenches, exactly in the same manner as had French Armies in 1914-1918. And, while this senseless battering was taking place, the bulk of French forces, complete with tanks, would be in Belgium, able to threaten the German right flank. Moreover, a side effect of such a Line would be the likely channeling of the German threat into an area which had the strongest sensitivities to Great Britain. A German advance into the Low Countries would almost certainly involve Britain in the war as a French ally. When plans for the Line were being drawn up, in

the mid-1920s, Anglo-French relations were strained. Indeed, Britain was considering France a hypothetical military opponent. Given this state of relations, France was far from certain that her island neighbor would intervene in a future Franco-German conflict. Constructing a fortified zone in her northeastern provinces would manipulate a German attack to violate Belgian neutrality, thus insuring the active participation of a nation whose naval forces would be essential for the economic strangulation of Germany. Naturally, this sensitive part of the plan was never openly discussed.

As the chronology demonstrates, the Line was planned and essentially fixed in terms of a 1920s strategic model. Into the early 1930s these continued with only one addition. The idea of a strategic deterrent came into being. Although this deterrent was always present, it was never included outright in the strategic aims formulated in the mid-1920s. But a subtle change of emphasis occurred when this was introduced. Only the Line was presented as a deterrent. There was no mention of the French Army's deterrent value, either in threatening a counterattack or even in moving into Belgium. Such a change was reflective of how the French themselves viewed their position. Increasingly, the focus of the Army was changing from an offensive force for deployment into Belgium, into a defensive cadre whose purpose was to man the Line. Detailed forecasts concerning mobilization schedules were generated along with scheduling plans for moving various units and supplies into the fortified zone. Paper plans for the Belgian deployment continued to exist, but these were increasingly ignored for the logistic, mobilization and deployment schedules demanded by the Maginot Line.

The enormous attention given to France's most visible strategic system was to induce a subtle change in the character of the defense. The care and feeding of the Line gradually became an end in itself, and this trend was only too compatible with the peculiar French tendency to emphasize tactics and logic over strategy and adaptability:

> The wars of 1914-1918 as codified...had reduced everything to a mathematical sum worked out with a ready reckoning of troops, ammunition, stores, casualties and time equated with the number of kilometres involved. This convenient technique seemed reassuring but was functionally unsound--as one was to see in 1940--because it left out the human element.[1]

The strategy of France became increasingly diverted from that of the 1920s model, upon which the physical construction of the Line was based, to one of inspired leaks and diplomatic maneuvering. Unfortunately, this political posturing was not based on any military capability. Nonetheless, the government behaved as though it were engaged in the construction, or had already constructed, an extended Line. The rationale behind this behavior was explained by Minister of National Defense, M. Daladier:

> We came to the conclusion that for reasons perhaps more psychological than military and for weighty international considerations, it was essential to vote the credits for fortifying the northern area...[2]

These statements jolted Belgium, which had depended upon the French Army for protection. The political switch to a frontier wall, as unreal as it was, immediately decoupled the Franco-Belgian alliance. The extended deterrence of the French Army over Belgium vanished and ~~The Hague~~ Brussels

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[1]General Andre Beaufre, 1940 The Fall of France (New York: Knopf, 1968), p. 38.

[2]As quoted in Rowe, p. 86.

was forced to search for alternatives to her security problem. In 1936, she declared neutrality.[1] From this point onward French actions were hampered by the inability to coordinate defense plans with Belgium. Consultations on war time deployments into Belgium, establishment of fortifications along the Albert Canal, and coordination of mobilization schedules all came to an abrupt halt after 1936. Still, the political guidance given to the French Army remained unchanged even though a fundamental break with earlier strategic planning had occurred. Moreover, the political campaign to make France the policeman of Eastern Europe continued unabated even though her Army was developing into a static defensive cadre. By 1939, the divergence between political and military strategy had become enormous. Neither the Army nor the French government engaged in any systematic analysis of grand strategy after the formative years in the 1920s.

The recommendation to construct gigantic fortified zones in the northeast should have hedged against the notorious instability of political relationships. Moreover, the models of the 1920s recommended an incredibly rigid war plan, literally being based upon a concrete network that required even more rigid mobilization, logistic and maintenance support in order for it to be implemented. The planners were, in effect, locking France into a single course of action for the next fifty years. Military solutions which constrain the civilian arm of government in serious and rigid ways should be looked upon only as desparate expedients. Models and other analyses that fail to consider strategic and political

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[1] Brian Bond, France and Belgium, 1939-1940 (London: Davis-Poynter, 1975, p. 43.

changes, such as the French example, do so at the risk of national security.[1]

Military operations began in September 1939 with the German invasion of Poland. France, politically pledged to come to Polish assistance, effectively did nothing:

> Our great Army had been mobilized and concentrated on the frontier along the Maginot Line. Now we could see the extraordinary influence of these fortifications: if we advanced, we lost the benefit of their protection; and to attack one must advance.[2]

The care and feeding of this system dictated in models nearly twenty years old, had diverted attention from exactly this type of problem. Additionally, the movement into Belgium in May 1940 turned out to be slow and cumbersome as it too had received scant attention over the years. The German Panzer breakthrough near Sedan was only the immediate cause of French defeat. Nearly all military attention had been given to the Line with the consequent neglect of adaptability in other fields.

It is ironic that the Maginot Line itself never determined in an important way the outcome of the Battle of France. While a few sections were captured by the Germans, this occurred after the fall of Paris. The Germans defeated the French by simply making an end-run around the Line.

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[1]Given the widespread neglect of this in contemporary strategic modeling and gaming activities, this may appear to be an impossibly tall order. However, if the subject matter really is strategic and is intended for operational planning purposes, the requirement for a sensitivity analysis around various political and strategic assumptions is just too important to be neglected. For a discussion of the inclusion of political assumptions into a systems analysis study see Systems Analysis Versus Systems Design, A.J. Wholstetter, P-1530 (RAND Corporation, October 1958).

[2]General Beaufre, op. cit., p. 146.

By the time the Line actually capitulated all of northern France had already been occupied.

A belief in the Line's invulnerability diverted French attention away from other problems. Invulnerable systems often have this disturbing feature of being studied only in terms of direct attacks on them. End-run attacks are frequently ignored by the human tendency to look at the strengths of the system rather than its gaps. When a rigid war plan is needed for such systems, the situation can become worse, serving to direct even more attention to its implementation instead of trying to poke holes in the defense.

The current methodological trend toward all-computer models at the expense of free-form gaming could accentuate some of these tendencies. Closed form computer simulations are generally quite bad at spotting end-run attacks on major systems. French planning was obsessed with the detailed calculation of ranges, concrete thicknesses, maximization of dead fire zones, cross-fire angles, etc. But these simply diverted attention away from the real problem. Unmistakable parallels exist between this pattern and the contemporary study of major U.S. strategic systems. One can only hope that the parallels are purely coincidental.

II. UNINTENDED SUPPRESSION

There is a well-known tendency for individuals to suppress both unpleasant memories and future possibilities. This phenomenon may also arise in strategic gaming. The extension from individual suppression to group and, in some instances, even organizational suppression is a surprisingly easy step.

It is convenient to consider two forms of suppression in the present context. Gaming outcomes that for some reason are undesirable may be suppressed and this can be termed suppression by commission. Alternatively, suppression may occur by omission. The omission of problems, scenarios or strategies from gaming can be a convenient method for avoiding unpleasant eventualities.

An unintended consequence which may arise from suppression in strategic gaming is the phenomenon of shadow gaming. Such games are extracurricular, unofficial games, generally informal, that attempt to study problems in their unsuppressed form. Although suppression of particular issues may receive group agreement, this shared norm may not convince all of the individuals who may believe it their duty to study the full problem. The Russian strategic gaming of a German invasion prior to the Second World War is a case that contains these features.

A. Invasion of the Soviet Union, 1941

In late 1935, Marshal M. N. Tukhacheveskii developed certain troubling ideas concerning the size and operational characteristics of a German attack on the Soviet Union. Organized into a pre-game proposal, these were presented that year to the Soviet General Staff.[1] He estimated that Germany could produce some 200 divisions in total, of which 80 divisions would be concentrated against White Russia, the region north of the Pripet

[1]John Erickson, The Road to Stalingrad (London: Weidenfeld and Niedson, 1975). See especially Chapter 1, "On War Games Soviet and German."

Figure 3

STRATEGIC GAMING OF THE INVASION OF THE SOVIET UNION, 1941

	SOVIET WAR GAMES		GERMAN WAR GAMES
Winter, 1935	General Tukhachevskii delivers pre-game plans to General Staff		
1936	Official war games of the German invasion played by General Staff		
Winter, 1937	Shadow gaming of the German invasion at General Staff Academy		
		July 21, 1940	Hitler orders study of an invasion of the Soviet Union
		August 1, 1940	Army Staff delivers pre-game Operation East study
		September, 1940	General Paulus commences gaming project
		November 23, 1940	KRIEGSSPIEL O QU I-ROTE PARTE: Full game play begins
December, 1940	Pre-gaming conference held in Moscow (Zhukov, Romanenko, etc.)	December 5, 1940	Halder briefs Hitler on war game results
		December 17, 1940	Written formal war game conclusions given to Hitler
		December 18, 1940	Hitler issues Directive No. 21, Case Barbarossa
January, 1941	East-West war game played, Stalin intervenes		
		February 15, 1941	Hitler issues directive on strategic deception to accompany Case Barbarossa attack on Soviet Union
		June 22, 1941	Germany attacks the Soviet Union

Marshes.[1] Such a deployment would have endangered the General Staff's current deployment of Russian forces. Further, Tukhachevskii's war game proposal for the German invader called for a surprise attack on unmobilized Russian defenders. The Chief of the General Staff contraverted this scenario, instead proposing a symmetric correlation of forces with operations commencing only after the Russians had fully mobilized for defense. It was this scenario that was approved and implemented in the 1936 war game.

Marshal Tukhachevskii continued his criticism of Red Army deployments for their reliance upon a linear defense close to the Polish border. Stalin had consistently fostered the strategy that in a future war the fighting would take place on enemy territory. Whether designed to develop an offensive spirit or to raise morale among the populace, any discussion of a protracted campaign on Soviet territory was suppressed. Forces were deployed close to the frontier where they were intended to catch an attacker in order that Soviet forces could quickly go over to the offensive, carrying the war onto enemy soil. This strategic idea dominated virtually all Soviet planning, at least all official planning.

In 1936, the General Staff Academy was formed in Moscow to educate officers in higher formation tactics. Its leaders requested Tukhachevskii to provide his opinions on the character of a future war. He responded in

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[1] It is pertinent to note that in the actual German planning for the Soviet invasion, five years later, War Game Barbarossa, a total of 210 divisions were available, of which 61 divisions were concentrated against White Russia. See "Barbarossa: The Strategic War Game and the Concentration of Forces in the East" by Field Marshal Paulus, contained in Appendix 2, pp. 97-120, Walter Goerlitz, Paulus and Stalingrad (London: Methuen, 1963).

detail and for nearly a year his informal verbal gaming of the official General Staff games was a major influence on the school. While the official war games called for offensive attacks designed to carry the war into enemy territory, Tukhachevskii's shadow games with the General Staff Academy were based upon a defense in depth. In the shadow game strategic reserve forces were to launch counterattacks aimed at pinching off the flanks of the German armored spearheads, separating them from infantry support. In June 1937, Tukhachevskii was executed on Stalin's orders. The virtual elimination of the Red Army high command by Stalin was an incredible act whose full price was only realized in the early days of the war. Although improvements in operational performance and weapons employment were undertaken after the calamitous Russo-Finnish War, a rigidity and lack of innovation continued to haunt the General Staff.

As the final moves of War Game Barbarossa were played at German Army Headquarters at Zossen in December 1940, Generals Zhukov and Romanenko were beginning a strategic invasion game in Moscow. The Soviet strategy still clung to the linear defense of the border, although this had now moved several hundred kilometers west because of the Polish partition of 1939. It would prove even more obsolete than Tukhachevskii had believed in the 1936 war game. For in 1940, the fortified districts of White Russia lay to the east of the Red Army which was now deployed in an open, narrow belt of territory between the German Army and their own defensive line--the Stalin Line. While Romanenko and Zhukov debated appropriate armored formation tactics at the December conference in Moscow, no discussion of strategic withdrawal (a la 1812 and 1915) or even defense in depth

was permitted. Such discussions would have contravened Stalin's forward defense scenario. The price for this suppression was to be quite high.

The Moscow conference was followed by the major East-West game played in January 1941. With Zhukov playing the Western invader and General D.G. Pavlov playing his actual role as Red Army Commander, the forward defense scenario was implemented. Hitler could hardly have done a better job of designing the Soviet defense to play into German hands. In his Directive No. 21 of December 18, 1940, "Case Barbarossa," he included as a key strategic element the engagement of the Red Army in the forward area:

> The bulk of the Russian Army stationed in Western Russia will be destroyed by daring operations led by deeply penetrating armored spearheads. Russian forces still capable of giving battle will be prevented from withdrawing into the depths of Russia.[1]

All of Tukhachevskii's main concerns in 1936 about the sizing of the German forces, the probability of surprise attack, and the vulnerability of a far forward Soviet deployment, turned out to be elements of Case Barbarossa. Yet the Soviet political and General Staff guidance of 1936 continued into 1941, even after repeated warnings to Stalin about a German surprise attack and after the experience of Poland and France against Panzer forces.[2] Stalin's suppression of all but his own scenario had even precluded the study of "what if" contingency plans.

The East-West game of early 1941 unexpectedly produced a final warning indicative of the danger inherent in existing Red Army deployment.

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[1]This directive is reprinted in H.R. Trevor-Roper, ed., Blitzkrieg to Defeat, Hitler's War Directives 1939-1945 (Holt, Rinehart and Winston, 1964), p. 49.

[2]See F.W. Winterbotham, The Ultra-Secret (Dell, 1974), p. 107. Also Barton Whaley, Codeword Barbarossa (MIT Press, 1973).

Under instructions from the war game director, Marshal Meretskov, the Russian East player, General Pavlov, put up a strong resistance to a German West attack (played by Zhukov) in the fortified regions north of the Pripet Marshes. This was the necessary first stage of the Stalin scenario. However, the West player (Zhukov) launched three converging attacks, all on the Soviet concentrations at Grodno and Bialystok, destroying these forces. The attack continued through to the town of Lida.[1] Stalin found these gaming results totally unacceptable. The game director, Meretskov, was summarily dismissed as Chief of the Soviet General Staff, being replaced by Zhukov, the successful Western invader.[2] Stalin's intervention demonstrates one danger in having senior officials participate in strategic games. His authority could not be opposed and it forced the suppression of issues he was not competent to judge. The sacking of Meretskov on grounds of incompetence preserved belief in the Stalin forward defense concept, at least for the time being. Thus were top Soviet generals educated about the coming war.

A check of War Game Barbarossa reinforces the belief that Pavlov's collapse in the Soviet war game was probably not attributable to poor game direction by Meretskov or even to inferior tactics employed by Pavlov

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[1]John Erickson, op. cit., p. 9.

[2]As for General Pavlov, the East player, during the real battle in June, he was to be in the identical position to that occurring in the January war game:

> The Commander of the Western front, General Pavlov, whose lines had resisted so briefly the onset of Army Group Centre was shot [on Stalin's orders] early in July together with his Chief of Staff and Chief Signals Officer.

John Keegan, Barbarossa, Invasion of Russia 1941 (Ballantine, 1970), p. 65.

himself. The German game director Paulus only one month before the Soviet game, described his play of Army Group Centre:

> The forward elements of Second Panzer Army were in action in front of Baranovichi with newly arrived enemy forces. Its rear elements were engaging enemy withdrawing eastwards from the Bialystok area in a battle in which the main body of the Army, wheeling north, would soon be called upon to intervene. The forward elements of Third Panzer Army had reached the area to the east of Lida...[1]

The events in the German and Soviet games were incredibly similar. The main difference consisted in the German assumption that the Red defender would attempt an eastern retreat to avoid encirclement by the Second and Third Panzer Armies. Of course, this latter eventuality did not arise because Russian plans did not permit eastward retreat, relying instead on Stalin's forward defense scenario. The Russians played into German hands with this strategy with the result that even the Nazis were amazed at the number of prisoners captured in the encirclements during the early days of the actual war. In the first seventeen days alone, Russia had 89 divisions destroyed, 300,000 prisoners taken and lost 2,500 tanks.[2] This was the geographic area whose loss back in the January war game caused Stalin to fire the game director for foreshadowing then what actually took place.

The forcible exclusion of alternative strategic ideas from analysis by Stalin was responsible for the near collapse of the Soviet Union in 1941. More interesting than the psychopathology of Stalin's motives is the recognition that this type of phenomenon can occur on a major scale.

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[1] War Game Barbarossa, Paulus, p. 113.

[2] Russian losses as stated in Barbarossa, The Invasion of Russia 1941, p. 65.

Whaley's analysis of German strategic deception[1] prior to June 22, 1941, takes on an even more important character in conjunction with the manic single-mindedness of Soviet strategic gaming. The question arises as to whether a nation is more vulnerable to deception when it develops a single strategic paradigm and suppresses, either by omission or commission, other viewpoints. If the 1936 and 1941 Soviet war games reinforced the belief that an enemy could be held at the frontier, minimizing any major threat to the Soviet Union, then this could well have contributed to the misappreciation of the strategic and tactical intelligence warnings then being received. If one believes in a single, unique answer to strategic problems, then one may be less aware of changing external developments expressed by perhaps contradictory intelligence warnings that do not conform to this answer.

Soviet gaming prior to the war produced the unexpected consequence of confirming Stalin's deluded appreciation of the strategic situation. The games were employed, even designed, to confirm this peculiar paradigm. It is difficult to believe that top Soviet officials were not convinced of the correctness of their views by a war game which assumed that correctness as a starting point. When reality interfered, either in the form of Tukhachevskii's shadow gaming or Pavlov's defeat in the 1941 game, it was suppressed because it did not conform to the accepted strategic world view. That view proved disastrously incapable of withstanding the reality of German invasion.

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[1]Barton Whaley, op. cit.

B. Midway, 1942

As an example of suppression by commission, the Japanese gaming of the Battle of Midway in 1942 serves well. Perhaps this is a case that should be made compulsory reading for all government officials and strategists who deal exclusively with paper plans relying on inputs from military professionals:

> Naval planners then turned their thoughts to the east and prepared ambitious plans for the capture of Midway and the western Aleutians in early June, the seizure of strategic points in New Caledonia and the Fiji Islands in July, air strikes on Southeast Australia, and operations against Johnston Island and Hawaii in August. These proposed operations were tested in a series of war games in the spring of 1942. During the play the Nagumo Force was attacked by land-based air while its own planes were attacking Midway. Following the rules of the game, an umpire determined that the carriers received nine hits and that two of them, the Akagi and Kaga, were sunk. Rear Admiral Ugaki, the director of the game, arbitrarily reduced the number of hits to three, and the number of sinkings to one and then permitted the sunken carrier to participate in the next part of the play dealing with the New Caledonia and Fiji Island invasions.[1]

This example appears rather simple. No propagation of a favored strategic paradigm seems present and it is not ideas and scenarios that are suppressed. It is merely an event in a war game. However, the implications for the business-as-usual evaluations which dominate national security discussion could be profound. Strategic uncertainty deriving from organizational self-delusion has hardly ever been explicitly considered. Displayed in neat columns on paper, perhaps even containing probabilistic statements, analytic results of some simulated military exchange appear deceptively certain. One wonders whether or not Ugaki's overruling in the Japanese example was reported to higher authorities with

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[1]Francis J. McHugh, Fundamentals of War Gaming (Newport: U.S. Naval War College, 1966), p. 2-19.

the game results. The issue of the frequency of such outright changes in the results of models, simulations and games deserves careful attention. The tendency for a model's data to be manipulated several times over by a number of interest groups, each operating independently, could be overlayed on an already fudged result. Appraisal of widely used models and games for check-out purposes from this viewpoint seldom seems to be undertaken by professionals. Perhaps none dare for fear of what might be found.

III. UNINTENDED LEARNING

Considerable attention has been given to the teaching and learning aspects of gaming. Although no generally accepted theories have been developed, almost all observers would agree that game participation teaches something. Juse what it is that is learned is not so easy to determine or measure.

One question of interest is whether gaming might teach long-term principles, even perhaps to an organization if its members were rotated through the game. Such a phenomenon might be expected to characterize repeated play of a particular game. This raises the possibility that an unexpected consequence of gaming might be long-term theory propagation even if the game was originally designed to teach narrow skills.

Descriptions of war gaming at the Naval War College during the 1930s as provided by McHugh clearly demonstrate this possibility.[1] During the years between the two world wars, hundreds of naval officers were circulated through this gaming facility in order to teach them the integration

[1] See Francis J. McHugh, op. cit., Chapter II.

of sea and air power. The use of the submarine and island hopping tactics were also developed during this period. While the game directors were probably more interested in teaching a fairly narrow set of tactical skills the total effects seemed more encompassing. In a 1960 lecture, Admiral Chester W. Nimitz stated:

> The war with Japan had been reenacted in the game room here [Naval War College] by so many people and in so many different ways that nothing that happened during the war was a surprise--absolutely nothing except the Kamikaze tactics toward the end of the war; we had not visualized those.[1]

It appears that, at least for the U.S. Navy in the 1930s, war gaming provided an unintended organizing theory of what a future war would be like, and how it would be prosecuted. Such a theory can be enormously important. Force posture evaluation, trade-offs, and deployments are all easier with such a theory. The social, psychological, and even organizational consequences of a tangible theory and plan of war probably have many other far reaching implications. While the U.S. Navy in the 1930s developed successful theories, no guarantee can be given that a wildly incorrect organizing theory might not be developed and propagated. This is why the British strategic models of the 1920s and 1930s are worth considering.[2]

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[1] Ibid., p. 2-24.

[2] A third intellectual possibility offers itself. This is the development of an incoherent theory. Some commentators are struck by the large variability in subject matter of contemporary gaming and simulation in the United States. No clear statement about what actually is the problem seems to occur. And no stable organizing strategy seems to exist; rather a smorgasboard variety of strategies are studied, with fads and fashions changing annually. Commenting on the planning of nuclear strategy Herman Kahn has remarked:

> The Department of Defense is a very large organization and the right hand doesn't know what the left hand is doing, and sometimes

A. British Strategic Bombing Plans, 1921-1940

The British analysis of the threat of strategic air attack between the wars is important for at least two reasons. First, it produced many important consequences such as the exclusive development of day fighters and bombers. Second, it contributed paralyzing constraints to the government's political bargaining position. The events leading to Munich are, in part, a consequence of it.[1] Moreover, the analysis was quantitative and could justifiably be called mathematical modeling. This feature should be of some interest to operations analysts and others who rely on technically sophisticated advice, particularly if they are not totally conscious of doing so.

The series of strategic war models is presented in Figure 4. They were not closed form models in the currently accepted operations research sense, rather each was a collection of serially connected calculations. In certain cases they were quite complicated. The actual quantitative techniques employed were simple, but so too are most techniques employed in

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neither knows what the head is doing. Further, it is very difficult to discuss these bizarre possibilities in public. I have seen this elsewhere in the world. I would argue the biggest single problem we have is that the Department of Defense is not clear. It itself doesn't understand its own plan. These issues go back to 1960, and they still don't understand them.

Civil Preparedness and Limited Nuclear War, Hearings before the Joint Committee on Defense Production, Congress of the United States, April 28, 1976, p. 57.

[1]The sources for this section include: Richard M. Titmuss, Problems of Social Policy (Her Majesty's Stationery Office, 1950); Robin Higham, The Military Intellectuals in Britain: 1918-1939 (Rutgers University Press, 1965); and George Quester, Deterrence Before Hiroshima (John Wiley and Sons, 1966).

Figure 4

BRITISH MATHEMATICAL MODELING OF STRATEGIC WAR, 1922-1939

ALPHA	1922	AIR STAFF OPERATIONAL ANALYSIS France could open the war with 150 tons of bombs on London in first 24 hours, followed by 110 tons the second day and 75 tons/day indefinately thereafter. This would bring 1500 tons/month onto Britain employing 1/2 of French Air Force operating 20 days per month. Morale loss factors would be enormous, outweighing physical damage.
BETA	1923	AIR STAFF OPERATIONAL ANALYSIS As above except French steady state bombing capability raised to 84 tons/day from 75 tons/day.
GAMMA	1925	AIR STAFF OPERATIONAL ANALYSIS As above except French steady state bombing capability raised to 100 tons/day from 84 tons/day.
DELTA	1926	AIR STAFF MEDICAL SUBCOMMITTEE OPERATIONAL ANALYSIS 1925 Air Staff operational analysis employed to study medical loads associated with war. Based on the "standard casualty rate" of 17 killed and 33 wounded per ton of bomb, 3,300 would be wounded the first day of war, 1100 wounded each day thereafter. A total of 50,000 would be wounded, with 36,000 needing hospitalization for an average stay of 30 days each.
EPSILON	1931	AIR MINISTRY ESTIMATE An attack dropping 100 tons of bombs on London would "paralyze" the city.
ETA	1934	AIR STAFF OPERATIONAL ANALYSIS Forecast for 1942 that Germany, operating from her own bases, could deliver 150 tons/day on Britain.
THETA	1937	AIR STAFF OPERATIONAL ANALYSIS After studying the combined effects of fighter defense, anti-aircraft ground fire, weather, counter offensives, etc. the Air Staff estimated that the Germans could deliver 644 tons/day on Britain, with capability, if unopposed, for 2,250 tons/day on both France and Britain by 1939. The opening first day German strike was expected to be 3,500 tons on Britain.
OMEGA	1937	COMMITTEE OF IMPERIAL DEFENSE WAR GAME Using threat forecasts from the Air Staff on German bombing capabilities and damage assessments the C.I.D. played out the effects of strategic war on Britain. The war would open with 60 days of strategic bombing during which 600,000 British would be killed and 1,200,000 injured, costing the nation £120,000,000 in compensation.
SIGMA	1939	AIR STAFF OPERATIONAL ANALYSIS As in THETA except steady state German bombing of Britain raised to 700 tons/day from 644 tons/day.

the 1970s' versions of strategic warfare models. Greek letter labels have been assigned for convenient reference.

These models ultimately produced a fantastic vicious circle of ever escalating horror scenarios causing wild bureaucratic overreaction and diplomatic paralysis. As is unfortunately all too common, none of the strategists, politicians, or governmental consumers questioned either their structure, assumptions, or data. A small group of analysts in the Air Staff, with a Top Secret security classification and a frightening self-confidence, prevented any external review of their models. The effect of this was to reduce Britain's bargaining ability with Germany in the crucial showdowns of the late 1930s for fear of an annihilating air strike.

Through a jerry-built mix of Zeppelins and Gotha bombers Germany was able to drop about 300 tons of bombs on Britain during the 1914-1918 war.[1] This produced 4,820 casualties (1,413 of which were fatal). Responding to a 1921 request for study by the British Committee of Imperial Defense (the highest defense policymaking group in the government) the Air Staff in the Air Ministry reanalyzed the World War I German bombardments. Four numbers are important as estimated from that experience (casualties include fatalities):

1914-1918 Britain.....	16 casualties/ton
1914-1918 London.....	36 casualties/ton
16 London night raids.....	52 casualties/ton
2 London night raids.....	121 casualties/ton

[1]Terrence H. O'Brien, Civil Defence (Her Majesty's Stationery Office, 1955), p. 11.

The Air Staff, operating under tight security without external review, proceeded to weigh the various numbers. They came up with a 50 casualties/ton parameter (one-third of which would be fatalities).[1] Incredibly, this parameter drove all of the models for the next seventeen years. What was wrong with the parameter?

- The sixteen night raids on which the 50 casualties/ton was based was a highly unrepresentative sample from a total of 103 German raids. These sixteen were the most devastating of the entire 103 raids.

- The estimated parameter derives from raids in which 270 people were killed and 818 injured (1,088 casualties) in attacks on London in 1917 and 1918. Of these casualties, 13 were killed and 117 injured by British anti-aircraft shell fragments and 14 killed and 14 injured in a mob rush to an air raid shelter. Thus, approximately 14 percent of the casualties were not directly caused by German bombs.

- Over 40 percent of the 1,088 casualties occurred in two raids (representing a 2 percent unrepresentative sample of the total 103 cases) in which 7.5 tons of bombs were dropped, by only 17 German planes. A single freak hit of Odham's Printing Works produced 98 of the casualties in this 40 percent group.

The Air Staff recognized the inappropriateness of using a constant parameter as a multiplier for strategic bomb damage assessments. They explicitly recommended adjustments for cities that had a lower population density than London. However, the 1926 Medical Subcommittee Estimates (Delta) made no such adjustments and directly applied the 50 casualties/ton parameter. This is an important observation because all too frequently the data sets employed in modeling are manipulated by those who have little or no familiarity with their peculiarities. This phenomenon is not raised

[1] To anyone familiar with this kind of work this "weighting" looks suspiciously close to straightforward rounding of the 16 London night raid estimate.

here because of its historical interest, but because it clearly exemplifies an all too common contemporary problem in strategic modeling. The faddish calculations now performed to support the contention that the U.S. land based missile force is vulnerable to a Soviet first strike may have some similarities with the British models of urban vulnerability. As the models diffuse throughout the research community certain caveats, inconsistencies, and even assumptions tend to be forgotten. Not only does this tendency have the possibility of producing wrong answers, it diverts attention away from real problems by its propagation of mythical numbers.

Although the Air Staff analysts may have been incompetent, they were not simple minded. They did recognize particular subtleties such as variations in population density and the effect this might have on damage assessment. Unfortunately, simple mindedness is far easier to detect than incompetence. And when data sets are repeatedly manipulated it can be terribly difficult to determine what value remains in them. In the British case, no one even thought it worthwhile to ask:

> By 1937 its origins [the 50 casualties/ton parameter] were unknown to the majority of senior officials in the civil departments. Nevertheless, it was still applied in these departments to revised estimates by the Air Staff of the weight of bombs that might be dropped.[1]

The models grew more sophisticated and more detailed over the years. The estimated throw-weight grew enormously, mainly fueled by German propaganda. The hospitalization estimates of 1926 are particularly detailed in their treatment of medical loads, average hospital stays, etc. Increasing detail contributed to increasing believability.

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[1]Richard M. Titmuss, op. cit., p. 12.

The Top Secret Air Staff models were tightly held. Summaries were conveyed to top government officials and other bureaucrats responsible for civil defense, medical care, evacuation, etc. Highly manipulated versions of the model results, but never the models or assumptions, were transmitted from one committee and bureau to another. Bureaucrats proceeded to further manipulate the model results in order to fulfill their mandated assignments. These were the results that induced public hysteria. The Air Staff models themselves were never exposed to external review, but their fifth and sixth order manipulations and transformations could not be kept under wraps. For example, the government refused to offer air attack insurance as it had in the First World War, based on a study that claimed 500,000 homes would be destroyed and 1,200,000 damaged in the first twelve months of war. But this study was based on another study which was in turn based on the classified Air Staff models. This refusal to underwrite insurance contributed to popular fears that a future war would be enormously destructive and may have weakened confidence in the government itself. A 1937 Home Office study developed a model that estimated the amount of timber needed for coffins in the event of war. The study concluded that 20,000,000 square feet of coffin timber would be necessary for each month of war. Coffin burial was concluded not to be cost-effective as it would have a price of £300,000/month. Instead, the Home Office analysts recommended mass burial in common graves supplemented by the burning of cadavers in lime.[1] This Home Office study was also based on the Air Staff models. In April 1939, the Ministry of Health issued 1,000,000 extra

[1]Ibid., p. 13.

death forms to its local offices.[1] Again, this was based indirectly on Air Staff work, accepted uncritically and further evaluated to produce the extraordinary result. With its own Air Staff's assistance, Great Britain was indeed learning an organizing theory about a future war.

These few examples are based upon the known relationships among different committees. But Britain is a highly stratified class society. Who can say what the effect of various rumors and security leaks in the gentlemen's clubs was? The refusal of Lloyd's to write war insurance in 1936 could easily have come from the informal information network connecting British executives with top government bureaucrats who received the fourth and fifth order manipulations of the Air Staff models.

The consequences were enormous. Consider Chamberlain's bargaining position with Hitler at Munich in September 1938. Although he was probably unaware of the Air Staff technicians with their statistics, he was certainly affected by them. Gas masks were being produced at 150,000/week, official government reports were predicting millions of destroyed houses, contingency plans were developed for mass public burials in lime, the largest insurance firm in the nation had refused to write any war insurance, and the public was in a state of near panic. During the Munich crisis 150,000 people fled to Wales in a spontaneous evacuation. And yet if someone had asked Chamberlain in September 1938 of his opinion concerning strategic warfare models he would almost surely have replied that he didn't concern himself with such "technical details." Many studies of the Munich crisis have considered the importance of Hitler's threats and his

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[1] Ibid., p. 21.

manipulation of British fear. Surely the context in which Chamberlain saw the threat of all-out war must have been influenced by the results of the Air Staff models which had diffused like some insidious disease throughout the government.

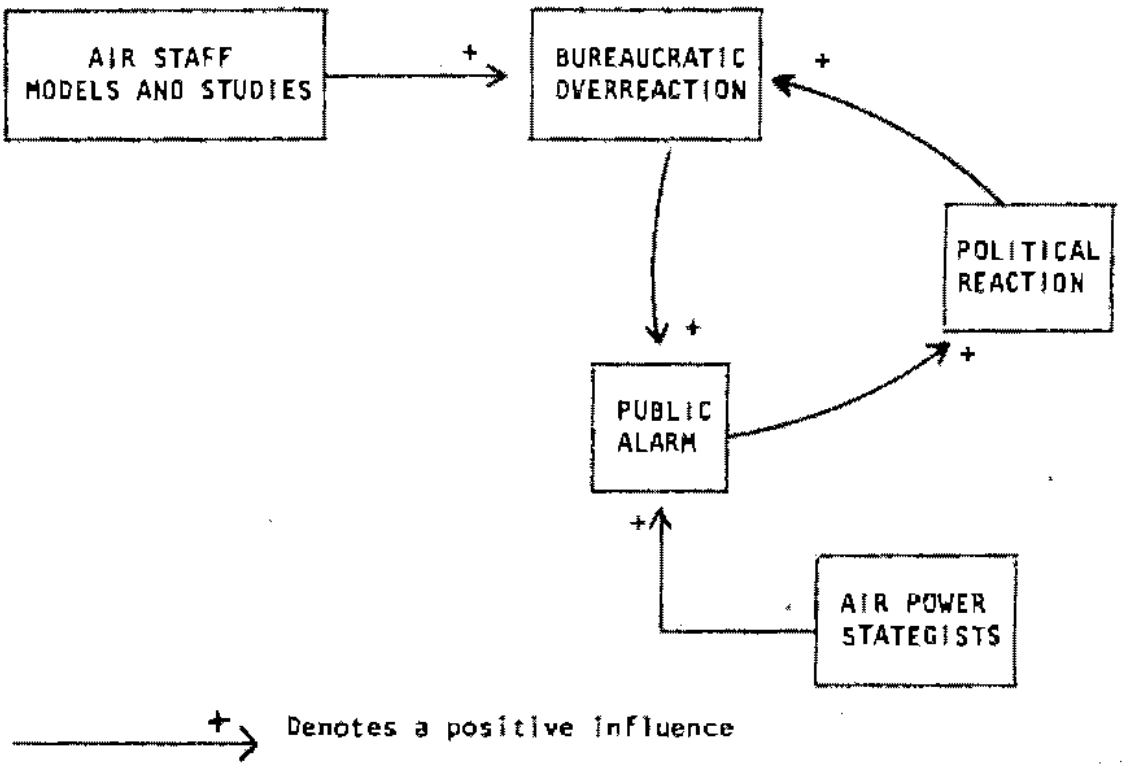
It might be tempting to place a harsh judgment on the Air Staff for their professional incompetence. But the manipulation of the fears they produced by various students of strategy perhaps deserves even greater attention. A great many books, articles, and lectures of the period gave an intellectual respectability to the viscious circle created. The 1934 publication of Behind the Smoke Screen is an example. Written by P.R.C. Groves, this book lambasted British foreign policy, called for huge increases in the strategic retaliatory bomber forces of the Royal Air Force, and developed an abstract theory of strategic warfare. But Groves never bothered to question the foundations of his argument. His book was a classic case of debating strategy in a vacuum. Others joined the bandwagon of analyzing the impact of strategic war even though most had not the slightest qualifications to do so, other than their claim of being "political strategists." It is one thing not to have proper clearance to receive certain answers but it is quite another not to even ask the questions in the first place. The vicious circle of paralyzing fear into which Britain drifted in the 1930s can be thought of in terms of Figure 6.

The series of Air Staff models of strategic war also had several unexpected military consequences. A crucial decision by Bomber Command[1] in

[1]The Air Staff was the chief authority for the several operational and administrative commands, including Bomber Command, Fighter Command, Coastal Command, Anti-Aircraft Command, Training Command, etc.

Figure 6

UNINTENDED CONSEQUENCES OF BRITISH STRATEGIC MODELING



1923 was that the only defense against devastating bomber attacks (as calculated by its own Air Staff) was the ability to strike first. Such a capability was also thought to deter massive attack. An additional feature was the deemphasis of the fighter force. This followed from an examination of World War I attacks wherein bombers penetrated British air space rather easily. A desire to maximize deterrence also contributed to the exclusive emphasis on bomber development. By converting fighters into bombers one would, in theory, maximize the throw-weight against the enemy. This would, again in theory, maximize deterrance which would save the British from

having to bury their dead in time following a German knock-out blow. The argument has a certain optimization appeal. The development of a rapid city evacuation scheme was opposed by some parties, logically, because it might tempt the Germans to strike first in a crisis.

Insulation characterized the Air Staff and Bomber Command. In an incredible display of a lack of reality testing, no bomb effectiveness tests were conducted by Bomber Command until 1937, even though these were requested as early as 1925.[1] When it was finally realized by the political authorities, in 1938, that Britain did not possess anything close to a knock-out bomber force against Germany the shock was felt throughout the government. Fortunately, other organizations had proceeded to adapt to test developments independently of Bomber Command. For example, in 1935 the Committee for the Scientific Study of Air Defense was formed. It studied the development of radar and various air defense tactics. A similar Air Offence Committee formed in 1937 was ignored and isolated by the Air Staff and Bomber Command.[2] The internalization of research resisted even cosmetic changes. About the time of the collapse of France in 1940 many in the various defense related agencies felt it was time for a fresh look at the Air Staff's models. For example, J.D. Bernal was employed by the Home Office to investigate city bombing. He simulated his own 500 plane raid on Coventry because he was skeptical of the Air Staff estimates. This period saw the growth of operational research sections

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[1]Robin Higham, op. cit., p. 184.

[2]See P.M.S. Blackett, Studies of War (Hill and Wang, 1962), p. 106.

throughout the Royal Air Force. Even here the Air Staff and Bomber Command were among the last to accept such external review and assistance.[1]

The British strategic warfare modelers were not guilty of the simple transmission of a mistaken piece of technical data. Unfortunately, the problem was more complicated and more insidious. The view that a single technical mistake had been made in the evaluation of World War I data also does not get at more basic issues such as professional review standards and civilian acceptance of expert opinion. First, the models tried to account for many factors. The compound effects of these were responsible for the large overestimates of the effect of strategic war. The Theta model of 1937 calculated the effects of fighter defense, ground fire, weather, and even the British damage limiting reduction of the German bomber force. However, no assessment of evacuation was undertaken even though this could be considered implicit in the Alpha model of 1922, which recognized the importance of population density. Somehow this was left out of later models. Moreover, probabilistic studies of bombing were performed in Britain as early as 1932.[2] Such work never caught Air Staff modelers' attention.

Additional compounding of error derived from intelligence threat analysis. The trend in estimates of enemy steady state bombing was as follows:

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[1]Sir Charles Webster and Noble Frankland, The Strategic Air Offensive Against Germany, 1939-1945, Vol. I (Her Majesty's Stationery Office, 1961), p. 251.

[2]Office of Scientific Research and Development, Probability and Statistical Studies in Warfare Analysis (National Defense Research Council, Applied Mathematics Panel, 1946), p. 23.

Figure 7

INTELLIGENCE THREAT ANALYSIS
OF ENEMY CAPABILITIES
FOR PROTRACTED BOMBING

Year	Throw-Weight
1922	75 tons/day
1923	84
1925	100
1934	150
1937	644
1939	700

Threat estimates such as these were a leading contributor to the model's overestimates. Throw-weight was undoubtedly increasing over this period but at nothing like the amounts estimated. During the peak Battle of Britain period the Germans delivered 150 tons/day.[1] And this was with a 1940-1941 Luftwaffe, not that of 1934.

Second, the opinion that a technical mistake was made is generally used to imply that the military consistently overestimates weapon effectiveness. True as this may or may not be, it draws attention away from the consumers of the Air Staff models. The more important issue is the lack of questioning or even interest by the planners, strategists, and others in the products upon which their own theories were based. An unhealthy divergence arose between the strategists and those with operational responsibility for the instruments of strategy. The two groups communicated, but in a highly indirect manner whereby each would concentrate on their own issues and problems. An actual snobbishness even seems to have arisen among strategists and politicians with respect to "technical

[1] P.M.S. Blackett, op. cit., p. 196.

problems." Unconscious as this appears to have been, its effects were profound. Had not a few individuals worked closely with Fighter and Anti-Aircraft Commands to develop radar and air defense tactics, rather than a hermit-like contemplation of theoretical strategy, the Battle of Britain might have been lost in 1940. The reality of war, particularly after the Battle of France, brought a sharp increase in the use of scientists and other outsiders to bridge the existing chasm between the two groups.[1] Operational research was born out of these developments. The term "operational research" was used as much to signify a break with the accepted military way of handling problems concerning weapons, strategy, and tactics, as it was to be descriptive. The problems examined by the Air Staff and the operations analysts at this time were quite similar. However, Blackett, Zuckerman, and Waddington, among others, wanted to make a clear distinction about the quality differences between the two groups. The birth of operational research came from a reaction against certain tendencies as much as from the need to study operational problems scientifically.

The British modeling of strategic war prior to World War II is a case study of the long-term propagation of an organizing theory about a future war. Unfortunately, bad theory was propagated. Long-term modeling and gaming has this dangerous capability. Moreover, trends in contemporary

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[1]The 1940 publication of Science in War, issued anonymously, was a manifesto for the increased cooperation between scientists and the military. It attacked the insulation common among government staffs. See Science in War (London: Penguin, 1940). [Authors included P.M.S. Blackett, J.D. Bernal, S. Zuckerman, and C.H. Waddington].

modeling and gaming are such that they may be particularly susceptible to producing this unintended consequence.

Increasingly, military research of this kind is performed within the services themselves.[1] In-house studies are especially difficult to evaluate because they receive poor distribution and are frequently hidden, as were the Air Staff models, by bureaucratic or official secrecy. The current trend in emphasizing all-computer simulations is also relevant. All too often these computer simulations are employed as black boxes by uncritical users who are unfamiliar with the peculiarities of data and structure contained within. The analogy between the modern all-computer black box and the bureaucratized British Air Staff of the 1930s could be dangerously close. Both have a tendency to spew forth results, withholding documentation, that are used as the basis for additional research. The proclivity of research organizations to produce paper studies of other paper studies can also be mentioned.[2] Often this is easier to undertake than is the reality testing of the theories which are analyzed. The

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[1]See Garry Brewer and Martin Shubik, "The War Game," Yale University, 1976.

[2]The U.S. Senate Select Committee to Study Governmental Operations in 1976 noted this trend with respect to the Central Intelligence Agency:

> Some analysts complain that the personnel system has fostered too much bureaucratic 'layering' and that there are too many people writing reports about reports. The effects are predictable. In the words of former DCI and Secretary of Defense James Schlesinger, "If you've got too much specialization and pigeonholing of people, you get the kind of people in the intelligence game who don't mind being pigeonholed, and the entire U.S. intelligence establishment is too much bureaucratized."

U.S. Senate, Select Committee to Study Governmental Operations, Foreign and Military Intelligence, Book I, April 26, 1976, p. 269.

British Air Staff declined to field test the effects of actual bombs, failed to reanalyze the World War I results, and failed to dispatch an observer to the Spanish Civil War. The avoidance of similar pitfalls remains one of the most important problems for defense analysts to guard against.

IV. CONCLUSIONS

Contrary to the picture suggested in the literature, gaming is a bureaucratically complicated technique with the potential for enormous unintended consequences. Accounts written by enthusiasts and advocates[1] have tended to simplify the process of gaming and modeling, particularly when organizational constraints are involved, and to propagate the belief that gaming is a clear-cut method for policy evaluation. Broadly speaking, this viewpoint fails to consider the importance of the informal verbal gaming (including shadow gaming) often used in practice by decision-makers, and the pattern of unintended consequences referred to as diverting, suppressing, and learning. Informal verbal gaming often bears a revealing relationship to the more formal quantitative games that receive the attention of professionals and the public. All too often an official game may turn into a compulsory ritual whose real meaning can only be interpreted by analyzing the after hours verbal gaming activities of key participants. Most professionals in the field have an intuitive sense of this phenomenon. The sensitivity of the subject has generally prevented a thorough analysis however.

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[1] Books such as Andrew Wilson, The Bomb and the Computer (New York: Delacourte, 1966) and Alfred H. Hausrath, Venture Simulation in War, Business, and Politics (New York: McGraw Hill, 1971), fall into this category.

The latter issue of unintended gaming and modeling consequences is a subject that, if neglected, could be very dangerous. Although the examples in this essay might be viewed as a mere series of technical mistakes, an alternative interpretation suggests the presence of systematic patterns inherent to the organizational structure in which strategic gaming and modeling occur. The British politicians in 1940 could claim that the military staffs provided them with faulty estimates concerning a strategic air war with Germany. Seemingly a technical mistake, this phenomenon appears so widespread that the possibility of certain built-in tendencies must be considered. As the British politicians were at the mercy of their Air Staff without fully being aware of it, so too in Japan did this phenomenon arise:

> One of the problems in assessing Japan's war capability was the limitation on information available to those charged with decision-making. For instance, General Suzuki Teiichi, the Director of the Planning Board, was unable to obtain information about petroleum by the armed forces until about October 1941. Foreign Minister Togo later complained: "I was astonished at our lack of the statistical data required for a study of this sort; but even more I keenly felt the absurdity of our having to base our deliberations on assumptions, since the high command refused to divulge figures on the number of our forces, or any facts relating to operations.[1]

The intentions of the British and Japanese military staffs may have been different but the effect of strongly influencing decision-makers with incorrect ideas was the same. With this as a background, the recently disclosed manipulations of Vietnam War casualty data among American government agencies cannot be surprising.

A clear possibility exists that current modeling and gaming efforts could fall into the seemingly natural pattern of diverting, learning, or

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[1] Togo Shigenori, The Cause of Japan (New York, 1956), p. 127.

suppressing. Whether or not this is the most useful scheme cannot yet be determined, but its use as a pattern recognition device to elicit current trends would be an important first step in considering the relationships between the users and consumers of gaming and modeling. As a hypothetical example, if U.S. defense groups such as the Studies Analysis and Gaming Agency routinely use gaming to study American and Soviet confrontations, it is not inconceivable that long-term learning could occur among the participants. If hundreds of American officials were rotated over the years through games where the United States received nuclear retaliation for vigorous actions to support foreign policy objectives, then a negative view concerning the usability and flexibility of U.S. power could be organizationally learned. Since attempts are made to involve senior American officials in these games, an influential group could receive long-term unintended learning experiences that might not be beneficial. If very senior Americans were involved with intense crisis gaming they might think about the more unpleasant possibilities in great detail. Should a real crisis arise they might be at a marked disadvantage for having explored in detail such "unthinkable" scenarios. True, a senior decision-maker could become more familiar with command and control systems by participating in a strategic game, but he might also take away a potentially paralyzing attitude with respect to crisis bargaining. This is basically what occurred in Britain during the 1930s, with at least two crucial differences. Britain's World War I derived data could well be superior to our estimates about strategic warfare systems because they had at least

some wartime data.[1] Second, Britain's early experiences in 1939-1940 demonstrated that strategic air war was not as bad as previously expected. With large nuclear forces attached to a hair trigger there might be no learning time available.

Suppression of unpleasant eventualities is also a conceivable pattern in contemporary modeling and gaming. This might arise in coalition situations where an official game suppresses critical issues in the interest of coalition unity. However, the national representatives in the coalition might feel it their duty to examine even unpleasant issues without formally involving other coalition members. The result could be a single official game turned into a ritual, and a set of shadow games that consider various "what if" questions. The manic suppression of realistic collateral damage problems resulting from tactical nuclear weapons following the 1950s play of the Carte Blanche war game by NATO could be an example of this. As for diverting tendencies, the reliance on the threat of nuclear retaliation employing "invulnerable" ballistic missile submarines could produce a dangerous complacency. In the past, invulnerable systems have been by-passed.

The contemporary cases mentioned are purely hypothetical. Greater research would need to be undertaken before actual patterns were found. They are provided merely to show what the form of an answer would look like. However, unless a more serious and sober analysis of various facets of strategic gaming and modeling develops, the patterns of past disasters could be repeated.

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[1] This suggests an intriguing parallel between the 16 Night Raids on London and the data from Hiroshima and Nagasaki in terms of very small samples having a disproportionately large influence.

BIBLIOGRAPHY

Beaufre, General Andre. 1940 The Fall of France. New York: Alfred A. Knopf, 1968.

Blackett, P.M.S. Studies of War. New York: Hill and Wang, 1962.

[Blackett, P.M.S.; Waddington, C.H.; Bernal, J.D.; Zuckerman, S., et al.] Science in War. London: Penguin, 1940.

Bond, Brian. France and Belgium 1939-1940, The Politics and Strategy of the Second World War Series. London: Davis-Poynter, 1975.

Brewer, Garry and Martin Shubik. "The War Game." Yale University, 1976.

Crowther, J.G. and R. Whiddington. Science At War. London: His Majesty's Stationery Office, 1947.

Erickson, John. The Road to Stalingrad, Vol, I. London: Weidenfield and Nicolson, 1975.

Hausrath, Alfred H. Venture Simulation in War, Business, and Politics. New York: McGraw Hill, 1971.

Higham, Robin. The Military Intellectuals in Britain, 1918-1939. New Brunswick: Rutgers University Press, 1966.

Ike, Nobutaka, ed. Japan's Decision for War, Records of the 1941 Policy Conferences. Stanford: Stanford University Press, 1967.

Kahn, Herman. Comments on Scope, Methodologies and Format, Basic Public Policy Issues, HI-1447. Croton-on-Hudson: Hudson Institute [January 1970].

McHugh, Francis J. Fundamentals of War Gaming. Newport: Naval War College, 1966.

O'Brien, Terrence H. Civil Defense, History of the Second World War, United Kingdom Civil Series. London: Her Majesty's Stationery Office, 1955.

Office of Scientific Research and Development. Probability and Statistical Studies in Warfare, Summary Technical Report of the National Defense Research Committee, Applied Mathematics Panel. Washington, D.C.: Office of Scientific Research and Development [1946].

Paulus, Field-Marshal Friedrich. "Barbarossa: The Strategic War Game and the Concentration of Forces in the East." Appendix 2 in Paulus and Stalingrad, pp. 97-120. By Walter Goerlitz. London: Methuen, 1963.

Quester, George H. Deterrence Before Hiroshima. New York: John Wiley and Sons, 1966.

Rowe, Vivian. The Great Wall of France. New York: G.P. Putnams, 1959.

Shubik, Martin. The Uses and Methods of Gaming. New York: Elsevier, 1975.

Strauch, Ralph E. A Critical Assessment of Quantitative Methodology as a Policy Analysis Tool, P-5282. RAND Corporation [August 1974].

Titmuss, Richard M. Problems of Social Policy, History of the Second World War, United Kingdom Civil Series. London: Her Majesty's Stationery Office, 1950.

Trevor-Roper, H.R., ed. Blitzkrieg to Defeat, Hitler's War Directives 1939-1945. New York: Holt, Rinehart, and Winston, 1964.

U.S. Congress. Senate. Select Committee to Study Governmental Operations, Foreign and Military Intelligence, Book 1. S. Rept. No. 94-755, 94th Congress, 2nd Session, 1976.

Waddington, C.H. O. R. in World War 2. London: Elek Science, 1973.

Webster, Charles and Noble Frankland. The Strategic Air Offensive Against Germany, 4 Vols. History of the Second World War, United Kingdom Military Series. London: Her Majesty's Stationery Office, 1961.

Whaley, Barton. Codeword Barbarossa. Cambridge: MIT Press, 1973.

Winterbotham, F.W. The Ultra Secret. New York: Dell Publishing Co., 1974.