

GAO

Report to the Chairman and Ranking
Minority Member, Committee on
National Security, House of
Representatives

June 1996

BOTTOM-UP REVIEW

Analysis of DOD War Game to Test Key Assumptions



**National Security and
International Affairs Division**

B-272119

June 21, 1996

The Honorable Floyd D. Spence
Chairman
The Honorable Ronald V. Dellums
Ranking Minority Member
Committee on National Security
House of Representatives

As you requested, we reviewed the objectives, methodology, and results of the Department of Defense's (DOD) war game Nimble Dancer, which assessed the ability of U.S. forces to fight and win two nearly simultaneous major regional conflicts (MRC). We also identified assumptions or data used in Nimble Dancer pertaining to several specific areas, such as readiness, threat, and force availability. This report, an unclassified version of our May 1996 classified report, presents our observations on the objectives, methodology, and results of the exercise, and appendix I provides details on the specific areas of interest.

Background

In its October 1993 Bottom-Up Review of the nation's defense needs, DOD, among other things, judged that it is prudent to maintain the capability to fight and win two nearly simultaneous MRCS. In the review, DOD also determined the forces, enhancements to force capabilities, and funding necessary to execute this element of the national military strategy. Since the Bottom-Up Review, DOD has conducted various studies to examine the two-MRC requirement. In an August 1994 memorandum, the Chairman of the Joint Chiefs of Staff authorized DOD to conduct the Nimble Dancer exercise. The primary objective of the exercise was to assess the capability of the programmed Bottom-Up Review force to fight and win two nearly simultaneous MRCS during different time periods, and the secondary objective was to identify critical issues for further resolution or study. The Chairman's memorandum generally stated that the exercise would test the sufficiency of forces by examining various areas, such as lift, intelligence, and sustainment, and provide a forum for conducting sensitivity analyses.

In preparing to conduct Nimble Dancer, DOD developed terms of reference and a study plan. These documents, among other things, identified various analyses for testing the sensitivity of game assumptions. They also established specific measures of effectiveness to evaluate each scenario, such as the level of risk, days of battle, and specific territory lost or

gained. According to DOD officials, the terms of reference and study plan were draft documents that were never finalized or formally approved as official guidance. Rather, these documents were used to generate discussion among the participants about the types of analyses that might be conducted. They stated that other than the Chairman's general memorandum, no official guidance governed the specific conduct of the war game.

Nimble Dancer, conducted from November 1994 to July 1995, consisted of baseline computer modeling, separate analyses on selected two-MRC topics, and seminars to discuss modeling and other analytical results. The computer modeling simulated force deployment and combat in various two-MRC scenarios involving a North Korean invasion of South Korea and an Iraqi invasion of Kuwait. According to DOD, this modeling assessed the scenarios in the years 1997, 2001, and 2005. Seminar participants were mid- and senior-level military officers and DOD civilians, including the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, and the commanders of selected combatant commands. Since conducting Nimble Dancer, DOD has continued to analyze issues related to the two-MRC requirement.

Based on Nimble Dancer, DOD concluded that the United States can fight and win two nearly simultaneous MRCs in the 1997 and 2001-2005 time frames, provided that the force enhancements anticipated in the Bottom-Up Review are completed as programmed and that national command authorities make timely decisions at the onset of the first MRC.¹ In reaching this conclusion, DOD identified several issues that it deemed critical to ensuring the success of U.S. forces. In press statements and congressional hearings, the Secretary of Defense and the Chairman of the Joint Chiefs of Staff said that Nimble Dancer tested and validated basic Bottom-Up Review assumptions, and they characterized the war game as extensive, intensive, rigorous, and robust.

Results in Brief

DOD statements that Nimble Dancer tested basic Bottom-Up Review assumptions through intensive and extensive war-gaming suggest a more rigorous level of analysis than occurred during the exercise. Nimble Dancer was a useful forum for promoting interaction among DOD organizations and in identifying critical issues in fulfilling the two-MRC requirement. However, Nimble Dancer used many of the same favorable

¹The national command authorities consist of the President and the Secretary of Defense or their duly deputized alternates or successors.

assumptions contained in DOD guidance implementing the Bottom-Up Review. Although DOD originally considered examining the sensitivity of certain key assumptions, this type of analysis in some cases was not done, and in other cases its scope was limited. Furthermore, DOD did not fully examine the impact of certain critical issues. For example, DOD's analyses of chemical warfare and the extraction of forces from peace operations were limited in scope and did not fully identify the impact of these issues on MRCS. Also, DOD deferred detailed analyses of the sufficiency of support forces and intelligence capabilities to other studies. The limited sensitivity analysis of certain key assumptions and limited analysis of some critical issues precluded DOD from analyzing the robustness of the programmed Bottom-Up Review force to meet the two-MRC requirement under more adverse circumstances. In addition, DOD lost opportunities to acquire additional information about the impact of specific critical issues on U.S. capabilities.

Military judgment is an integral part of any DOD war game or analysis. During Nimble Dancer, DOD relied on the professional military judgment of participants to reach its conclusions, especially where modeling and other analytical results were not available.

All of these factors—favorable assumptions, limited sensitivity analysis, the lack of full analysis of certain critical issues, and heavy reliance on military judgment in some cases where analysis was lacking—should be considered in evaluating DOD's conclusions that Nimble Dancer tested and validated Bottom-Up Review assumptions.

Nimble Dancer Promoted Interaction Within DOD and Identified Critical Issues

Nimble Dancer served as a means to promote interaction among DOD organizations and identify critical issues related to the two-MRC requirement. In Nimble Dancer, DOD included numerous modeling and analytical efforts that resulted in what officials described as an unprecedented sharing of data among participants. Officials told us these factors ensured a thorough discussion of the two-MRC scenario and related critical issues.

Game Participants Included Experienced Officials From Key Organizations

Nimble Dancer participants represented many offices and levels within the defense community responsible for planning and executing the two-MRC requirement. For example, participants included representatives from the Office of the Secretary of Defense; the Joint Staff; unified commands; the Army, the Navy, the Air Force, and the Marine Corps; and defense agencies. Military officers from these organizations served as participants

in the issues identification and senior officer phases of the war game. Participants from combatant commands included those with responsibilities for developing U.S. war plans for the MRCs addressed in Nimble Dancer. Additionally, the military's highest ranking military and civilian officials participated in the war game. For example, the Secretary of Defense and the Chairman of the Joint Chiefs of Staff were among the participants in the final phase of the war game. According to DOD officials, the war game provided for continuity in that approximately 60 percent of the officials who participated in the Nimble Dancer 1997 assessment also participated in the 2001 and 2005 assessments.

Collaborative Modeling Efforts Described as Unprecedented

According to DOD officials, Nimble Dancer promoted the sharing of model assumptions and data, which was unprecedented. Models used in the war game, among other things, examined the execution of the conflicts, conduct of deployment, use of airpower, impact of chemical weapons, and employment of theater ballistic missile defense. According to DOD officials, for the first time, the Navy, the Air Force, and the Army exchanged detailed data on each other's weapon systems for use in their respective service models. For example, the Navy, using data from both the Air Force (on fighters) and the Army (on helicopters), modeled a complete joint air campaign. In addition, DOD used contractors to perform modeling using Joint Staff inputs. For example, DOD contracted with BDM Federal, Inc., and the Johns Hopkins University Applied Physics Laboratory to perform modeling for chemical warfare and theater ballistic missile defense, respectively, because DOD believed their models could examine the issues in greater depth. BDM and Applied Physics Laboratory officials told us that they also shared information while performing their respective analyses.

Participants Say Critical Issues Were Identified

According to Nimble Dancer participants, the war game served as a useful tool for identifying and discussing critical issues for fighting and winning two MRCs. Such issues included the

- sufficiency of strategic mobility,
- timeliness of national level decision-making,
- sufficiency of combat and support forces to meet desired conflict end states,
- mitigation of the impact of chemical and biological warfare,
- impact of extracting forces from peace operations,
- effectiveness of intelligence capabilities,

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- availability of Bottom-Up Review force enhancements,
 - planning to optimize the apportionment of forces and lift assets for two MRCS,
 - mitigation of the impact of mine warfare threats, and
 - mitigation of the impact of ballistic missile threats.

In addition, Nimble Dancer led to follow-on Joint Staff studies of intelligence capabilities and the extraction of forces from peace operations. It should also be noted that DOD had previously identified some of these critical issues. For example, a DOD mobility study that preceded the conclusion of Nimble Dancer emphasized the importance of acquiring sufficient airlift and sealift assets and prepositioning equipment and supplies overseas.²

Nimble Dancer Testing of Key Assumptions Was Limited

During Nimble Dancer, DOD used many key assumptions in modeling the two MRCS that were identical or similar to assumptions in the May 1994 Defense Planning Guidance (DPG), which implemented the Bottom-Up Review. These assumptions were generally favorable; that is, they minimized risks to U.S. forces and objectives. DOD officials originally considered performing analyses to test the sensitivity of several key assumptions to more adverse circumstances. However, because of guidance to adhere to the DPG and other factors, certain sensitivity analyses were not done. Furthermore, in some cases, the scope of the analyses that were performed was limited. These limitations precluded DOD from analyzing the robustness of U.S. forces to execute the two-MRC strategy under more adverse circumstances. Furthermore, DOD lost the opportunity to identify additional critical issues that could have emerged.

We examined several key assumptions used in Nimble Dancer to determine the extent that they were derived from the DPG, were favorable, and were tested against more adverse circumstances. As discussed below, these assumptions involved national command authorities' decisions on mobilizing reserves and activating the Civil Reserve Air Fleet; separation time (that is, the time between conflicts); warning times before enemy attack; and the location of MRC end states (that is, the point where hostilities cease). We focused on a particular two-MRC scenario that DOD said created the greatest risks to U.S. forces and objectives. Information on other assumptions appears in appendix I.

²DOD Mobility Requirements Study Bottom-Up Review Update, March 28, 1995.

Reserve Mobilization

In Nimble Dancer, DOD used DPG assumptions about the timing of the presidential selected reserve call-up authority³ and the partial mobilization authority.⁴ These assumptions appear favorable in that DOD assumed the national command authorities will decide very early in the scenario to mobilize reserves. According to the study plan, DOD considered performing sensitivity analyses on the mobilization of reserves to determine the timing and level that would be required to support two MRCs. However, as discussed later, DOD did not conduct these sensitivity analyses.

Activation of the Civil Reserve Air Fleet

In Nimble Dancer, DOD used DPG assumptions on when the national command authorities will activate the Civil Reserve Air Fleet—civilian aircraft that augment the military in wartime. These assumptions are again favorable because they assume that the national command authorities activate the fleet very early. According to the study plan, DOD considered conducting sensitivity analyses related to fleet activation to determine the timing and level that would be required to support two MRCs. These analyses would also have examined the economic impact of activation and the potential contribution of foreign airlines to move personnel. However, DOD did not conduct these sensitivity analyses.

DOD officials cited a variety of reasons why they did not conduct certain sensitivity analyses. They stated that the Chairman requested that they adhere to the DPG as much as possible and to not use a worst-case scenario. The Chairman also requested that Nimble Dancer be completed by March 1995. Further, they said time and manpower constraints prevented them from doing all of the sensitivity analyses originally considered in the terms of reference and study plan and still generally meet the time frames set by the Chairman. For example, the Joint Staff requested modeling assistance from some DOD organizations that could not meet such requests due to competing work priorities. Finally, they said that if assumptions were deemed reasonable by most game participants, no sensitivity analysis was considered to be needed.

Amount of Separation Time Between MRCs

In Nimble Dancer, DOD assumed a separation time between the beginning of the two MRCs similar to that in the DPG. According to some Nimble Dancer documents, this separation time between MRCs could be

³Under 10 U.S.C. 12304, the President can activate up to 200,000 reservists for up to 270 days without a declaration of war or other national emergency.

⁴Under 10 U.S.C. 12302, the President can activate up to one million reservists for up to 2 years to meet the requirements of a war or other national emergency.

interpreted as advantageous. Combatant commands, specifically the Pacific Command and the Central Command, estimate different separation times.

According to the terms of reference and study plan, DOD considered conducting sensitivity analyses to use combatant commands' views on separation time to determine whether U.S. forces could meet requirements using different assumptions. During Nimble Dancer, there were two analyses that varied separation time from the baseline—one by U.S. Central Command representatives participating in the game and another by DOD's Office of Program Analysis and Evaluation. According to command and DOD officials, these analyses were conducted in a relatively short period of time and were not structured or intended to comprehensively examine the implications of shortening the separation time. The scope of these analyses did not include reexamining the allocation and flow of forces to the second MRC based on the different separation time and covered only a 1997 scenario. Furthermore, these analyses used different measures of effectiveness than the Nimble Dancer baseline scenario. In commenting on a draft of this report, DOD noted that the analyses provided insights concerning risk and other issues associated with the different separation times.

Amount of Warning Time Before the Attack

In Nimble Dancer, DOD used assumptions similar to the DPG about warning times—the number of days warning before the enemy attacks. These warning times are more favorable than those used by the combatant commands, which estimate significantly different warning times.

According to the terms of reference, DOD considered performing sensitivity analyses on warning times. Representatives from two combatant commands—U.S. Central Command and U.S. Forces Korea—participating in the game performed analyses that included different warning times than the baseline scenario. According to command officials, these analyses were conducted in a relatively short period of time and were not structured or intended to comprehensively examine the warning time issue. The scope of these analyses covered individual MRC scenarios in the 1997 time frame and did not address a two-MRC situation or the 2001-2005 time frame. Furthermore, the Central Command analysis used different measures of effectiveness than DOD used in the Nimble Dancer baseline scenario.

Location of End States

In Nimble Dancer, DOD assumed end states (the point where hostilities cease in the MRCS) based on U.S. forces achieving certain objectives similar to those in the DPG and used by combatant commands. However, the Joint Staff and combatant commands differ on the geographic location where these end state objectives would be achieved.

As part of the different warning analyses previously described, U.S. Forces Korea and U.S. Central Command representatives participating in the game examined the implications of achieving more aggressive end states than used in the baseline scenario. According to command officials, their review of the implications of using more aggressive end states was done relatively quickly and was not structured or intended to be a comprehensive assessment. The scope of their analyses addressed individual MRC scenarios in 1997 and did not cover a two-MRC situation. The analyses also did not address the 2001-2005 time frame.

DOD Did Not Fully Analyze the Impact of Some Critical Issues

During Nimble Dancer, DOD did not fully analyze certain issues that it deemed critical to the success of fighting and winning two MRCS. For example, DOD's analyses on chemical warfare and the extraction of forces from peace operations were limited in scope and did not fully assess the impact of these issues on the MRCS. Furthermore, DOD's analysis of other critical issues, such as the sufficiency of support forces, effectiveness of intelligence capabilities, and the use of the Army National Guard enhanced brigades primarily consisted of discussions, and in some cases, DOD deferred detailed analysis to other studies. Because of its limited analysis, DOD lost opportunities to acquire additional information on the impact of some critical issues on U.S. capabilities. DOD relied on military judgment—an integral part of any war game—throughout Nimble Dancer. In those cases where modeling and other analytical results were not available, DOD based its conclusions exclusively on military judgment.

Chemical Warfare

DOD identified chemical warfare as a critical issue, but it did not fully examine the issue during Nimble Dancer. In the game's 1997 baseline modeling, the Joint Staff modeled only a limited amount of chemical weapons. Because of the amount of chemical weapons used in the baseline scenario, some Nimble Dancer participants did not believe the scenario provided a realistic representation. DOD did not adjust the 1997 baseline to increase the volume of chemical attacks.

During Nimble Dancer's 2001 and 2005 assessments, DOD excluded chemical weapons from the baseline modeling. Instead, DOD contracted with BDM Federal, Inc., to conduct a separate analysis on the use of chemical weapons in a specific individual MRC scenario. DOD officials said that BDM had a proprietary model that was superior to DOD models for simulating chemical warfare. BDM, as tasked by DOD, did not examine the impact of chemical weapons on some key factors that could affect the outcome of the conflict and did not perform sensitivity analyses on certain key assumptions. The BDM analysis also did not use certain measures of effectiveness established for Nimble Dancer. The Nimble Dancer terms of reference and study plan identified the number of days to halt the enemy advance, start the counterattack phase, and complete U.S. objectives as measures of effectiveness. However, in accordance with DOD tasking, BDM limited its analysis to the halt phase. Additionally, the final results of the separate BDM analysis became available at the second phase of the Nimble Dancer 2001-2005 war game. Thus, the results were unavailable to earlier participants.

Extraction of Forces From Peace Operations

In Nimble Dancer, DOD identified the extraction of forces from peace operations as a critical issue, but its analysis of the issue has some limitations. In the 1997 scenario, DOD officials told us they identified the types of forces that might need to be extracted to fight the MRCs by taking a "snapshot" of forces engaged in peace operations as of August 1994. Although DOD identified potential shortages in certain types of units, they did not examine the impact of those shortages. In addition, they did not analyze any delays or lift requirements associated with extracting such forces from the peace operations and transporting them to the MRCs.

DOD conducted a separate analysis to examine the issue of extracting forces from a peace operation in the 2001-2005 time frame. Specifically, DOD examined the impact of extracting 25,000 U.S. troops from Bosnia and redeploying them to a MRC. DOD's analysis, however, did not test the sensitivity of its assumption that sufficient strategic lift would be available. This is particularly critical because of the competing demands for lift between the peace operation and both MRCs. Additionally, DOD did not complete the separate analysis until the final phase of the war game. Thus, the results were unavailable to participants in the first two phases of the war game.

Sufficiency of Support Forces

In Nimble Dancer, DOD identified the availability of sufficient support forces as critical to the outcome of the conflict and determined that

shortages could delay the start of the counterattack in the second MRC. However, DOD did not model or analyze in detail the sufficiency of combat support forces. For example, DOD did not examine actual requirements or the readiness or adequacy of support forces to meet those requirements. For the purpose of the baseline modeling, DOD assumed that support forces would accompany combat units when they deployed. While game participants acknowledged the shortages in support forces, the impact of these shortages on the conflict was not analyzed. Treatment of these issues was limited to identifying and discussing functional areas where shortages were anticipated, such as seaport operations, trucking, heavy construction engineering, and police work. DOD officials also discussed alternative ways to resolve support shortages, including increased allied/host nation support and use of contractor support.

In-depth analysis was deferred to an ongoing Army study—the Total Army Analysis—a biennial process for determining support needs. This process identifies the numbers and types of units needed to support combat units in two MRCS and the personnel needed to fill these units. The Total Army Analysis, completed in January 1996, concluded that about 60,000 required positions are presently unfilled. DOD and the Army are continuing to examine options for meeting support force requirements.

An example of a key combat support function for which DOD did not perform any modeling or meaningful analysis involved the medical treatment of casualties. In Nimble Dancer, DOD assumed that medical support would be adequate to handle all U.S. casualties and postponed further examination pending the outcome of the Total Army Analysis and other ongoing studies within DOD, such as the update of the section 733 study.⁵ Although the study plan specified casualty rates as one measure of effectiveness, DOD did not analyze either U.S. or allied casualty rates in Nimble Dancer. Casualties greatly affect support requirements and the flow of forces into the theater. High casualty estimates translate into high support requirements (for example, consumables such as water, blood, and surgical supplies; lift assets for evacuating casualties out of theater; and engineers to assemble hospital structures in-theater).

Effectiveness of Intelligence Capabilities

Based on Nimble Dancer, DOD concluded that continued enhancements to intelligence capabilities (such as increased timeliness and interoperability and more systems such as the Joint Surveillance and Target Attack Radar

⁵Section 733 of the National Defense Authorization Act for Fiscal Years 1992 and 1993 required DOD to conduct a study to, among other things, determine the size and composition of the military medical care system needed to support U.S. forces.

System) were critical for U.S. forces to fight and win two MRCs. These enhancements are closely linked to precision-guided munitions because improved intelligence capabilities are required for effective targeting of these weapons.⁶ The services project that inventories of these precision-guided munitions will increase dramatically between the 1997 and 2001-2005 time frames.

While DOD originally considered performing some sensitivity analyses during Nimble Dancer, it did not model or otherwise conduct in-depth analyses on intelligence capabilities. DOD officials said existing models were inadequate for such analyses and that they reached conclusions about intelligence by reviewing the earlier Intelligence Bottom-Up Review and applying the military judgment of Nimble Dancer participants. Some participants, including flag officers, were concerned about reaching such conclusions without detailed supporting analyses. DOD officials said that because they could not model certain intelligence capabilities, they deferred more in-depth analysis to a subsequent war game (known as Nimble Vision), which they plan to complete in the summer of 1996.

Army National Guard Enhanced Combat Brigades

According to the Bottom-Up Review, 15 Army National Guard enhanced brigades are part of the Army's force structure needed to fulfill the two-MRC requirement. In Nimble Dancer, DOD identified these brigades as available to respond during two MRCs. These brigades were also included in the list of force enhancements that DOD deemed critical to the U.S. success in fighting and winning two MRCs. During Nimble Dancer, DOD officials discussed the brigades in seminar discussions. However, they did not perform any detailed analysis on how deploying the brigades would affect U.S. capability. Although DOD's baseline modeling of combat scenarios for 1997, 2001, and 2005 assumed that 15 brigades would be mobilized early in the first MRC and that 5 of the brigades would be ready to deploy within 90 days, none of the brigades actually deployed. They were, therefore, not part of the forces used in either MRC.

According to DOD officials, Nimble Dancer did not conduct detailed analyses on enhanced brigades because the scenarios in the modeling did not involve adverse conditions, including the need for additional capability to counter high-intensity chemical attacks or to prosecute a more aggressive end state. Therefore, they assumed that 10 active Army divisions provided sufficient combat capability. During senior-level

⁶Precision-guided munitions include the Army Tactical Missile System with the Brilliant Anti-Armor Submunition, Longbow Hellfire missile, Sensor Fused Weapon, Joint Direct Attack Munition, and Joint Standoff Weapon.

seminar discussions, Army and combatant command officials emphasized that enhanced brigades would be needed in two MRCS; however, opinions varied as to the number and type of brigades required and the capability of the brigades to meet the Bottom-Up Review's goal of being ready to deploy 90 days after call-up.

DOD Relied Heavily and Sometimes Exclusively on Military Judgment During Nimble Dancer

DOD relied heavily on the military judgment of seminar participants throughout Nimble Dancer. DOD officials told us that in reaching the overall conclusion that the war game tested and validated Bottom-Up Review assumptions and showed that U.S. forces can fight and win two MRCS, participants applied their judgment based on extensive military experience when assessing the implications of modeling and other analytical results. The use of military judgment in providing input to the war game models and in analyzing the output is a necessary part of any war game because models by themselves are not predictive.

In some cases where analytical results were not available, military judgment was the sole basis for reaching conclusions. For example, DOD officials told us that because current models used by the Joint Staff cannot simulate the impact of specific force enhancements, such as precision-guided munitions and upgrades in intelligence capabilities, they judged—based on their collective experience—these enhancements to be critical to the success of U.S. forces to respond to two MRCS. Also, as previously discussed, DOD deferred analyses of certain critical issues, such as sufficiency of support forces and intelligence capabilities. In these cases, Nimble Dancer participants relied solely on their military judgment to determine that potential vulnerabilities associated with these issues would not preclude U.S. forces from fighting and winning two MRCS. In commenting on a draft of our report, DOD stated that in assessing issues where modeling support is not sufficiently mature or timely, it is common to rely on the combined judgment of senior players to arrive at a conclusion.

Agency Comments and Our Evaluation

DOD provided written classified comments on the classified version of this report. We summarized their comments below. We also incorporated their comments in the report where appropriate.

DOD disagreed with our finding that key assumptions used in Nimble Dancer were generally favorable and that DOD generally did not perform sensitivity analyses to test the impact of using more adverse assumptions.

DOD stated that it based game scenarios and assumptions on the May 1994 DPG to provide a common reference point for game participants. DOD noted that it conducted considerable analyses and war game discussions on the assumptions to assess their impact on U.S. ability to fight and win two MRCs. These analyses and discussions, according to DOD, provided various insights, including potential risks associated with more adverse assumptions and the importance of timely national decision-making, and helped support recommendations for continuing programmed force enhancements. In its comments, DOD summarized the extent of analysis conducted on certain game assumptions.

We recognize that Nimble Dancer involved analyses and discussions of key assumptions, enabling game participants to gain insight into various aspects of the two-MRC requirement. Based on additional information provided by DOD, we modified the text to reflect the extent of DOD's analyses on the sensitivity of certain assumptions and our assessment of these analyses. We continue to believe that certain game assumptions were favorable because they set conditions that were mostly advantageous to U.S. forces, thereby minimizing risk. Based on DOD's public comments that the game involved rigorous and robust analyses, we expected that DOD performed considerable and varied sensitivity analyses to test the sensitivity of scenario assumptions. We agree that DOD examined the impact of adverse circumstances for some assumptions. However, we found that in some cases the scope of analysis was limited, such as focusing on individual MRCs rather than a two-MRC situation or covering only part of the Nimble Dancer time frame.

DOD partially concurred with our finding that certain critical issues were not fully examined. DOD acknowledged that some issues were not analyzed exhaustively and were deferred to follow-on studies; however, it noted that considerable analysis was conducted during Nimble Dancer. DOD also stated that its leadership recognized that there would be practical limits to the scope of analysis within the time frames and resources available and fully considered these limitations in constructing and executing Nimble Dancer. Based on DOD's comments, we modified the text to clarify the extent of analysis provided on critical issues and our evaluation of this analysis. We continue to believe that Nimble Dancer did not fully examine certain critical issues to the level implied in DOD's public comments that the game involved rigorous and robust analyses.

DOD also believed that we implied that the game relied too heavily on military judgment. We do not believe that the report gives this impression.

Rather, as reflected in the text, we recognize the role and value of military judgment in a game like Nimble Dancer. We did not reach a conclusion about the appropriateness of DOD's application of military judgment. Rather, we describe the circumstances in which such judgment was applied, including those instances where it was the sole basis for reaching conclusions.

Scope and Methodology

To review the methodology, assumptions, and results of Nimble Dancer, we interviewed knowledgeable officials at the Office of the Secretary of Defense; the Joint Chiefs of Staff; the Defense Intelligence Agency; the Central Intelligence Agency; the Army, the Air Force, the Navy, and the Marine Corps headquarters; and two defense contractors—BDM Federal, Inc., and the Johns Hopkins University Applied Physics Laboratory. Our scope was limited to reviewing the Nimble Dancer war game. We did not attempt to independently assess the ability of U.S. forces to meet the Bottom-Up Review's two-MRC requirement.

We also interviewed or obtained written responses from officials at the U.S. Central Command, the U.S. Pacific Command, and U.S. Forces Korea to obtain information on their participation in Nimble Dancer and their views on its methodology, assumptions, and results.

We reviewed relevant documentation, including briefing slides and information papers prepared for Nimble Dancer discussion seminars, DOD and contractor analyses of selected two-MRC issues, and other pertinent documentation. DOD officials denied us access to specific supporting documentation on DOD's baseline modeling, and we therefore could not verify the specific nature and results of the modeling effort. DOD did not write an after-action report on Nimble Dancer to summarize its analyses or conclusions. Accordingly, we reviewed briefing slides summarizing the modeling effort. However, these slides lacked specific details such as information about the types and quantities of force enhancements used for the 2005 scenario.

We performed our review between August 1995 and March 1996 in accordance with generally accepted government auditing standards.

We are providing copies of this report to the Chairmen and Ranking Minority Members, Senate Committee on Armed Services, the Subcommittee on Defense, Senate Committee on Appropriations, and the

Subcommittee on National Security, House Committee on Appropriations; the Secretaries of Defense, the Air Force, the Army, and the Navy; the Commandant of the Marine Corps; and the Director, Office of Management and Budget. We will also make copies available to others upon request.

If you have any questions concerning this report, please call me on (202) 512-3504. Major contributors to this report were Sharon Pickup, Stephen L. Caldwell, Marc Schwartz, and Vincent Truett.

A handwritten signature in black ink that reads "Richard Davis". The signature is written in a cursive style with a prominent "R" and "D".

Richard Davis
Director, National Security
Analysis

GAO Responses to Specific Questions From the House National Security Committee

In the letter requesting our review, the Committee asked 15 specific questions. Table I.1 provides information on those questions that we were able to address in an unclassified manner. The format of the questions has been changed to better match the table below.

Table I.1: Information on Selected Nimble Dancer Assumptions and Analyses

Committee question	Nimble Dancer assumption/process	Comments on analysis/use of data
What assumptions were made about readiness?	Assumed all U.S. active and reserve forces were 100 percent ready upon deployment (i.e., manned, trained, and equipped).	Assumption appears favorable. Sensitivity analysis was considered by the Joint Staff but was not done.
What assumptions were made about deployability?	Assumed all units deployed as scheduled with no delays at ports or airfields.	Assumption appears favorable. Sensitivity analysis was considered by the Joint Staff, but was not done.
What assumptions were made about force modernization?	In 1997 and 2001 scenarios, DOD assumed Bottom-Up Review force enhancements would be available as scheduled and in quantities programmed in 1996-2001 Future Years Defense Program. In 2005 scenario, assumed quantities as projected by military services.	Availability of force enhancements identified as a critical issue. Assumptions appear favorable. No sensitivity analysis done to examine impact if program schedule delays occur. Modeling adjusted to reflect quantities in 1997, 2001, and 2005. Modeling results reflect aggregate contributions of precision-guided munitions and accelerated force flow due to additional repositioning and lift. Model unable to isolate impact of individual force enhancements. We were unable to verify enhancement types and quantities because DOD officials denied us data.
What assumptions were made about the level of acceptable casualties?	Casualty rates were not analyzed.	DOD originally identified casualties as a measure of effectiveness but decided not to use this measure.
What assumptions were made about the enemy's use of weapons of mass destruction?	Baseline modeling included limited use of chemical weapons.	Mitigating the impact of chemical and biological warfare identified as a critical issue. Use of chemicals in baseline scenario for certain time frame considered unrealistic by some participants due to amount of chemicals used. No adjustments made to change amount. Baseline assumptions for another time frame were favorable because no chemicals were used. A separate analysis done by BDM Federal, Inc., had some limitations: used some favorable assumptions, did not examine certain factors, and used different measures of effectiveness than baseline.
What assumptions were made about the readiness of U.S./allied forces to operate in a nuclear, biological, or chemical environment?	When chemical weapons were factored into scenario (i.e., 1997 baseline scenario and 2005 BDM analysis) DOD and BDM analyses assumed U.S. forces were prepared to operate in a contaminated environment. Allied nuclear, biological, and chemical readiness not addressed.	Mitigating the impact of chemical and biological warfare identified as a critical issue. Assumption appears favorable. No sensitivity analysis done.

(continued)

**Appendix I
GAO Responses to Specific Questions From
the House National Security Committee**

Committee question	Nimble Dancer assumption/process	Comments on analysis/use of data
What assumptions were made about forces participating in the two MRCs?	Assumed Bottom-Up Review force structure would be in place for 1997 and 2001-2005 scenarios. Assumed entire force would participate in the MRCs, except for the 15 National Guard enhanced brigades because circumstances not considered adverse enough for their use.	Force participation consistent with the DPG. Combatant commands describe importance of enhanced brigades as a strategic reserve force. Modeling was not adjusted to account for redeployment of forces from peace operations. (See separate entry on peace operations.)
What assumptions were made about defense budgets?	Used the 1996-2001 Future Years Defense Program for 1997 and 2001 scenarios. DOD stated service projections were used for the 2005 scenario.	No sensitivity analysis done to test impact if enhancements not available as planned. DOD officials denied us access to 2005 weapon system and weapon quantities.
What assumptions were made about mobilization?	Assumed rapid decision-making by national command authorities.	Timeliness of national decision-making identified as important. Assumptions are the same as DPG and appear favorable. Sensitivity analysis was considered by the Joint Staff, but was not done.
What assumptions were made about activation of the Civil Reserve Air Fleet?	Assumed rapid activation by national command authorities.	Timeliness of national decision-making identified as a critical issue. Assumptions are the same as DPG and appear favorable. Sensitivity analysis was considered by the Joint Staff but was not done.
What assumptions were made about access to overseas bases?	Assumed there would be no access problems.	Assumptions appear favorable. No sensitivity analysis done.
What assumptions were made about U.S. nuclear retaliation?	No use of nuclear weapons by U.S. or enemy forces.	
What were the Nimble Dancer war game objectives?	Objectives were to assess ability of programmed U.S. forces to fight and win two nearly simultaneous MRCs in 1997 and 2001-2005 time frames and to identify critical issues related to the two-MRC requirement.	DOD used measures of effectiveness (risk; forward line of troops; and days to complete halt, buildup, and counterattack) in modeling results. DOD relied on military judgment throughout game. DOD concluded U.S. forces could fight and win two MRCs in 1997 and 2001-2005 time frames, stating that Nimble Dancer tested and validated basic Bottom-Up Review assumptions. DOD emphasized importance of continuing force enhancements and timely decision-making.
What assumptions were made about the war termination conditions?	End state conditions required U.S. forces to achieve certain objectives.	End state conditions consistent with DPG. U.S. Central Command and U.S. Forces Korea did analyses using alternative end states. Per command officials, analyses were done quickly and not structured or intended to be comprehensive. Scope limited to individual MRCs in 1997 and did not address a two-MRC situation or 2001-2005 time frame.
What models were used?	Game used more than 15 models. Key model to simulate war was TACWAR. Other models included FDE and MIDAS (for deployment), ITEM (maritime and air battle), THUNDER (air battle), and METRIC (chemical warfare).	

(continued)

Appendix I
GAO Responses to Specific Questions From
the House National Security Committee

Committee question	Nimble Dancer assumption/process	Comments on analysis/use of data
What were the models' strengths and limitations?	TACWAR models ground battle at operational level but cannot model intelligence capabilities, combat support forces, or maneuver warfare. FDE and MIDAS model intertheater force flow but cannot model intratheater transport. ITEM (Navy) models naval warfare and airpower but cannot model the ground battle. THUNDER (Air Force) models airpower and the ground battle but cannot model naval surface warfare or amphibious operations.	No single model can simulate everything. DOD recognizes limitations and has a joint model improvement program underway.
Was the seminar war game format sufficient to provide a definitive assessment that the two-MRC requirement is supportable?	Models alone are not predictive or conclusive. Seminar provided forum for discussing model results and critical issues.	Seminar results were not documented in an after-action report. No format can provide a definitive assessment—only fighting the war can.
Beyond the baseline modeling, were any sensitivity analyses or separate analyses done?	Complete sensitivity analyses done on sequence of MRCs. Limited sensitivity analyses on strategic warning, separation time between the MRCs, and war termination conditions (end states). Separate analyses done on chemical warfare and extracting forces from peace operations.	DOD officials originally considered conducting several sensitivity analyses, but some were not done, and others had limited scope, making comparisons with the baseline difficult. (See separate entries on mobilization, Civil Reserve Air Fleet, strategic warning, separation time between the MRCs, war termination conditions, enemy use of weapons of mass destruction, and peace operations.)
What assumptions were made about strategic warning?	Assumed unambiguous warning times similar to those used in the DPG.	U.S. Central Command and U.S. Forces Korea did analyses using different warning times. Per command officials, analyses were done quickly and not structured or intended to be comprehensive. Scope was limited—only addressed individual MRCs in 1997. Central Command's analysis used different measures of effectiveness than the baseline.
What assumptions were made about separation time between the MRCs?	Assumed a separation time between the two MRCs that was consistent with the DPG.	Assumption is consistent with the DPG and appears favorable. U.S. Central Command and DOD's Program Analysis and Evaluation office did analyses using different separation times. Per command and DOD officials, analyses were done relatively quickly and not structured or intended to be comprehensive. Scope of analysis was limited—addressed 1997 only, did not reallocate force flows, and used different measures of effectiveness than the baseline.
What assumptions were made about U.S. response to strategic warning?	Assumed a series of flexible deterrent options.	Assumptions used in war fighting and deployment models. Flexible deterrent options in 2001-2005 scenario were exercised earlier and were more aggressive than in 1997 scenario.

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What assumptions were made about the availability and deployability of support forces?	Baseline modeling assumed support forces (combat support and combat service support) were sufficient to support combat forces.	Sufficiency of support forces identified as a critical issue. War modeling implicitly assumes support forces available. Identified possible shortages of types of units (e.g., engineers, port handlers, military police, transport). In-depth analysis deferred to Total Army Analysis 2003.
What assumptions were made about the availability and deployability of forces engaged in peace operations?	Baseline 1997 and 2001-2005 scenarios assumed that peace operation forces would be extracted and redeployed to support MRCs when needed. The 1997 scenario used a "snapshot" in time (Aug. 18, 1994) to identify forces that might be needed in the MRCs but did not model the impact of extracting these forces.	Impact of extracting forces from peace operations identified as a critical issue. Baseline assumptions appear favorable. Separate analysis done on impact of extracting and redeploying 25,000 forces from Bosnia peace operation to an MRC in the 2001-2005 time frame. No sensitivity analysis done on sufficiency of lift, nor was the impact on peace operations examined.
What factors could have affected the outcome of Nimble Dancer?	Change in key assumptions (e.g., separation and warning times, timing of decision-making, enemy capabilities, and access to ports and bases) could affect risk, location of end states, and length of each MRC.	Limited sensitivity analysis done on key assumptions.
How were assumptions set?	Assumptions based primarily on existing guidance and studies (DPG, Mobility Requirements Study Bottom-Up Review Update, Defense Intelligence Agency data).	Assumptions appear generally favorable.
How were disagreements resolved?	Participants disagreed on some key issues.	When applicable, disagreements were resolved by using assumptions in the DPG. For issues not addressed by the DPG, the Joint Staff made the final decision after participants discussed the issues.
What assumptions were made about access to ports and bases and host nation support?	Assumed there would be no access problems.	No sensitivity analysis done. Assumptions used in war modeling.

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