

AD-A228 112

DTIC FILE COPY

SIMULATING THE FOG OF WAR

John K. Setear

February 1989

DTIC
ELECTE
NOV 06 1990
S B D

P-7511

DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

The RAND Corporation

Papers are issued by The RAND Corporation as a service to its professional staff. Their purpose is to facilitate the exchange of ideas among those who share the author's research interests; Papers are not reports prepared in fulfillment of RAND's contracts or grants. Views expressed in a Paper are the author's own and are not necessarily shared by RAND or its research sponsors.

The RAND Corporation, 1700 Main Street, P.O. Box 2138, Santa Monica, CA 90406-2138

PREFACE

This piece originally appeared in *Fire & Movement*, Number 58, October/November 1988. *Fire & Movement* is a magazine that reviews commercially published conflict simulations, and the piece refers extensively to such wargames, (with their titles in underlined type).^{*} These games often differ substantially from the political-military games or intricate computer simulations typically undertaken in the defense-analytic community. Nonetheless, the piece presents a more generally applicable treatment of the types and importance of uncertainty in warfare. In addition, the article discusses how to modify the paradigmatic commercial wargame so as to represent more realistically the fog of war, and those modifications may also be applicable to some of the human-oriented games used in the defense-analytic community.



Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By <i>per letter</i>	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
<i>A-1</i>	

* Use of the name of any product without mention of trademark status should not be construed as a challenge to such status.

Simulating the Fog of War

by John Setear

I. Introduction

Late in the day at Waterloo, Napoleon sees clouds of men in blue in the woods to his right and cannot tell whether Grouchy has at last arrived or the Prussians have come to turn his flank. George B. McClellan, though a brilliant organizer, is paralyzed in the field by the legions of phantom Confederates that he forever sees behind the rebel lines. In a nameless war, a battle-hardened captain halts a company of troops and tries to divine what -- or who -- is behind the next ridge, and wonders where the devil the sergeant is with the support he asked for hours ago. The commander of an American armored cavalry regiment in the Fulda Gap wonders how long he can really delay a Soviet Motorized Rifle Division. Thick is the fog of war.

A wargamer sits down to a board game in which, after a reading of the rules and an examination of the initial set-up, he knows not only the exact terrain but the precise strengths, dispositions, and even objectives of his opponent's forces, as well as the exact rates of movement and probabilities of inflicting losses on the enemy in a given set of conditions. His greatest uncertainty is whether the cat will jump up onto his side of the mapboard or his opponent's.

Something appears to be rotten in the state of Wargaming, at least to the extent that it has any pretensions to fulfilling the claims to put YOU in the shoes of the commander. The fog of war, along with death, is what distinguishes war from peace, yet commercial board wargames have traditionally made no more effort to impose the former upon the players than it does the latter. Games released within the past few years have shown a greater propensity to

include a rule or two treating this crucial aspect of simulating war, but the fog of war is still creeping in on delicate feet.

This article is a survey of the board wargames that attempt to generate at least a mist of war over paper battlefields. I first briefly discuss the fog of war in actual battles, and then survey the techniques used to simulate it. My purpose is not to study every rules case that introduces more uncertainty into wargaming than is present in Afrika Korps, but rather to explore the broad categories of real-life and simulation uncertainty, and thereby to provoke further thought on the subject and encourage future designs to take account of the fog of war.

Though many computer wargames simulate much of the fog of war, I consider here only board wargames, chiefly for reasons of limited space and my own ignorance. I note, however, that the average wargamer -- whether because he is strapped for cash or is simply wedded to maps he can fold and counters he can touch -- still prefers to see his field of combat stretched out before him horizontally rather than in cathode-ray verticality.

II. The Fog of War

Whether he is a rookie fighter jock, a silver-haired fleet admiral, or an aging politician, the commander of a military force wants to know more than he usually gets told about the enemy. Commanders in the field, whether of an army or an airplane, generally also want to know more about the environment -- weather, for example, or the relevant terrain. Finally, much as it pains a bureaucracy like an armed service to admit it, a commander often lacks the ability to get his own organization to report to him adequately about its *own* status or to carry out his orders. Even in an army of smokeless powder and ball bearings, the fog and friction of war dominate the battlefield, and make the vanquished easy prey for armchair historians -- or boardgamers -- whose environment presents them with no difficulty more baffling than matching their socks.

The first source of the fog of war is *uncertainty about the enemy*. The enemy's *intentions* are perhaps the most important of these uncertainties. Will he attack or retreat? Seek to capture my capital or destroy my army? Is it all a trap? Another source of uncertainty about the enemy stems from the limited information generally available about the enemy's *forces*. Can I find the *Bismarck* in all this ocean? Has Wellington put Scottish Highlanders or turn-tail Dutchmen on the reverse slope of that ridge? Are there four more MiGs up there in the sun waiting to be vectored in by a radar controller on the ground? The disposition and strength of enemy forces is the most immediate threat to any command, and is in fact the explicit focus of most intelligence-gathering efforts.

Another source of the fog of war is uncertainty about the natural *environment* facing the commander. When will this fog lift so that we can get some close air support over Bastogne? Is the sonar convergence zone always so hard to find in this part of the ocean? Can we wade across Antietam Creek? Predicting the weather, as all of us know, remains difficult even in the modern era; questions of terrain have become less crucial with modern mapmaking and satellite reconnaissance, but were an important part of the fog of war for centuries and remain an important part of that fog for those unblessed, by virtue of nationality or rank, with the output of overhead assets.

The third generator of uncertainty stems from *friendly forces*. Often one's own men fail to communicate effectively with one another, and commanders can therefore never be certain that they are acting on the best information available or that their orders will be carried out properly. Why didn't somebody figure out that all that movement on the other side of the Ardennes meant the Germans were going to attack? Why did J.E.B. Stuart fail to inform Lee of the Union Army's movements during the Gettysburg campaign, and why did the Japanese commander of the main battleship force at Leyte Gulf turn back at the mouth of a bay holding a completely undefended American invasion force? Why do peacetime delusions survive at least until the first sound defeat?

Great commanders not only plan, after all, but *lead*, and leadership is in some respects about knowing how to choose subordinates and how to keep the channels of communication functioning.

One more source of uncertainty does not fit neatly into the three categories above, but is important enough to war that it is worthy of mention even though wargame designers almost universally ignore it: uncertainty about the underlying *laws of war* that govern the clash of arms on the battlefield. I am not referring to man-made laws of war like the Geneva Convention, but rather to the semi-natural relationships among space, time, weapons, and the men who use them that combine to determine the outcome of a given encounter between armed forces. How far can one of Napoleon's corps march in a day? How many B-17s in an unescorted squadron will fall to enemy fighters on the way to Germany? How often can a U.S. destroyer find a Soviet ballistic-missile submarine? These rates, and the conditions that affect them, are difficult indeed to predict: pre-war experiments may occur under controlled conditions but usually prove to be unrealistic, while in war the true relationships among variables are confounded by the confusion and varying conditions of the battlefield.

It is important to note that these uncertainties affect commanders at all levels from a President to a pilot, and in all combat environments from the desert to the deep blue sea. The particular focus of the uncertainties varies -- the commander-in-chief focuses on production capacities extending over years while the squad leader worries about firepower during the next few seconds -- but the underlying principles remain the same. Some commanders now rely upon high-tech sensors and the opinions of experts for their intelligence rather than upon the naked eye and a ride around the battlefield, but the uncertainties discussed above have affected commanders in every historical period -- indeed, it is the uncertainties that remain constant while short-term certainties about the national identity of the enemy and the technology of warfare change.

III. The Designer's Toolbox

The standard wargame has until recently been almost as single-minded about neglecting to trouble the players' minds with the fog of war as the gods of battle have been in clouding commanders' minds with it. The standard move-fight sequence of play, with the typical map and counters equally visible to the two sides, does of course result in a player's uncertainty about some of the short-term intentions of his opponent. The player cannot, after all, predict perfectly his opponent's decisions about where and with whom to attack.

Nonetheless, all the short-term allocations of limited resources seen in the typical wargame -- movement, combat, supply points, production points, rallying units, and so forth -- occur within a basic framework of certainty about the opponent's overall intentions (as expressed in known victory conditions), the opponent's force strengths and locations, the terrain, the governing laws of war (as expressed in movement rates, combat factors, and a known but probabilistic combat results table), and the capabilities of friendly forces. Even a game as faithfully executed as *Victory Games' Vietnam* barely nods in the direction of uncertainty while treating a war in which the location, strength, goals, and will to resist of the United States' enemy -- and often of its ally -- were all nearly impossible for the United States to divine.

Furthermore, this lack of uncertainty exists across a great range of complexity, scale of operations, and topics. Whether one sits down to play a relatively challenging tactical game like *Wooden Ships and Iron Men*, a simple operational game like *Battle for Moscow*, or a highly complicated strategic game like *Third Reich*, one's chief worries are remembering the rules and counting up factors. The often-paralyzing uncertainties about whether you will be attacked, where, with what, and with what result, are absent.

This section examines the tools that game designers have used to give players some glimpses of the uncertainty that pervades the

combat zone, and explores how those tools relate to the real-life categories of uncertainty discussed above. In the process, I also evaluate the usefulness of the tools employed so far by designers, and suggest how such tools might be adapted or created in games not yet designed.

A. *Referees Real and Simulated*

Computer wargames can solve the problems of simulating limited intelligence by using the machine as the guardian of information known only to one side (or to neither), or as the gremlin that delays or garbles orders. The designer of boardgames can attempt a similar feat by requiring the players to use a third party as a referee. Virtually any game might be so modified: one needs only some extra pieces and mapboards to allow the players and referee each to have their own version of the situation, and some rules to govern how one goes from knowing only about one's own forces to knowing something about the enemy's forces.

Using a human referee has some disadvantages, however. One problem is the duplication of counters and mapboards that is necessary, a disadvantage of cost and space that grows about three times as quickly as the size of the game grows (at least if the referee and the players all need their own map and set of counters). Another disadvantage is the general cumbersomeness of transferring the players' moves to and from the referee's mapboard. Finally, adding a referee means finding yet another person with enough gray matter and time to learn and play the game -- and the referee must be content simply to stand by and watch while the other two players go at it.

The "old" SPI's NATO Division Commander attempted to get around at least the need to round up an additional participant by providing for a "controller's" version of the game. One player cooked up the Soviets' plan of battle and then switched hats to play out the rigid Soviet implementation of that plan as the referee, while the player in the title role fought not only T-62s but an ignorance about

which of the various "sectors" delineated on the map might contain them. The modern major general, American style, had to allocate his limited resources of aerial reconnaissance, signals intelligence, and brave units to find out just what was going on out there. (In a game I played as controller, the luckless NATO division commander became progressively more baffled as he was unable to reduce general indications of enemy troop presence to a specific sector despite focusing his intelligence resources along the likely avenues of approach. Unfortunately, his searchings were always just a sector or two behind the ever-advancing Soviets, and a battalion of T-62s suddenly dropped in, unannounced and undetected, at his headquarters!)

While providing one player with the opportunity to suffer the pangs of ignorance, the "controller" solution still leaves the other player essentially passive during the actual play of the game. There is also a great deal of either pre-planning or "pre-programming" required to simulate the non-playing side's actions, and the resulting need for detail or extensive rules to govern the non-playing side's pieces can become tedious. One of the two players involved must be willing to invest a good deal of pre-game time in drafting the basic battle plan, and willing to play a passive (and even-handed) role once the game actually begins. Nonetheless, if the proper personality match can be found, the controller system has some promise for situations in which one side's operational flexibility is much more constrained than is the other's, either by doctrine or terrain. The Japanese doctrine near the close of action in the Pacific Theater during World War II comes to mind, as might several battles of the American Civil War in which the Union forces slavishly followed either overly intricate or extremely direct plans of battle.

Some designers have drafted the game system -- and both the players -- to act as a simulated referee in "blind" or "double-blind" games. These games use some combination of separate mapboards (and often special counters), the players' honesty, and a search mechanism to keep a player from knowing instantaneously and exactly the location or strength of his opponent's forces.

Bismarck and Midway, a pair of early naval games from The Avalon Hill Game Company, use a simple map-and-search system to mask completely the location of the enemy's forces. Once that location is discovered through an honor-system search, however, the strength of the unit(s) is known as well. Games like Game Designers' Workshop's critically well-received but slow-selling (and slow-playing) Normandy Campaign or 3W's Clash of Steel emphasize masking the *strength* of the enemy's units -- rather than their location -- by using a map for each player with generic counters for the opponent's forces placed in their actual locations. The "searches" to determine those units' actual strength generally consist of attacks against them, though some limited provision is made for more purely intelligence-oriented activities.

Both the location-masking and the strength-masking systems slow play significantly because players must take some time to listen to the called-out search and look for that spot on their map, and/or to change the "unknown" counters on their map to the proper units once discovered. Nonetheless, this single change powerfully reproduces what is often the commander's overwhelming concern: where is my enemy's strength?

A "simulated referee" also resides in the paragraphs of games like Ambush and Open Fire. In this paragraph-solitaire system, the game system itself is the equivalent not only of a second player but also of a referee. The game begins with the human player completely unaware of the strength and location of enemy forces. As the player's forces enter each new hex (or as some other triggering condition occurs), the player triggers a reference to a particular paragraph and consults a paragraph booklet to see what has happened. Sometimes nothing happens; at other times, the enemy reveals himself in firing upon the player's forces; occasionally, the player must suffer incoming fire without even being able to locate the enemy forces responsible. This system, regrettably, is at least as cumbersome as the other referee-based systems, and in addition has yet to be adapted to a non-solitaire game.

B. *Counters that Conceal*

Back when games came in zip-loc bags with maps about as exciting as a day-old sandwich that hadn't been put in a zip-loc bag, the pre-TSR SPI had a series of games on mid-19th-century conflict that included Lee Moves North and Franco-Prussian War. The small number of combat units (and an even smaller number of dummy units) were moved upside down, with combat or cavalry probes the only way of revealing their actual strength. No separate mapboards were required, and the "searches" consisted of turning over the upside-down units, but the system was in many ways as tense and unpredictable as any double-map or refereed game. Low unit density and highly varied unit strengths made the system easy and exciting to use, especially against the backdrop of the indecisiveness of army-against-army combat in the era of the rifled musket.

A variation on this system was flung far into the future in SPI's long-time best-seller, Starforce: Alpha Centauri. There, a single generic starforce counter might represent one ship -- or a dozen. This kept the opponent guessing, especially since the units were relatively mobile and could therefore agglomerate at a friendly "stargate" and then disperse with some new arrangement of forces represented by each counter but still unknown to the enemy. Games like Clash of Arms' The Emperor Returns, in which a leader traipses about the map leading forces kept off the map and visible only to the controlling player, provide a similar effect.

These counter-based methods could be profitably adapted to a wide range of gaming situations, and indeed have been adapted by several more recent games, among them The Avalon Hill Game Company's Platoon and West End Games' Air & Armor. Fans of purely aerial modern combat and of the movie *Top Gun* could easily use a single "bogey" counter to enter the map in their next scenario of Flight Leader or Air Superiority, and wait for their opponent to cry out, "Bogey ... wait, no, it's two bogies ... Christ, there's four of 'em!" Games with varied units involved can be modified by placing blank counters of the proper color to cover the unit counter and uncovering the unit counter only when it is within a certain distance of an

enemy unit (which might in land games be only when an attack is actually declared). New designs might copy Air & Armor and print generic -- but properly colored and coded -- unit symbols on counters and also provide plenty of strength counters, or provide two-sided counters with the back side of the unit counters "generic" and the front side displaying a fixed strength. These simple but rarely taken steps would not only avoid the tedium of counting up exactly the proper factors for each attack, but allow the players to experience some of the tension involved in assaulting an unreconnoitered area of the line, or feel some of the frustration of having to wait for intelligence from scout or reconnaissance units before launching an attack.

These systems, as well as the refereed or double-map systems, show players the fog of war that results from uncertainty about the enemy's units. A design tool that also simulates the uncertainties that commanders may face with respect to *friendly* forces is the "untried unit" system, in which one side of each counter is marked with a tantalizing question mark and the general type of the unit, and the other side is marked with the actual unit strength. This system, born in SPI's quickly forgotten Invasion America and immortalized in its now-republished (by TAHGC) Panzergruppe Guderian, forces *both* players to wait until the moment of combat before finding out the strength of the untried unit. This seemed especially appropriate for its asymmetrical application in Panzergruppe Guderian to the combat strengths of unpredictably competent Soviet units facing combat-tested German units in the first few months of the Barbarossa campaign. Related games simulating somewhat later battles of the war, such as Drive on Stalingrad, reduced the variation in unit strengths to simulate the greater knowledge that both sides had about the capabilities of individual Soviet units, but there remained more than enough agony in the flipping-over of untried units.

Unfortunately, the untried-unit system is not appropriate for all simulations, at least if one assumes that its unit-strength variations are fairly high. Once the first few clashes of arms in a

conflict have occurred, a commander faces much less uncertainty about his own troops' capabilities, and his uncertainty about the enemy often stems more from an inability to locate particular units than from his uncertainty about their quality. Nonetheless, the untried-unit system seems a natural for simulating battles where only one of the forces is untried (such as the U.S. forces at Kasserine Pass in World War II) or even when both armies are untested (as in First Bull Run, or even as a twist that *might* be sufficient to justify another operational NATO-Pact simulation).

C. *Counters Potentially In Play*

The tools discussed so far often succeed in showing the player the problems stemming from limited intelligence about the enemy's (or even one's own) *forces*. They limit more stringently than the typical wargame the player's knowledge about the enemy's *intentions* (or friendly capabilities). These games are therefore a significant improvement, in limited-intelligence terms, over their conventional brethren. Nonetheless, with the exception of the paragraph-solitaire system, these methods usually fail to make a player uncertain about the composition of the enemy's *entire force*. This latter uncertainty can be important indeed, as Napoleon discovered to his chagrin at Waterloo with the arrival of the Prussians and as Pope found out at Second Manassas with the arrival of the other half of Lee's army; the "young Napoleon" McClellan suffered from the opposite but equally devastating problem of *overestimating* the size of the enemy's forces. A glance at the initial set-up and the reinforcement tracks in the typical wargame, however, will usually protect the simulated commander from any similar embarrassments.

A few games use a die roll to determine whether or when certain reinforcements enter the map, an approach that introduces total-force-composition uncertainty to some extent. West End Games' Soldiers essentially extends this method to the initial order of battle, an adjustment that other games might make particularly useful if the

fog of war were also extended (by the means discussed earlier) to the precise identity and strength of units once play began.

These modifications carry with them some price, of course. An adjustment in the victory conditions, keyed to the magnitude of the changes from the historical forces and arrival times, may be necessary to maintain play balance if the variation in the initial order of battle is significant. A more difficult problem is the lack of "historicity" that some may feel if they maneuver or face a force that varies significantly from the force actually present in the battle zone on the fateful day they seek to recreate; for this problem, there would seem no remedy but the realization that the commanders present were uncertain at the beginning of the battle as well.

D. The Rulebook

Rulebook tools tend to fall into two categories: modifications to the sequence of play (or the method of determining the end of a game-turn) and specific rules cases. The former methods tend to introduce a fairly diffuse fog of war by limiting a player's ability to predict what both friendly and enemy units will be capable of doing in the next game-turn, while the latter method tends to introduce a dense fog bank in a relatively limited area or for a relatively brief period of time.

Making the game-turns of unpredictable length renders unpredictable the short-run ability of one's forces to move or to bring the enemy's forces to battle. In Victory Games' Civil War, for example, the players roll the dice at a number of points in the turn to see whether the calendar moves on or play continues for another round of movements and battles; GDW's A House Divided uses a die roll to vary the number of "groups" of units that can move each turn, and West End's Against the Reich and more tactical St. Lo are also variations on this theme. Victory Games' Lee vs. Grant takes the technique to one extreme, in which every unit's movement allowance is determined by -- shades of Battle Cry! -- a die roll (combined with the get-up-and-go rating of its commander).

Tightly interleaved sequences of play can have a similarly befuddling effect on the tabletop commander. In Victory's Panzer Command and West End's Tank Leader pair, leaders of World War II tank units face a combination of random and willful influences on the order in which their various units perform their functions; in the many games with "reaction phases" or the like, players similarly find that enemy actions (or reactions) interpose themselves maddeningly -- and unpredictably -- between their units and their execution of the perfect plan. In Up Front, the random draws from the deck of action cards are sure to force a choice of some options at the expense of others, and to reward the flexible -- or at least patient -- commander. The slew of simultaneous-movement tactical games from the old SPI, of which only Sniper seems to have risen from the ashes in republished form, provoked similar dilemmas when players had to decide whether their opponent was going to move or shoot, and plan accordingly. (These games also introduced uncertainty about the capabilities of your own forces with the concept of "panic," in which each member of your force was subject to sudden free-lancing according to a die roll that varied with the overall quality of the larger unit of which the squad you commanded was a part.)

In all these games, one discovers with unpleasant rapidity that the first casualty of even simulated war is The Plan. Bad luck, or your opponent's lucky guesses, transmogrify your brilliant improvisations into the blunderings of a commander likely to inspire simulated historians to make about you the sorts of piquant observations generally reserved for hereditary monarchs governing in grave crises.

Rulebook tools have in many ways proven the most compatible with more traditional design concepts of all the methods handy to the game designer seeking to simulate some of the uncertainty of warfare: the maps and counters (and the other rules) can remain almost entirely as they would in a game in which the players had perfect knowledge, but the result of the modifications can lead to a whole new wargame. Enterprising players should give serious thought on a particularly rainy afternoon to trying to cobble up some

variation along these lines of a game with which they are familiar but which has lost a bit of its luster.

More narrowly applicable rules sometimes pop up that attempt to graft the effects of limited intelligence onto an otherwise-conventional wargame. In Victory Games' Nth Fleet series (which, now that Seventh Fleet has joined Second Fleet and Sixth Fleet on the shelves, may be a complete series unless one wishes to simulate raids against San Diego or Norfolk), one must roll the proper number on a die before your carrier battle group can fire at the submarine that it can see two hexes away. This is a step towards representing the fog of war, but not much of one. Similarly, games treating the battle of Shiloh, or the 1967 or 1973 Arab-Israeli wars, generally make a nod towards simulating the surprise that the initial defenders felt by imposing some early-turn movement restrictions on the side caught napping or praying. These methods are better than nothing, but generally smell a bit too much of artifice to be very satisfying.

One area where relatively simple changes can have important and realistic effects is one that can literally create a fog over the battlefield: the weather. Many games have rules for the effects of a particular weather condition upon play, but games that create uncertainty about what the particular weather condition will be on a given turn are a bit rarer. The old SPI's War in Europe series had the seasons change according to a rigid and certain schedule, for example, with the result that the German player could spend the final turn of good weather burrowing into defensive positions -- relieving the player(s) from the real-life commander's dilemma about whether to press forward in hopes of continuing clear weather. Fire in the East, in contrast, uses a simple table to generate uncertainty about the change of the seasons. Games simulating ship-of-the-line warfare -- Frigate, Wooden Ships and Iron Men, and Fighting Sail -- similarly vary the crucial blowin' of the wind with a die roll, sometimes literally taking the wind out of the poorly placed commander's sails.

E . Modifying the Map

We have covered virtually the entire range of tools that designers use to simulate the fog of war, and seen examples of efforts to introduce uncertainty about enemy forces, friendly forces, the efficacy of one's own plans, and the weather. We have yet, however, to see a single instance in which the players are presented with uncertainty about the *terrain* in which they will fight. (Simulated seamen and pilot pretenders, of course, may ignore this problem of those tied to solid land and skip ahead to the next section.) Indeed, one quasi-military game about European exploration of the Americas (the now-republished Conquistador) began a few short years after Columbus' voyage but provided would-be explorers, in the form of the traditional terrain map, with full knowledge of every mile of coastline and terrain of the "New" World! Source of the Nile was not a wargame at all, but its designers understood the importance of uncertainty about terrain enough to include grease markers, an erasable map, and what might be called a "terrain-results table" to be used to determine and mark the terrain that each explorer entered in his search for the start of Egypt's life blood. The old SPI's Dungeon of Doom employed a draw of geomorphic terrain chits to introduce terrain uncertainty. Those interested in mucking about uncertainly on battlefields rather than in jungles and dungeons, however, have so far been out of luck.

In light of the importance of uncertainty about terrain in history, this omission seems as glaring as any set of glossy fru-fru pink and baby-blue counters on a shiny paper map. Burnside would have had no bridge named after him if he had ordered a single horseman to ride into the easily fordable Antietam Creek. Many a small-unit action has been won or lost on the basis of who can read their maps better -- or who has the better map. Indeed, the Swiss have a maxim that acknowledges the potential uncertainties about terrain: "When the map and the terrain disagree, trust the terrain."

The grease-pencil or counter-construction methods are appropriate for solitary simulations, but in two-player games such methods would reveal to both sides the terrain that only one side has

passed through or scouted. An alternative is an initially blank map with a "terrain booklet" listing the characteristics of each hex; as players moved their units through each hex, they would consult the booklet to discover its characteristics. They could then place in the hex a terrain counter with the proper marking on one side and their color on the other side, and (only) they could later examine the terrain side to refresh their memory. If both sides' forces had entered the hex, the counter could be turned over. This would be a bit cumbersome, but might well be worth the effort.

Players would suddenly discover that the high speed but low staying power of scouting or reconnaissance units does not make them useless, and that an opponent forced to fight in a poorly scouted area is at a disadvantage. A new terrain listing would be needed for each play of the game, but such information is sufficiently compact that several run-throughs could be provided in each booklet. Alternatively, two trusting players could use a die roll (properly modified to reflect the fact that, for example, one woods hex is likely to be adjacent to other woods hexes) and dispense altogether with the need for a terrain booklet, as Source of the Nile did.

F. The Laws of War

Two other areas of the fog of war that are almost completely neglected in boardgame design deserve some mention: the goals of the enemy and the laws of war.

Because of the fact that victory conditions are known to both players, the wargamer immediately knows the overall intentions of his opponent in all their details -- whether the opponent will have to take the attack, where his geographical focus will be, and what value he places on sustaining and inflicting casualties. History is replete with examples of the opposite type, in which commanders or politicians lack any precise idea of their opponent's aims.

Wargames should provide more often for a die roll at the beginning of the game (recorded by only the rolling player) that

determines the victory conditions for a side, or allow a player to choose his victory conditions from a menu of goals that are equally attainable. One could thereby make unpredictable the degree to which each side must take the initiative, and the costs that it may incur in doing so. If combined with limitations on force location and strength, a player would face nearly the same problems of identifying the enemy's ends and means as real commanders must confront.

An even more fundamental area in which game designs lift the fog of war from the battle area is in the "laws of war" -- the relationships among physical variables that determine the outcome of a given engagement between units. No one knew before the American Civil War or World War I how deadly the rifled musket or the machine gun, respectively, would prove to be on the battlefield, despite pre-war weapons testing. Certainly the French -- and even the Germans -- did not know before World War II how quickly heavily armored units could penetrate, and then move beyond, enemy lines. The games with variable game-turn lengths introduce some confusion into this area, but they do not rise to the level of obfuscating the relative worth of the various arms of combat.

Two more thoroughgoing methods for introducing this uncertainty onto paper battlefields come to mind, though neither one is entirely satisfactory. The first is to provide a variety of combat results tables and terrain effects with each game, with a referee to select and to apply them to the attempted moves and combats of the players. This carries with it the disadvantages of the refereed game discussed above. The second method is to force players to plan their operations over an extended period of time, then choose randomly a set of movement and combat laws, and allow the players some chance to readjust their plans after those plans have been carried out in significant part. This approach requires pre-planning, the disadvantages of which are treated above in the discussion of "controller" games.

One might also take a cue from the fact that one's first play-through or two of a complex game is in some sense the most realistic

in simulating a commander's knowledge about the laws of war: the players do not quite understand the rules of the game those first few times through, and they are likely in retrospect to find many of their decisions based on misunderstanding and poor predictions about the capabilities and interactions of their units. In a game between two careful and trustworthy opponents, one could assign to each player one of several different (but somehow pairwise-compatible) rules governing a particular aspect of play, and do so without the opponent knowing which rule had been assigned to them. To take a relatively simple example, in an operational-level game of ground combat, the two sides might be assigned different combat bonuses for the use of the same amount of close air support, or even required to use more radically different procedures in determining how effective that support is. Indeed, in some instances, one might even be able to assign to the *opposing* player the task of resolving the combat, leaving each player in the dark about how their forces actually function on the attack.

IV. Conclusions

If we compare the factors that contribute to real-life fog of war (see Sec. II above) with the simulations tools that have so far been employed, we find that designers have made significant efforts to simulate the uncertainties stemming from limited knowledge about the enemy's forces -- including blind and double-blind systems, untried units, and variations in the sequence of play. Uncertainty about the environment has been very poorly treated in terms of terrain, but less neglected in terms of weather. Uncertainty about friendly forces exists for a side with untried units and in games with "panic," but the maddening instance where a subordinate is insubordinate -- or just incompetent -- is rarely a possible outcome. The record on the whole is decidedly mixed even when focusing on games that actually make *some* effort to simulate the fog of war.

One can, however, take a bit of comfort from the trend line. Several games released within the past few years -- especially, it

would seem, from West End Games -- have included some serious efforts to reflect at least a single aspect of the fog of war. Columbia Games' Rommel in the Desert actually includes at least two -- unit values and supply -- and arguably even introduces some uncertainty about the laws of war governing combat with an intricate and interactive system of resolving series of battles. Nonetheless, the fog of war is hardly thick over any of the paper battlefields.

There are several explanations for this relative neglect of a factor that actual commanders consider to be virtually the essence of combat. The first is that, despite claims displayed on the outside of the game boxes, many wargamers do not actually play the games in order to place themselves in the boots of a commander. The cutthroat gamers, rulebook in hand, play for the competitive challenge of besting their opponents. Rules simulating uncertainty pollute the purity of the competition by removing absolute control from the hands of the players. Similarly, the armchair historians, footnoted text in hand, play to learn about the forces and terrain involved in the battles about which they read. Rules simulating uncertainty hinder their effort to rehearse what happened.

Those who actually play to get some glimpse of what it was like to be in the saddle or on the bridge or in the cockpit *at the time* may be few and far between. Rules simulating uncertainty help their efforts to find out *why* events transpired as they did, and the loss of control over play in the short run assists them in discovering in the long run what sort of flexibility and confidence a good commander must possess. I encourage such brave folk to scour the countryside for referees, turn their counters over with abandon, roll to see whether their subordinate with political connections can finally muster some military enthusiasm, pray the rains don't come, and fan their scouts out into the unknown countryside or airspace. *And* hope for the day when a two-player, non-computer wargame hits the shelves that actually uses more than a couple of these techniques at once.