2001

Global 2000

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The focus of the twenty-second Global Game, played at the U.S. Naval War College in the summer of 2000, was to explore ways to implement network-centric operations.[1] Since its inception in 1978, the annual Global Game in Newport, Rhode Island, has been among the preeminent analytic resources of the U.S. national security community. Throughout its history it has represented "an opportunity to investigate ideas and concepts that may vary from current strategy or policy wisdom."[2] From its inception, the game series has confronted defining issues: the first five years constituted a "test bed or crucible for an emerging maritime strategy," a strategy that was to be the U.S. Navy's fundamental concept of global warfare until the dissolution of the Soviet Union.[3]

Global 2000, conducted by some six hundred invited players and guests, plus gaming staff, in the College's new McCarty Little Hall from 14 to 25 August 2000, grappled with an issue—network-centric warfare—no less crucial to the Navy's future than was power projection in 1978–83, and it focused upon an "emerging" document likely to shape the twenty-first-century Navy as fundamentally as did the Maritime Strategy the fleet of the 1980s and nineties—the *Capstone Concept for the Navy after Next*, being prepared by the Navy Warfare Development Command, Newport, Rhode Island. This article will examine the observations that emerged from that exercise, the directions further research should take to assess those observations, and some more general issues that arose concerning the gaming of futuristic operational concepts and combat systems.

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CONCEPTS AND PURPOSES

"Network-centric operations" are military activities undertaken by forces that are thoroughly interconnected, or netted. Such interconnection permits complete and rapid sharing of information, plans, and assessments. Given a fully functioning network, what one part of the force "knows" about the adversary or battlespace, the entire force knows; what one part "sees," all parts see; and what one part "thinks" is available to the whole force. This is not simply a matter of efficiency and convenience: the anticipated payoffs include greatly accelerated and rapidly adaptable military operations, indeed to such an extent as to render an adversary effectively paralyzed, "locked out" of the battle. Today, however, theater-level analysis of network-centric operations is at a rudimentary stage. Much has been written characterizing these operations, in a variety of aspects, but relatively little empirical data has been produced with which to test these predictions.

Global 2000 was intended to help meet that need. For this purpose it was necessary to permit as full an exploration of network-centric operations as possible. Therefore, the game design deliberately excluded almost entirely the political constraints that in the "real world" would almost certainly not allow network-centric operations to take their own course unchecked. This lack of constraint is clearly unrealistic, but it was a necessary "laboratory condition" if the game was to help players and analysts understand the full array of phenomena associated with network-centric operations. For example, the game-control cell permitted network-centric operations to set their own pace—which was as rapid as possible—even though in a more realistic framework a "national command authority" cell would have slowed the pace of events. Further, in Global 2000 the National Command Authority permitted BLUE—in effect, the United States and its allies—to strike a broader range of targets than likely would have been authorized. Most important, the game controllers permitted BLUE to behave much more aggressively than would have been the case in the "real world." These features of Global 2000 were deliberate and necessary artificialities, and they *in no way reflect* current U.S. policy or expectations of future intentions.

Global 2000 sought to address (but surely not completely) two primary questions. Will network-centric military operations in fact speed military operations, as predicted? If so, how will commanders and their staffs manage this increased tempo, and how will they employ the information network connecting the force elements?

The game also explored the "pillars," or "subconcepts," of network-centric operations, as described in the draft *Capstone Concept*: information/knowledge advantage, assured access, effects-based operations, and sea basing. *Information/knowledge advantage* is a prerequisite for effective network-centric

operations—achieving, defending, and using a superior capability to collect information and draw operational inferences from it. This advantage lies at the heart of the benefits expected from network-centric operations; for this reason, adversaries can be expected to attack it and to defend their own information. That raised a further question to be explored by Global 2000: Will the value of information produce a "fight for information" in future military campaigns, and if so, what can be said about the conduct of that fight?

Assured access refers to the ability to operate in any ocean area or airspace, when necessary, at an acceptable cost. The concept does not imply that the U.S. Navy must be able to place high-value combat assets anywhere, at any time. Rather, it means that the Navy must be able to conduct its missions wherever it needs to at a given time. The Global 2000 scenario required BLUE to gain assured access to a heavily contested, confined body of water near an adversary; as a result, the gamers were able to explore a further specific question: What concepts of operations and platforms would be most useful for assured access?

> *Information tends to be a wasting asset: the greater one's information advantages, the greater the incentive to exploit them before they diminish, then vanish.*

Effects-based operations, of whatever size, are planned and executed so as to produce, if indirectly, particular desirable reactions. Such enemy reactions may range from sending forces in certain directions to shutting down segments of air defense systems, even to suing for peace. The purpose of conceiving military operations in terms of their desired effects is to deemphasize preoccupation with massive physical destruction of the adversary. Inducing desired effects may involve the integration of several tools, such as information operations, deception, movement, and timing, in addition to attacks upon targets. Even for physical destruction itself, effects-based planning calls for careful choices of precise targets in order to induce particular responses. This often requires painstaking analysis of an adversary's values, culture, processes, and politics, so as to hit the points, of all kinds, that will have the desired effect, and no others. The related question explored by Global 2000 was: Will effects-based operations produce military campaigns noticeably different from those conducted along more traditional lines? If not, does the concept contribute materially to advancing U.S. thinking about warfighting in general, and network-centric operations in particular?

Sea basing is a concept by which military expeditions would be conducted from the sea rather than from land bases in a theater. It recognizes that in the future land bases may be either denied politically or vulnerable to attack, especially by missiles and weapons of mass destruction. The concept argues that

the United States must reduce its expeditionary "footprint" on land, particularly that of ground forces and logistical support, by basing as many military functions at sea as possible. Global 2000 was designed to explore sea basing in general, and in particular a hypothetical large and very fast logistics ship known as the "Theater Support Logistics Vessel." The question on sea basing examined in Global 2000 was: How and to what extent would ships with the characteristics of the hypothetical Theater Support Logistics Vessel affect the Navy's sea-basing capabilities?

SCENARIO AND GAME "FLOW"

The scenario for Global 2000 placed the players in 2010. Between 2000 and 2010, it posited, a technologically advanced adversary (RED) had become increasingly willing to use military force to resolve its national security concerns. One such concern was a border dispute with BROWN, an ally of BLUE. BROWN's vigorous economy and self-confident society made it a potential regional competitor, from the viewpoint of RED, which had ultimately decided to head off this eventuality through military aggression. RED's primary objective was to disrupt the treaty obligations between BLUE and BROWN, eliminate the basing of BLUE forces within BROWN's territory, and remove BLUE's military presence from the region.

As diplomatic relations with BROWN grew contentious, RED adopted a military strategy that included a series of annual "active defense" training exercises, beginning in 2007. RED intended to use these exercises to cover the logistical and operational preparations for an attack on BROWN. A BLUE-led coalition, along with BROWN and GREEN (a neighboring island nation), responded, beginning in 2008, by monitoring RED's exercises. For two years, these exercises and monitoring deployments were conducted without incident. In 2010, however, RED intended to initiate its long-planned assault upon BROWN, under the cover of its usual exercise. Its plan was to launch a limited but swift surprise attack with air and ground forces. RED intended, after the speedy seizure of secure enclaves inside BROWN, to halt and call for negotiations leading to mutual RED and BLUE withdrawals from BROWN and termination of BLUE-BROWN treaty arrangements. RED calculated that it could deter BLUE intervention, or make it excessively costly, by controlling sea and air access to BROWN and by destroying valuable and politically salient portions of BLUE's forces, such as capital ships.

BLUE had developed a three-phase campaign plan against such a contingency. Its first element was Operation OVERWATCH, which would emplace (as part of a BLUE coalition exercise) an "expeditionary sensor grid," a sophisticated netted collection of sensors, and then use it, when ordered, to gather targeting information on RED invasion forces. BLUE thus placed early priority on gaining the information advantage it would need to employ a network-centric strategy successfully. In

OVERWATCH, BLUE planned to establish and operate a robust C4ISR* architecture to help create and maintain a *common operating picture* of the key movements of RED forces. BLUE forces could then "network" to share information and collaborate in real time.

The second phase of the BLUE campaign plan was OVERKILL, operations against RED offensive capabilities—even if that meant firing first. In the event of hostilities, BLUE commanders were also, under this heading, to defend BROWN and to take appropriate force-protection and power-projection actions.[4] Moreover, BLUE would try to ensure access to the operating area by eliminating havens or sanctuaries from which RED might operate. The third element was Operation OVERWITH—counteroffensive operations to eject RED forces, should they invade BROWN territory; to restore the previous border between RED and BROWN; and to reestablish freedom of navigation in territorial waters.

On the basis of Global 2000, it would be hard to claim that effects-based operations look appreciably different from current U.S. military practice.

When the game began, OVERWATCH had been initiated; in the course of game play that phase was carried out successfully, in spite of early attempts by RED to attack the expeditionary sensor grid and inhibit BLUE's ability to profit from the information gathered. That information pointed increasingly to the imminence of RED offensive incursions into BROWN; in response, the BLUE National Command Authority approved a transition to Operation OVERKILL—large-scale operations against RED's offensive forces and infrastructure—before RED had attacked BROWN or even seriously contested BLUE's presence in the area. The BLUE political leadership based this decision on its judgment that there existed "unambiguous warning" of RED's intent to strike BROWN.

OVERKILL severely disrupted RED's planned actions and greatly weakened its assault but did not, in the event, prevent it from occupying a portion of BROWN or from delivering serious attacks on BLUE sea and air forces. Still, BLUE losses were not large enough to diminish significantly its ability to protect BROWN. BLUE accordingly began Operation OVERWITH, ground operations supported by joint and coalition air, maritime, and special operations forces. The counteroffensive incorporated high-speed maritime logistics ships and other advanced sea-basing concepts. Game controllers halted play when it was clear that RED's enclaves within BROWN were about to be eliminated.

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* Command, control, communications, computers, intelligence, surveillance, and reconnaissance.

OBSERVATIONS MERITING DEVELOPMENT

Traditionally, the Global series has served both training and research objectives. With respect to the former, it has provided senior officers, particularly those of the Navy, opportunities to become familiar with futuristic systems and operational concepts, as well as with likely aspects of potential political-military crises. The participants reported that Global 2000 performed this function well, through its focus on network-centric operations and the four supporting pillars of that concept.

We must be cautious, however, in evaluating the performance of Global 2000 as a research tool. So elaborate a war game can be held only once per year. We must be especially careful not to generalize from a single game—the behavior of one set of players in the context of one scenario—to broad conclusions about the value of particular systems or concepts. War games seldom produce firm "findings," and that is particularly true of large, elaborate, infrequently played games like the Global series. Instead, Global 2000 can best be viewed as a source of observations about systems and concepts, observations that should be tested and assessed by careful and detailed analysis.

Information/Knowledge Advantage: Obtaining Information

The expeditionary sensor grid was the single most important "force multiplier" possessed by the BLUE players. That complex system of netted sensors provided them with plentiful, targeting-quality data about RED's order of battle, dispositions, and movements. In fact, the grid was largely responsible for the fact that the BLUE strikes against RED's preparations for invasion of BROWN inflicted disruption from which RED never recovered. Both RED and BLUE understood, if not fully, the advantage conferred by the grid's capabilities. As a result, the first salvo of the game involved RED attacks on the grid and BLUE operations to defend it. It can be truly said, therefore, that the first battle of the campaign was fought over information. That battle lasted throughout the campaign, concluding only when the game itself did.

The important issue that arises is how best to conduct this battle, and a general observation upon it seems in order. The process by which information is gained, used, defended, and denied has grown increasingly important and complex. We can expect this trend to continue as the information-related military capabilities of the United States grow and its operational concepts become concomitantly dependent on information superiority. This suggests that the fight to obtain and protect information superiority cannot be consigned to an annex or tab of a military campaign's operational plan, as it so often is today. Rather, it will have to be viewed as a distinct aspect of the campaign, needing doctrine, tactics, techniques, and procedures of its own. These are now very rudimentary,

if they exist at all. The details of the "fight for information" represent an excellent candidate for intensive follow-on research.

Information/Knowledge Advantage: Managing Information

Information, once collected and defended, must be exploited properly if it is to be of value. "Exploitation" is the process of assessing information and disseminating it in usable form to the entities requiring it, all within appropriate time limits. Global 2000 experimented with this command-and-control process, in part by providing players with computers (linked in a "game internet") and software by

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which information could be readily shared and moved. Players were free to post on-line whatever they felt was useful and were similarly free to retrieve anything that had been posted. Their actual use of this capability was interesting and revealing in several ways.

First, players very quickly began using the game internet with great intensity. Within one hour of the game's start, the available bandwidth was being regularly saturated, causing the technical performance of the network to deteriorate. Analysis showed that players posted information virtually without restraint, even large data files and graphics-rich briefings and articles. Usage rules soon had to be imposed to prevent the system from becoming unusable. Second, the players were unable to assess the validity of posted information. Communications, messages, and information could be edited freely, by anyone, and then reposted; amended versions quickly proliferated. Postings intended to be directive—as commander's intent, rules of engagement, and even direct orders—quickly became ineffectual, as players lost the ability to determine which version was authoritative. Third, players were able to use effectively comparatively little of the power of the software provided to search the net, display information in revealing ways, and process data. This was particularly true of commanders, who had difficulty moving quickly from one item of important information about the battle to another as the campaign progressed.

Many discussions of network-centric warfare have conveyed visions of a command-and-control structure akin to the civilian Internet. They presume that the natural creativity, spontaneity, and adaptability of war fighters can be unleashed by freedom from constraint analogous to that of the civilian Internet in commercial settings. No such vision was realized in Global 2000. The difficulties the players encountered may well not have been artifacts of this particular game; it should not be surprising that the civilian model of a network may not be transplantable directly into the military domain. The World Wide Web leaves

it to individual users to form their own opinions as to the accuracy of information they find there; military users have neither the time nor the resources to do so—yet the stakes for military users are quite high. The Web contains search engines; the Global game net, at least, did not. World Wide Web users often are not under time pressure; military users generally are.

For these reasons, it is hard to avoid the suspicion that whatever form a military operational net might take, the information it contains is likely to require considerable structure and "predigestion." Doctrine will also be necessary to impose constraints on who can use the military net, where, when, and for what. The rights to post and edit will have to be limited to prevent the loss of "configuration control" observed in Global 2000. In sum, Global 2000 suggests that command and control using information networking will require a new body of doctrine, akin to that developed for traditional command and control. If so, it will be no trivial matter to balance the power of netted collaboration against the need to impose more traditional discipline.

In a similar vein, the difficulties encountered by commanders in managing and focusing the flow of information to and from themselves suggest the need for a new staff function—the knowledge manager. In Global 2000, individuals were placed in each game cell to help players, especially commanders, cope with the command and control network. These individuals, all civilians, succeeded to varying degrees; it became quite clear, however, that the knowledge-management function was much needed. Precisely how that service should be provided is an open question. Should the individuals be military staff officers or civilians? Should they be primarily war fighters or technical specialists? Should they be simply "consultants" or the commanders' alter egos? These issues are already being grappled with today by the new and growing knowledge-management community.

Information/Knowledge Advantage: Sharing Information
Part of the command and control capability supplied to BLUE was the "common operating picture." In physical terms, the common operating picture was represented in Global 2000 by a collection of video monitors, known as "the Knowledge Wall," displaying the status of different military functional areas—logistics, theater air and missile defense, intelligence, surveillance, reconnaissance, and the like. At the center of this display were two large monitors showing the entire theater and the locations of various BLUE and RED units. Icons on all displays could be "clicked" upon for more detailed information. In principle, the BLUE commander and staff members could use the Knowledge Wall simultaneously and independently, as dictated by each individual's needs.

In actual utility the Knowledge Wall fell short of the ideal, for reasons consistent with the information-related problems already discussed. The BLUE players did not need all the information the Wall provided, and they had difficulty weighing its validity. The forms in which information was conveyed were often not transparent or intuitive. The players did not have the time, training, or patience to sift the wealth of information on

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the Knowledge Wall to find "nuggets" of value to them. Like other facets of network-centric command and control, the Knowledge Wall seems to have called for structure, constraint, and discipline. Again, the problem is how to provide those things without destroying the collaborative, horizontal, and largely unimpeded transfer of information that lends such revolutionary power to modern information technology.

Assured Access: Exploiting Information

The value of knowledge can be a function of time. Some knowledge may seem virtually eternal—for example, philosophic truths. But information about a military adversary has value only so long as the information is current and relevant. For example, a vulnerability is not likely to exist indefinitely. The enemy may become aware of it and correct it. Also, a vulnerability may be the transient result of a particular sequence of events—when that sequence ends, the vulnerability disappears. Specifically, adversaries preparing attacks often incur the vulnerabilities of concentration as their forces mass together; this vulnerability is alleviated when the forces disperse, perhaps during the attack itself.

Precisely this vulnerability presented itself to BLUE as RED built up forces for the incursion into BROWN. RED accepted this vulnerability in part because hostilities had not begun; it did not believe that BLUE could detect and target the massing forces.[5] RED's calculations proved incorrect on both counts. The expeditionary sensor grid enabled BLUE to detect and target RED's forces, to a considerable extent. It allowed BLUE to perceive not only that an attack was imminent but also that some elements of the RED force would disperse prior to the attack, thereby becoming less vulnerable. It was for this reason that BLUE attacked when it did, while the RED forces were still concentrated. Strictly speaking, therefore, it is correct to say that BLUE was the first to attack massively the military capabilities of its adversary—though RED was in the process of "pulling the trigger."

The larger issue raised here is straightforward: Will U.S. forces have the freedom of action to exploit their information advantages? The easy answer, of course, would be, "It depends." Is the nation in the midst of a conflict, or does

exploiting the information advantage entail preemption? How great are the benefits of acting first? How durable are those benefits? What responses are available to the adversary? What opportunities are open to the adversary to escalate? And, of course, what are the political implications?

Though the specifics depend on the situation, it is reasonable to suspect that the broad pressures to act early felt by BLUE in Global 2000 were "real" and not game artifacts. Information tends to be a wasting asset: the greater one's information advantages, the greater the incentive to exploit them before they diminish, then vanish. Not to act would waste the investment made to obtain the information advantage in the first place—and that investment is likely to have been considerable.

Yet the operating environments of U.S. military forces often include restrictive rules of engagement and formidable reluctance by the national command authority to permit early or independent action, and that state of affairs is likely to continue. Precisely that sort of tension developed in Global 2000 between the game political leadership and the theater military commanders, even with the artificially relaxed political constraints. The dimensions and details of this problem represent a fertile area for further research. In particular, ways of developing more flexible rules of engagement are being actively explored and will be part of Global 2001. The stakes are high; much of the operational advantage gained by network-centric operations could be thrown away by strategic-level caution, delay, or inaction. Yet such "friction" at the strategic level may be the unavoidable result of coalition or alliance influence. Coalition partners frequently find the United States too eager to act quickly and decisively, and they typically require restraint as a condition for participation in coalition operations. In such a case network-centric warfare could never achieve full expression. There may be no real solution to this problem, but we must thoroughly explore it before accepting that pessimistic conclusion.

Effects-Based Operations

Analysts of effects-based operations often assert that massive physical attacks are not a particularly potent way of creating effects with respect to an adversary's perceptions. Whether that is true or not, effects-based operations do involve the precise control, direction, and focus of force in time and space. Frequently the concept is contrasted with "attrition-based warfare," which conjures up images of massive, indiscriminate, industrial-style onslaughts.

In Global 2000, the players were made aware at the outset that effects-based operations constituted a focus of the game. The extent to which players actually undertook them, however, is unclear. Certainly the language of effects-based operations was spoken often by commanders and staff members; planners were

ordered to design campaigns with the aim of producing specific effects. There was, however, no common understanding of what effects-based operations entail and how to go about them. Some players envisioned influencing the adversary's highest leadership—a strategic-level definition; others applied it to the RED operational commanders; some used the term to connote information operations; yet others conflated the concept with "signaling," using force for symbolic and demonstrative purposes. This diversity of views was aggravated by time pressure and the absence of straightforward ways to link BLUE options with specific effects on RED.

In the event, though BLUE's operations were not indiscriminate, they were massive and directed to the physical destruction of RED; it would be difficult to distinguish the aim points of BLUE weapons in Global 2000 from those of the weapons actually launched against Iraq a decade earlier. In sum, simple knowledge of a concept called "effects-based operations" was widely shared among the players. Much less widely shared was an understanding of what the concept entails. Finally, on the basis of Global 2000, it would be hard to claim that effects-based operations look appreciably different from current U.S. military practice.

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The research implications of this experience may be hard to implement. First, greater effort is required to clarify what effects-based operations are intended to be and how they differ from past practice. Second, research is badly needed to evaluate whether or not the theory of effects-based operations can be concretely applied in a campaign. In other words, do effects-based operations actually exist in a way that can be reliably operationalized? There is no doubt that some military operations have had effects on the enemy well beyond the physical destruction inflicted—the 1942 Doolittle raid on Japan is an example; the 1968 Tet offensive of the Vietnam War is another; so are the 1983 Beirut bombing and the events of 1993 in Somalia. The problem facing American planners is how to convert knowledge that such operations are possible into a reliable, predictable, and controllable tool for directing U.S. military force.

Sea Basing

Global 2000 was not designed to generate information sufficiently detailed to bear on platform design or choices among alternative platforms. That said, the game included a notional platform, the Theater Logistics Support Vessel (TLSV). This ship was defined only in a general way, as a large catamaran of advanced design capable of high speeds (forty to fifty knots) in the open sea and of very

quick loading and unloading. Like the expeditionary sensor grid, the Theater Logistics Support Vessel had a considerable effect on BLUE's ability to respond quickly to RED's attack on BROWN.

Specifically, the TLSV permitted BLUE to implement what is described in *Joint Vision 2020* as "focused logistics." Its speed and capacity allowed it to make numerous round trips between logistical centers and deployed ground and air forces in the same time a conventional logistics ship needs to make just one. As a result, BLUE was relieved of the necessity to project logistics requirements far ahead, and in turn, logistical stocks in the field could be substantially reduced or eliminated. The players described the approach as close to a "just-in-time" supply organization.

The speed of the TLSVs was also used to offset the problems arising when events caught a maritime prepositioning ship out of position. The BLUE commander was able to offload the prepositioning material to TLSVs, which quickly delivered it. As a result, ground operations could begin sooner than would have been the case had BLUE been compelled to wait until the maritime prepositioning ship could steam to the theater.[6]

Finally the speed of the Theater Logistics Support Vessels provided greater protection from submarine attack, in two ways. First, submarines had difficulty achieving good positions for torpedo shots (though, of course, speed was no defense against antiship missiles). Second, BLUE antisubmarine warfare forces could sweep submarine-free channels more effectively, because the TLSVs could traverse them so quickly thereafter; with slower-moving ships, submarines might have been able to reenter the cleared lanes in time. For the same reason, the swept zones could be narrower.

Much research remains to be done, however, before a Theater Logistics Support Vessel as hypothesized by Global 2000 can be seriously contemplated by the Navy. Initial assessments will focus on how Navy and Marine Corps force structure and deployments could be affected by them. If these studies and rough order-of-magnitude costing prove encouraging, more detailed analysis could be undertaken.

BALANCING CONSTRAINTS AND OPERATIONAL FREEDOM

To begin, we must again emphasize the limits of any single war game: these observations arising from Global 2000 must be viewed as tentative, fragile, the merest beginnings of further investigation. But they are nonetheless important and interesting. They all address major dimensions of network-centric operations; they are all plausible; and none can be easily explained away as a game artifact.

If a theme connects most of the observations, it is that modern information technology and current concepts for its use did not free the Global 2000

participants from the need for certain traditional constraints, at least not to the extent envisioned in theoretical discussions of network-centric operations. If a single challenge emerges, it is how to capture the predicted advantages of information-rich environments while avoiding the problems observed in Global 2000. Specifically, netted command and control still seems to require a doctrine that limits the ways the net can be used, what can be introduced into it, and who can alter what is already circulating. Further, a common operational picture does not in itself enable the parts of a force or staff to regulate themselves; some shaping and filtering of the data in that common operating picture is still required. (These are substantial problems, but certain allowances must be made at this early stage for "experimental technique." First, the Global 2000 players may not have fully understood how to exploit the command-and-control capabilities at their disposal. They received instruction in the use of the netted command-and-control system, but one cannot expect that to offset twenty-plus years of experience in traditional modes. Second, the netted command and control provided in Global 2000 may have been poorly designed. Third, the predicted advantages of netted command and control may be overoptimistic, however effective a system and proficient its users. Global 2001 will focus on sorting out these factors.)

In addition to command-and-control issues, Global 2000 exposed tensions between the desires of theater war fighters to exploit information superiority rapidly and decisively, and those of the national command authorities and their coalition partners to proceed more cautiously. Further research will have to focus on when and how information superiority can and should be converted to operational advantage in politically complex environments. It seems likely that potential benefits of information superiority may not be exploitable under certain circumstances. In any case, how can such advantages be measured?

Finally, though it is not an issue directly related to the use of information, the concept of the high-speed logistics ship deserves further examination. It is unusual for the very existence of a single platform to have such a tangible impact on so large an exercise; this fact alone justifies more detailed study.

NOTES

1. The Navy Warfare Development Command in Newport—which prepared the document adopted as the Global 2000 conceptual framework—uses the term "network-centric operations" to subsume the more familiar "network-centric warfare" as well as settings other than warfighting. For both concepts, see George Kasten [Capt., USN], "Building a Beehive: Observations on the Transition to Network-centric Operations," *Naval War College Review,* Autumn 2000, pp. 127–40; Edward A. Smith, Jr., "Network-centric Warfare: What's the Point?" *Naval War College*

Review, Winter 2001, pp. 59–75; and the references of both these articles.

2. Bud Hay and Bob Gile, *Global War Game: The First Five Years,* Newport Paper 4 (Newport, R.I.: Naval War College Press, 1993), p. vii.

3. Ibid. *Global War Game,* by two figures prominent in the history of the series, examines the purposes, courses, outcomes, and lessons of its earliest games. Throughout the Cold War the series was known as the "Global War Game."

4. This is a good example of the liberties that were taken with political realism in order to test the full range of phenomena associated with network-centric operations.

5. Note again the political unreality. The point is not whether BLUE would or would not actually "go first" but rather the nature of the incentives to exploit information superiority that may be created by network-centric operations.

6. There is some question as to whether this transfer of material could in actuality have been effected so quickly and easily.