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As we now know it, war gaming started in Germany about 165 years ago, where the term *Kreigspiel* was applied to a game played on a map rather than on a chessboard. Here at the Naval War College, war games have been played for just over a hundred years. For the first seventy of those years, games were played on maps or charts or giant plotting boards.

Then in 1958 the Navy installed its first computer game, the Navy Electronic Warfare Simulator (NEWS). The computer was an analog computer and contained a very large collection of vacuum tubes. This system was replaced during the mid-1970s by the Warfare Research and Analysis System (WARS), a digital computer, which was in turn replaced in the early 1980s by another computer system called the Naval Warfare Gaming System (NWGS). Two years ago this system was "enhanced," so the system is now referred to as ENWGS. Similar installations are now operating at the tactical training centers at Dam Neck, Virginia and San Diego. These "host computers," as they are called, are interconnected to four remote sites at the headquarters of the fleet commanders-in-chief and to the Naval Postgraduate School in Monterey, California. One measure of the increased capabilities of succeeding generations of computers is that while the NEWS could track 48 ships or aircraft, its successor, the WARS, could track 300, and its successor, NWGS, 1,000, while the ENWGS can track 2,000.

The year NWGS was installed, 1983, may go down in history as something of a high point in computer war games:

- A movie, *War Games*, was released that year, giving audiences an exaggerated view of a computer war game. The story was based on the premise that a computer game could take over military operations in the real world.
- On television, ABC ran an enactment of a Southwest Asia problem. You might remember it: Edmund Muskie played the president, Clark Clifford played the secretary of state, and James Schlesinger played the secretary of

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defense. This game could really be called a political-military simulation rather than a war game, but it was like a war game, for there was a large staff that provided the players with the basic situation and later with new events and reactions to players' decisions. This television program is used today at the Naval War College to stimulate discussion on problems in crisis management in that part of the world.

- You may remember the novel *Red Storm Rising*, which begins with the Soviet occupation of Iceland. The novel starts that way because in about 1983, Tom Clancy and his coauthor Larry Bond had war-gamed a superpower war in the North Atlantic a number of times as part of their research in preparation for writing the book. They concluded from their war games that the Russians could not win so long as *we* held Iceland. They postulated that the Russians would come to the same conclusion in *their* war games, and therefore they resolved to have the Soviets capture Iceland at the outset of the war in the book they wrote.

At this point, instead of defining for you the term war game, I will illustrate a war game by an example. Before I begin, I should at least tell you what falls outside the definition of war games. I would not include:

- reenactments of battles using miniature soldiers,
- field and fleet exercises using live forces, or
- campaign analyses, which involve calculations of outcomes.

Let me illustrate the term war game by the use of chess. As a game of strategy and tactics, chess has long been associated with warfare, and sometimes it has been used to keep alive the mental skills that are thought to be required for warfare. It was the transition from military chess or war chess, played on chessboards, to games played on maps and charts that marked the start of war gaming in the modern sense.

Suppose we wanted to convert the game of chess into a war game. What changes would we have to make?

First, we would have to decide what objectives the players are to pursue. We could decide to leave the objective unchanged, that is, that each player seeks to attain a position that would threaten his opponent's king. We could give players other objectives—to occupy certain parts of the board, or to capture as many of his opponent's chessmen as possible, for example. And the objectives might not be the same for players on both sides. In any case, these player objectives would become part of the initial disclosure to the players.

We would then have to decide how much information each player would be given. At present, chess is an "open" game, that is, each player has complete information on the location of all the pieces on both sides, and each player can predict the exact outcome of any move where one chessman lands on a square already occupied by an opposing chessman. In a war, neither of these

things is true—it is not always known where enemy forces are, nor is it clear what the outcomes of engagements will be. We mighr therefore consider denying players access to some of the information about the location of their opponent's pieces. We could do this by withholding information from each player about the location and moves of his opponent's chessmen, except perhaps when one chessman captures another or when an opposing chessman is on an adjacent square (if we thought it might be reasonable for real forces to know this). Games where information is withheld from the players would require three separated chessboards—one for each player and one on which the umpires would keep track of "ground truth." Computers can be used to maintain this ground truth for umpires, and to disclose portions of it to players.

In chess, each player controls his chessmen directly. In real life, commanders at the upper end of the chain of command exercise their control over the equivalents of chessmen—ships, planes, tanks, infantry battalions—through subordinate commanders. Players could be made to exercise control of their forces indirectly rather than directly. Thus, in a war game, players might be able to task directly only two subordinate task force commanders, each of whom might have direct control over, say, one bishop, one knight, one rook, and two or three pawns. The game would then reflect a chain of command approach, and would require players to get their decisions executed through umpires acting as their subordinate commanders.

Most of the rules of chess deal with the movement of chessmen. The relative strength of chessmen is reflected in the range of movements they are able to make. In a war game, the movement and strength of forces are constrained by rules based on the capabilities of real-life ships, aircraft, and ground forces, reduced if appropriate by the effects of weather, terrain, and damage previously suffered. Hence, we might want to adopt special rules of movement; and we might want to depart from the conventional rule that when a chessman moves to a square occupied by an opposing chessman, it "captures" that opponent. We might prefer a rule that would resolve these engagements in a different way, taking into account the relative strength of each chessman, and perhaps providing some edge to the chessman exercising initiative (to the extent that we believe that exercising the initiative confers an advantage in a real battle). We might, for example, adopt a rule that if a bishop moves onto a square occupied by an opposing pawn, the probability that the bishop will capture the pawn is 85 percent, while the likelihood that the pawn will capture the bishop is 15 percent; but if the pawn moves onto a square occupied by an opposing bishop, the pawn will capture the bishop 40 percent of the time, and be captured by the opposing bishop 60 percent of the time. (Umpires are able to convert such probabilities into yes/no decisions for discrete events by pulling a number from a table of random numbers from zero to ninety-nine. If the random number drawn is less than

the probability number, the event is judged to have taken place; but if the random number is equal to or greater than the probability number, the event is judged not to have happened.)

Sets of Rules

As you can see, a war game requires at least five sets of rules:

- Objective Rules, by which the performance of players will be judged.
- Knowledge Rules, that determine how much information will be made available to players, both initially and during play.
- Execution Rules, that describe whether the pieces on the board are to be controlled by the players directly, or indirectly by umpires acting on behalf of players.
- Movement Rules, that tell the players when they may move, that describe the mobility of their units, and that identify which factors might reduce mobility.
- Engagement Outcome Rules, that govern how umpires or computers determine the outcomes of interactions or how—in some seminar games—players are expected to reach a consensus on the outcomes.

Game Design

There are some choices that need to be made before a war game can be designed.

First, there is the purpose for which the game is to be played. Some games are played for educational purposes: to provide players experience, to develop their skills, or to provide them insight about the dynamics of combat. Other games are played for research purposes: to analyze a concept or validate a plan. The sponsor of the game determines the purpose for which a game is to be played and such other details as:

- The number of sides. In one-sided games, the opposing side is played by someone in the control group; in a two-sided game there are players on both sides.
- How much information will be made available to players, i.e., whether the game is to be open (like chess) or closed (like poker, where some of the information is withheld).
- The level at which the players will act—tactical, theater, or strategic.
- The level at which the interactions will take place. Will the pieces on the board (used by umpires to establish results) be individual aircraft and ships or will they be entire task groups?
- Whether outcomes will be assessed in a top-down fashion, where umpires will decide first on the major results and then work out details, or in a bottom-up method, where small interactions will be assessed first and

then aggregated. Human umpires are able to assess in either fashion, but computers tend to be better at making bottom-up assessments.

During a lecture at the War College in 1960, Admiral Nimitz remarked that "the war with Japan had been reenacted in the game rooms at the 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 towards the end of the war; we had not visualized these."

In a letter to the War College president five years later, Admiral Nimitz wrote that "nothing that happened in the Pacific was strange or unexpected."

These statements are a heavy burden to carry, because war games are not really intended to be predictions of future events, but as the admiral pointed out, they can reduce surprise.

War games here from 1919 to 1941 deserve some special comment. It is possible to trace the evolution in U.S. naval thought during those years by noting that during the annual war games, the naval officers that played them:

- shifted from the view that a war between the United States and Japan would last only for 60 to 90 days to a view that such a war might last from 3 to 5 years;
- shifted from the view that such a war would be mainly a fleet transit followed by a fleet action to the view that successive amphibious landings would be required and so would a logistics buildup that was until then unimagined; and
- shifted from believing that such a war would be decided by a decisive fleet action to a realization that such a war would end as a result of a sea blockade of Japan combined with an aerial bombing campaign.

Early classes at the Naval War College devoted much of their study time to developing a war plan against a specific country. Each country had a color—the United States was always Blue, Japan was Orange, and the first Orange plan was written before World War I. War games based on Orange plans were played very often in the 1920s and 1930s, but so were games based on Red plans (against Great Britain), Black (against Germany), or Silver (against Italy). A number of games since World War II have been played by students and others with the Soviet Union as the opposition. Such games have been set in the Norwegian Sea, the Eastern Mediterranean, the Northwest Pacific, and the Indian Ocean. The Maritime Strategy is the modern equivalent of the Orange plan, and the color Orange—no longer referring to Japan—is often the color of the major opponent, while Blue remains the color of the home team.

Each summer for the past eleven years, a superpower war called the Global War Game has been played, usually for three weeks, at the Naval War College. It is a two-sided game, and most of the players come from Washington and the major unified command headquarters around the world.

For a five-year period, 1984-1988, the game was continued from year to year, so the war, in effect, lasted 10 or 11 weeks. (Some overlaps account for the game not having progressed further.)

In a manuscript published by the U.S. Army's Historical Division in 1952, a German general, D. Rudolf Hofman, reports an example of a war game becoming reality in early November 1944. Field Marshal Walther Model was conducting a war game at his headquarters to explore with his major commanders the defensive measures that they might take against a possible American attack along the boundary between two German armies. During the game, which was a map exercise, the players received word that the 28th Division of the U.S. Fifth Corps had indeed attacked. Model ordered the war game to continue, but to use actual reports as additional game disclosures. Within a few hours, the situation both at the front and in the map exercise became so critical that Model's reserve, the 116th Panzer Division, was committed. The division commander, who was playing in the map exercise, received his orders directly—first from the army group commander, then the army commander, and then the corps commander, all of whom were also players at the game. The division commander set his division into motion in the shortest conceivable time, and in the event the attack by the U.S. 28th Division was repulsed.

One aspect of war gaming that deserves consideration is the question of who should "play" the opposition. There are two schools of thought. One is that for educational games, it is all right to have some U.S. students play the opposition because by doing so, they will come to appreciate the capabilities and limitations of opposition forces. The second view is that a U.S. player playing opposition forces will probably make his decisions like a U.S. player, but it is important that students playing Blue confront an opposition player who is closer to what the opposition would really do. Therefore, a Naval Operational Intelligence Center Detachment has been formed here to play the opposition in most war games. The members of this detachment try hard to give the players a true representation of the way the intelligence community feels that the Soviets (or other game opponents) will operate their forces.

Nowadays we have computers to support war games at several levels of interaction. Ships have a computer game call Navtag (for Naval Tactical Game) to sharpen the tactical skills of surface warfare officers—usually in simulated close tactical situations between U.S. and potential enemy ships and aircraft. The war-gaming computer here and at the tactical training groups can play more units than Navtag can, but they are still played at the detail level: individual ships and aircraft, together with their weapon systems, including individual missiles and torpedoes.

At the highest level is a computer called the RAND Strategy Assessment System that for ground warfare uses entire divisions as the basic pieces on

the board. The game was developed only after computer programs had been developed to play the roles of policymakers of the Soviet Union and the United States, each in a doctrinal way, using programs called Ivan and Sam. After Ivan and Sam were developed, it was discovered that no computer game existed where the forces were aggregated at a high enough level, so the RAND game was developed.

Recreational computer games seem to be useful for educational purposes, but they do raise the question as to whether the extent of the game designer's wisdom places a ceiling on how much a player can learn. I am inclined to think that players can really learn more than the designer put into the game, but this may be a controversial view. We have experimented a little with such games. While some are based on past battles or current military situations set, for example, in the North Atlantic and using relatively simple models, others are more abstract. One involves the capturing of flags and will play an opposition that replicates the decision-making style of Napoleon, Genghis Khan, Clausewitz, Sun Tzu—your choice.

What conclusions can be drawn from all this?

First, the great utility of gaming is that it permits us to see events "longitudinally," that is, to follow a long sequence of decisions and actions in a way that our minds are usually unable to grasp without some such aid.

Second, gaming can undermine one's sense of the inevitability of historic outcomes—that the British will always win at the Falklands, that the Soviets will always back down in a Cuban Missile Crisis, and so forth. At the War College some of the games are played ten to twelve times. Starting from the same initial disclosure, using the same forces, playing by the same rules, often with the identical umpires in opposition, the games result in widely varying outcomes. During these games we can sometimes sense the shift in momentum, the different turning points, and realize that history is only one pass through events; there could have been many other outcomes, things could well have turned out quite differently.

Third, the value of computers in war gaming is not entirely clear. Computers are indeed proving useful by keeping track of things, by generating graphic displays, and by saving calculation time, but they can also consume a lot of time for inputs. They also allow us to restart or repeat scenarios and give us an ability to do some reconstruction of actual engagements. The speed and repeatability of computers can be very useful. But we are stuck with whatever limitations exist in either the data or the programs, and there is an understandable uneasiness that we might not agree with the data or programs if we ever really learned everything they contain. These problems are not dissimilar from problems of computer applications generally. The real concern about computers, I suppose, is that they drive us into details. A great deal of effort is often made to achieve "fidelity" between the capabilities

of forces being played and the capabilities of real forces. Yet much more variability exists in the way that decisions are being made at the several levels and on both sides.

Finally, and this should be no surprise, human beings still dominate in war gaming—people are the players, people are the umpires, and people program the computers. The psychology of combat—the determination and leadership of commanders at all levels—really determines outcomes. Good war games emphasize these factors. A war game is, after all, a bit of theater. A good umpire will make reports to the players that emphasize uncertainties. I once overheard an umpire reporting to the players in the landing force commander's cell as follows: "My company commanders keep reporting that they're being shot at by some 155's. I don't know, shells always look bigger when they're coming at you. Anyway, that's what they're reporting."

Let me close by quoting from Stephen Vincent Benet's *John Brown's Body* on the difference between war games and real war:

If you take a flat map
And move wooden blocks upon it strategically,
The thing looks well, the blocks behave as they should.
The science of war is moving live men like blocks.
And getting the blocks into place at a fixed moment.
But it takes time to mold your men into blocks
And flat maps turn into country where creeks and gullies
Hamper your wooden squares. They stick in the brush,
They are tired and rest, they straggle after ripe blackberries,
And you cannot lift them up in your hand and move them.
—A string of blocks curling smoothly around the left
Of another string of blocks and crunching it up—
It is all so clear in the maps, so clear in the mind,
But the orders are slow, the men in the blocks are slow
To move, when they start they take too long on the way—
The General loses his stars and the block-men die
In unstrategic defiance of martial law
Because still used to just being men, not block-parts.

This article is adapted from a talk given by Captain Snyder to the Quindecim Club of Newport, Rhode Island on 21 March 1989.