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MILITARY OPERATIONS

Recent Campaigns
Benefited from
Improved
Communications and
Technology, but
Barriers to Continued
Progress Remain



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Highlights of [GAO-04-547](#), a report to the Chairman and Ranking Minority Member, Senate Committee on Armed Services; Chairman and Ranking Minority Member, House Committee on Armed Services

Why GAO Did This Study

Recent U.S. combat operations in Kosovo, Afghanistan, and Iraq benefited from new Department of Defense (DOD) strategies and technologies, such as improvements in force networks and increased use of precision weapons, designed to address changes in the security environment resulting from the continuing terrorist threat and the advent of the information age.

Based on the authority of the Comptroller General, GAO reviewed these conflicts, with a focus on bombing operations, to gain insight into the changes being implemented by DOD. This report focuses on (1) assessing the impact on operational effectiveness of improvements in force networks and in the use of precision weapons and (2) identifying key barriers to continued progress.

What GAO Recommends

GAO recommends that DOD take steps to improve standardization of information used in bombing operations, address continuing problems with battle damage assessments, develop a unified battlefield information system to improve analyses of combat effectiveness, and develop realistic joint training to help personnel adapt to emerging changes to the operating environment. DOD generally agreed with the recommendations and stated that it is addressing the issues GAO raised in a variety of ongoing efforts.

www.gao.gov/cgi-bin/getrpt?GAO-04-547.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Neal Curtin, (757) 552-8100, CurtinN@gao.gov.

MILITARY OPERATIONS

Recent Campaigns Benefited from Improved Communications and Technology, but Barriers to Continued Progress Remain

What GAO Found

Improvements in force networks and in the use of precision weapons are clearly primary reasons for the overwhelming combat power demonstrated in recent operations. However, the full extent to which operations have been speeded up or otherwise affected is unclear because DOD does not have detailed measures of these effects. Enhancements to networked operations, such as improved sensors and surveillance mechanisms, and more integrated command and control centers, have improved DOD's ability to share a broad view of the battlefield and communicate quickly with all elements of the force—reducing the time required for analysis and decision making in combat operations. However, recognizing that the full impact of these changes is unclear, DOD is conducting a series of case studies to better understand the effects of networked operations. Improvements in force networks have also been enhanced by the use of precision-guided weapons and associated technologies. These improvements not only provide commanders with greatly increased flexibility, such as the ability to conduct bombing operations in poor weather and from higher and safer altitudes, but also increase the accuracy of bombing operations. GAO's analysis found that the percentage of attacks resulting in damage or destruction to targets increased markedly between operations in Kosovo and those in Afghanistan.

Notwithstanding these improvements, certain barriers inhibit continued progress in implementing the new strategy. Four interrelated areas stand out as key:

- A lack of standardized, interoperable systems and equipment, which reduces effectiveness by requiring operations to be slowed to manually reconcile information from multiple systems and limiting access to needed capabilities among military services.
- Continuing difficulties in obtaining timely, high quality analyses of bombing damages, which can slow ground advances and negate other improvements in the speed of operations.
- The absence of a unified battlefield information system to provide standardized measures and baseline data on bombing effectiveness, which creates confusion about the success of new tactics and technologies, about assumptions used in battlefield simulation programs, and about procurement decisions.
- The lack of high quality, realistic training to help personnel at all levels understand and adapt to the increased flow of information, more centralized management, and other changes in the operating environment brought about by the strategic changes.

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Abbreviation

DOD Department of Defense

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United States General Accounting Office
Washington, DC 20548

June 28, 2004

The Honorable John W. Warner
Chairman
The Honorable Carl Levin
Ranking Minority Member
Committee on Armed Services
United States Senate

The Honorable Duncan Hunter
Chairman
The Honorable Ike Skelton
Ranking Minority Member
Committee on Armed Services
House of Representatives

Recent U.S. combat operations in Kosovo, Afghanistan, and Iraq have been widely regarded as an unprecedented demonstration of combat power. Relying predominately on air power, Operation Allied Force drove the forces of Slobodan Milosovic out of Kosovo in 78 days during the spring of 1999. Operation Enduring Freedom, using a combination of air power and special operations forces, drove the Taliban from power in Afghanistan in 175 days between October 2001 and March 2002. And, most recently, the combination of air power and ground maneuver elements used in Operation Iraqi Freedom drove Saddam Hussein from power in only 43 days between March and May 2003. These operations have benefited from the fielding of new strategies and technologies developed to deal with the new security environment—now characterized by surprise and uncertainty as a result of the evolving terrorist threat, and by the need to transition from the industrial age into the information age. The Department of Defense's (DOD) new capabilities-based strategy seeks to contend with uncertainty by improving DOD's ability to act quickly and decisively across a wide range of combat conditions. This strategy is being enabled by moves toward more highly integrated force networks that combine information superiority and advances in technologies for surveillance, communications, precision weapons, and other areas to gain the advantage and rapidly defeat the enemy.

On the basis of the authority of the Comptroller General, we reviewed the operational results of recent conflicts in Kosovo, Afghanistan, and Iraq, with a focus on bombing operations, to gain insight into the strategic and

technological changes being implemented by DOD. This report focuses on (1) assessing the impact on operational effectiveness of improvements in force networking and in the use of precision weapons and (2) identifying key barriers to continued progress. We are addressing this report to you because we believe it will be of interest to your committees as you address DOD's programs and funding. In performing our work, we reviewed DOD policies, procedures, and reports related to implementation of the new capabilities-based strategy; met with officials from throughout the department; conducted a detailed analysis and reliability assessment of bombing data; and discussed the results of our analysis with cognizant officials. A more thorough description of our scope and methodology is included in appendix I. We performed our work from April 2003 through March 2004 in accordance with generally accepted government auditing standards.

Results in Brief

Improvements in force networking and in the use of precision weapons are clearly primary reasons for the overwhelming combat power demonstrated in recent operations. However, the full extent to which operations have been speeded up or otherwise affected is unclear because DOD does not have detailed measures of these effects. The emerging concept of networked operations, referred to by DOD as network-centric operations, involves developing communications and other linkages among all elements of the force to create a shared awareness of operations. Technological enhancements to these network-centric systems include improved sensors and other intelligence, surveillance, and reconnaissance mechanisms for observing targets on the battlefield; more integrated command and control centers for analyzing targeting data and approving attacks; and improvements in precision weapons. The improved ability to share a broad view of the battlefield and communicate quickly with all elements of the force has compressed the time required for analysis and decision making in bombing operations, thus increasing lethality. However, DOD recognizes that the full extent to which operations have been speeded up or otherwise affected is unclear because of the absence of detailed measures of these effects. As a result, DOD's Office of Force Transformation is conducting a series of case studies of training exercises and combat operations in Afghanistan and Iraq to better understand the effects of networked operations. Advances in force networking have been enhanced by improvements in the use of precision-guided weapons and associated technologies, providing military commanders with greatly increased flexibility and accuracy in bombing operations. For example, the introduction of laser-guided and Global Positioning System-guided bombs has reduced limitations on operations

created by poor weather and visibility and allowed bombing operations to be conducted from higher and safer altitudes. Further, increases in the number of aircraft capable of delivering such weapons allow DOD to use old aircraft in new ways, further improving flexibility. These improvements are also increasing the accuracy of bombing operations. Our analysis found that the percentage of attacks resulting in damage or destruction to fixed and mobile targets increased markedly between operations in Kosovo and those in Afghanistan.

Despite such improvements, DOD officials and reports identified a variety of barriers inhibiting continued progress in implementing the new strategy. Four interrelated areas stood out as key to continued progress.

- **Lack of standardized, interoperable systems and equipment.** This is a long-standing problem in DOD that reduces effectiveness by requiring operations to be slowed as time must be taken to manually reconcile information from one operating system into forms usable by other systems, or by limiting access to communications or other needed capabilities because equipment from one service cannot interact with equipment used by another for the same purpose. For example, DOD has not standardized procedures used in basic operations, such as reporting on the results of bombing missions. As a result, each service and unified command must develop its own procedures, with no system to ensure standardization. During operations in Afghanistan, the Central Command received mission reports using at least 23 different formats—requiring time-consuming manual deconfliction. The Joint Forces Command also reported that operations in Iraq were beset by a lack of commonly understood operational-level standards for evaluating the effect of attacks. The integration of information was undermined by groups adopting their own standards and formats, resulting in difficulties in translating information and coming to a mutual understanding. We have also reported¹ on problems with standardization and interoperability. DOD understands that the lack of standardization fundamentally hampers attempts to improve networking and joint operations, and it has been trying to address various aspects of the problem. However, previous reforms have been undermined by parochial allegiances to the services and other problems that continue to exist.

¹ U.S. General Accounting Office, *Defense Acquisitions: Steps Needed to Ensure Interoperability of Systems That Process Intelligence Data*, [GAO-03-329](#) (Washington, D.C.: Mar. 31, 2003) and *Military Readiness: Lingering Training and Equipment Issues Hamper Air Support of Ground Forces*, [GAO-03-505](#) (Washington, D.C.: May 2, 2003).

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- **Difficulties in obtaining timely, high quality assessments of the effects of bombing operations.** Battle damage assessments are an increasingly critical component of combat operations. Slow or inaccurate assessments can negate improvements in the speed of operations, create uncertainty about the battlefield situation and slow ground advances, and ultimately increase the risk of death or injury to ground troops. However, lessons learned reports on operations in Iraq—similar to earlier operations—found that battle damage assessments could not keep up with the pace of operations and failed to provide the information needed for operational decisions. These problems are due to several factors. First, advances in network-centric operations and precision weapons have increased the speed at which targets are generated and attacked. At the same time, the lack of an occupational specialty for damage assessments and other problems result in shortages of trained analysts when resources need to be surged during combat operations, resulting in the need to rely upon on-the-job training of personnel from other areas. Moreover, according to officials, DOD does not have a comprehensive system to track personnel who have received training, further exacerbating the problem. The Joint Forces Command has called for recognition of this problem as a major obstacle to operations requiring a variety of changes to resolve.
 - **Absence of unified data to measure combat effectiveness and plan for the future.** Advances in the accuracy of bombing operations have raised expectations for more efficiency and effectiveness in combat operations. Instead of traditional operations where multiple sorties and multiple bombs were required to destroy one target objective, some DOD officials now believe one bomb per target and multiple targets on one sortie should be the norm. However, confirmation of such expectations is difficult because DOD does not have a unified battlefield information system to provide standardized, baseline data on the effectiveness of bombing operations. Currently, the services and the unified commands maintain their own databases. As a result, the services create databases to measure different aspects of operations, and measures of key operational data elements—such as attacks needed to destroy a target, effects of operations, and basic targeting characteristics—are defined differently. The absence of a baseline system to bridge these differences and provide information about actual bombing operations effectiveness creates confusion about the success of new tactics and technologies and about the assumptions used in battlefield simulation programs. The lack of such a unifying system also makes it difficult to make procurement decisions for weapons required for operations and calculate DOD's return on investment from the new technologies.
 - **Lack of realistic training to help understand and adapt to changing command and control environment.** DOD officials also cited the need

for high quality, realistic training to help personnel at all levels understand and adapt to changes in the operating environment brought about by the move to a networked force using advanced technologies. For example, officials noted that large increases in the pace of operations and the volume of information associated with more integrated force networks have overwhelmed commanders and other personnel at times. Further, increased networking and other changes have fostered a more centralized style of management, with senior leaders increasingly involved in operations. At the same time, network-centric operating concepts are distributing information to lower and lower organizational levels, raising the potential for increased autonomy for small units and individual soldiers. However, training has not kept pace with these changes. For example, the Joint Forces Command reported that the lack of realistic training undermined intelligence and surveillance management and other operational-level capabilities during Operation Iraqi Freedom. Consistent with DOD's basic tenet that a force must train as it will fight, DOD officials called for improved training to match the scale and tempo of actual operations. Similarly, the Defense Science Board reported that the changing operating environment will have unintended consequences that will require personnel to adapt to increasing cognitive demands at even the most junior levels. However, according to the Board, current training is not adequate to prepare DOD personnel to cope with these demands.

To ensure that these problems do not continue to inhibit realization of the full promise of DOD's strategy, we are recommending that DOD take steps to provide more standardized operating information for use during joint combat operations, formulate a plan to address problems with battlefield damage assessments, develop a unified battlefield information system to improve assessments of combat effectiveness, and develop realistic joint training to help commanders and personnel adapt to the changing operating environment. In comments on a draft of this report, DOD generally agreed with our recommendations and stated that it is addressing the issues we raised in a variety of ongoing efforts.

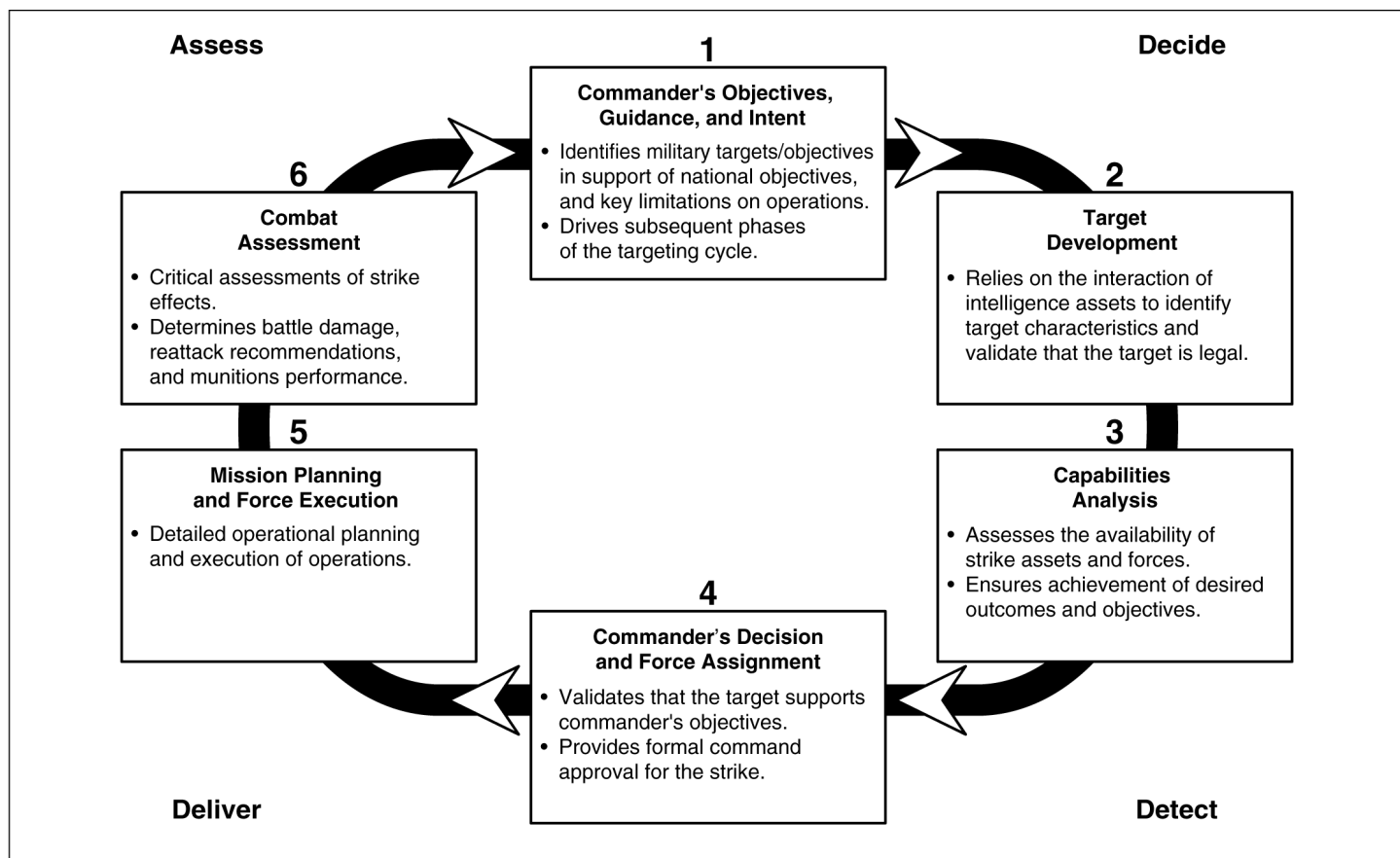
Background

The close integration and coordination of ground combat forces and bombing operations is essential to the exercise of lethal combat power on the modern battlefield. As depicted in figure 1, military doctrine² describes targeting in terms of a cyclical process composed of six basic phases.

² U.S. Department of Defense, Joint Publication 3-60: *Joint Doctrine for Targeting* (Washington, D.C., Jan. 17, 2002).

During this process, the joint force commander identifies the objectives for military operations in support of the national objectives for the conflict and any key limitations on operations—such as procedures for limiting civilian collateral damage. The commander’s guidance then drives the subsequent phases of the targeting cycle to include identifying and analyzing potential targets and resources available to attack them, obtaining formal permission for the strike, executing the strike, and then assessing strike effectiveness and any need to reattack.

Figure 1: The Joint Targeting Cycle



Source: DOD.

The success of this process is highly dependent on the speed and quality of interaction among the people and systems conducting the various activities at each phase. Trained ground control personnel must interact quickly and covertly with manned and unmanned aircraft, electronic sensors and space-based satellite imagery systems, or other intelligence,

surveillance, and reconnaissance mechanisms to spot the target and accurately mark its location. Accuracy depends upon the ability of the ground personnel to locate themselves, the target, and any friendly forces nearby and accurately judge the distance between each. These elements must be able to communicate the targeting information to command and control centers that coordinate the actions of a variety of analysts and others who assess the situation, plan the strike, communicate the information back to the ground personnel, and analyze the effectiveness of the attack.

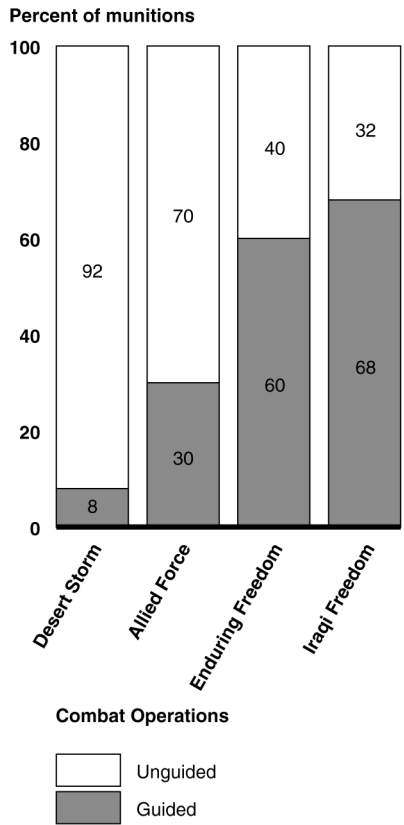
DOD is working to improve the interaction of these elements by using network-centric operating concepts. The term “network-centric” is used to describe a broad class of approaches to military operations that are enabled by networking the force. DOD’s approach involves developing the sensors and other technologies to provide pervasive oversight of the battlefield, and then linking them to all elements of the war-fighting force through communications and other technologies. This allows the various elements of the force to develop a shared situation awareness, a shared knowledge and understanding of commanders’ intent, and the ability to rapidly process and analyze information. The belief is that these capabilities will increase combat power by better synchronization of weapons effects in the battle space and greater speed in command decision making. This strategic change is being accompanied by an array of changes to doctrine, tactics, organization, and training to integrate the network-centric concept into DOD’s culture.

Advances in networking the force are being complemented by advances in precision weapons.³ Precision-guided weapons provide precise control of bombs through the use of electrical equipment that help guide the weapon in flight. These capabilities provide an advantage in accuracy over conventional weapons that do not have the ability to adjust their trajectory while in flight. The transition from unguided to guided weapons has accelerated rapidly since Operation Desert Storm in 1991 where unguided weapons were the norm. For example, as shown in figure 2, only about 8 percent of the weapons used during Operation Desert Storm were guided, while this number increased to about 68 percent in Operation Iraqi Freedom.

³ In this report, the terms weapons, bombs, and munitions are used interchangeably.

Operations in Kosovo, Afghanistan, and Iraq provided a variety of conditions for the development of these network-centric approaches. For example, operations in Kosovo were conducted primarily by air over rugged and undeveloped mountainous terrain. There were no direct attacks by large massed ground forces, and the cover of forests and villages allowed enemy forces to easily conceal their location. Similarly, Afghanistan's rugged and mountainous terrain and large number of caves and bunkers also provided numerous opportunities to conceal Taliban and al Qaeda forces. Light infantry and special operations forces were the primary U.S. forces on the ground, with aircraft as their sole means of fire support. In contrast, the terrain in Iraq is characterized by mostly broad plains with mountainous regions along the borders and a largely desert climate posing threats from dust and sand storms. Initial operations pitted large massed forces against one another in more traditional ways of fighting. However, the conduct of U.S. operations also relied heavily on small, dispersed groups of special operations forces operating on battlefields with no clear front and rear lines, as enemy forces blended in and out of urban populations.

Figure 2: Percentage of Guided and Unguided Munitions Used in Recent Combat Operations



Sources: DOD and Northrop Grumman.

With the exception of Kosovo, these conflicts were also characterized largely by pronounced U.S. air superiority, with little threat from enemy air defenses. During Operation Enduring Freedom in Afghanistan, enemy air defenses were so limited that U.S. forces were able to win near total air supremacy early in the war. Similarly, air superiority was not a concern during Operation Iraqi Freedom. Prior to the conflict, military forces had been working to set the conditions for air dominance through more than 3 years of bombing. During Operation Allied Force in Kosovo, however, there were significant concerns about enemy air defense systems, causing bombing operations to be carried out at high altitudes to avoid the threat. Moreover, access to overseas bases was problematic in all three of these operations, straining logistical support systems and complicating military operations. For example, this lack of forward air basing infrastructure within effective fighter range of land-locked Afghanistan required U.S.

forces to rely primarily on carrier-based aircraft to provide strike power during the operations. These operations were also conducted in an environment of pronounced concerns about limiting collateral damage to civilian populations and infrastructure. Adversaries attempted to exploit collateral damage in an effort to gain public sympathy for their cause and cast a negative light on U.S. operations. U.S. forces adjusted the target selection and approval process to minimize collateral damages, calling on senior leaders to approve target selection in some cases. However, attempts to minimize collateral damages can also create tension with military objectives and complicate bombing operations.

Improvements in Networked Forces and the Use of Precision Weapons Central to Increased Combat Power

DOD officials cite improvements in networking the force and in the use of precision weapons as primary reasons for the overwhelming combat power demonstrated in recent operations. Network-centric operating concepts, particularly in surveillance and command and control systems, have created unprecedented battlefield situation awareness for commanders and their forces, yet the full extent to which operations have been affected is unclear. Technologies enhancing the use of precision-guided weapons have also provided military commanders with increased flexibility and accuracy in bombing operations.

Networked Surveillance and Command and Control Systems Create Improved Situation Awareness

Network-centric operating concepts have improved battlefield situation awareness for commanders and their forces. DOD has indicated that technological improvements in information-gathering systems allow commanders an unprecedented view of the battlefield. Such improvements provide for greater shared situation awareness, which, in turn, speeds command and control. However, while it appears that enhanced networking has speeded operations, the full impact on operations is unclear because of the absence of detailed measures of their effects.

Improvements to Information-Gathering Systems Allow for Unprecedented Ability to Monitor Battlefield

DOD officials and reports cite a variety of technological and other improvements in intelligence, surveillance, and reconnaissance mechanisms as basic to the unprecedented ability of commanders and forces to observe and monitor the battlefield. For example, surveillance aircraft orbiting the battlefield—such as the E-3 Sentry airborne warning and control system (for detecting enemy air and naval activities and directing friendly fighters), the RC-135 and EP-3 aircraft (for locating enemy radar and other electronic emissions), the E-8C Joint Surveillance Target Attack Radar System (for detecting enemy ground activity), and the U-2 (for high altitude, wide-area surveillance)—have been outfitted with

smaller, lower cost, and higher quality sensors and radars, improving their ability to detect the enemy and provide high resolution imagery of the battlefield. Another key is the development of unmanned aerial vehicles, such as the Predator and the Global Hawk used extensively in Afghanistan and Iraq. These aircraft carry cameras, sensors, or even weapons and are used to constantly circle over the battlefield and provide continuous live surveillance of the enemy without risk to human pilots. The Predator is remotely piloted by operators on the ground, while the Global Hawk is self-piloted, controlled by a preprogrammed onboard computer that controls the aircraft from takeoff to landing.

These systems interact with ground personnel, such as special operations forces or specially trained combat controllers, to locate and precisely mark targets and assess bombing results. Technological advances now enable these controllers to identify a target and determine its precise location by using laser designators, which may be connected to a hand-held Global Positioning System receiver. Reports have cited the use of these technologies interacting with aircraft flying at high altitudes to avoid enemy air defenses, combined with new tactics for integrating special operations forces with conventional units, as a breakthrough capability. During Operation Enduring Freedom in Afghanistan, special forces teams used these technologies linked to piloted aircraft or unmanned Predator drones—providing live battlefield video directly to nearby AC-130 gun ships—to attack small groups of al Qaeda and Taliban fighters and other fleeting targets. The Joint Forces Command report⁴ on missions conducted during Operation Iraqi Freedom also cited the capabilities provided by these advances.

Shared Situation Awareness Speeds Command and Control

DOD officials indicate that the improved ability to share a broad view of the battlefield and communicate quickly with all elements of the force has compressed the time required for analysis and decision making in bombing operations, increasing lethality significantly. Before an actual strike may begin, information on potential targets generally must be routed through command and control centers where the target information is analyzed; information is exchanged between a myriad of commanders, analysts, and other elements of the force; and final approval for the strike is granted. The ability to network these elements and rapidly exchange information during this process—central to combat

⁴ U.S. Department of Defense, Joint Forces Command, *Joint Lessons Learned: Operation Iraqi Freedom Major Combat Operations* (Norfolk, Virginia: Mar. 1, 2004).

effectiveness—is enabled by improvements in computing power, digital communications, and satellite data links in recent years. For example, increases in computing power have enabled the networking of computers from a multitude of personnel and locations, with near instantaneous exchange of information through techniques such as file sharing, video conferencing, and e-mailing. These capabilities are enhanced by digital communications, which can be faster and more accurate than voice communication. For example, digital systems allow a ground controller to input the coordinates and other information needed for an attack into a computer and transmit this information instantly to computers on board an aircraft or at command and control centers.

The ability to rapidly exchange information generated by these networks has some limitations. For example, the Defense Science Board recently reported⁵ that despite the successes in Afghanistan, there were difficulties in passing coordinates from ground personnel to aircraft overhead due to the unreliability and limited range of secure communications and the absence of digital communications systems. As a result, instead of instantaneously transmitting targeting information across digital systems, ground controllers were required to pass Global Positioning System coordinates by voice radio to aircrews. Aircrews then had to write the coordinates on boards held on their knees, and then read them back for confirmation. Once confirmed, aircrews needed to load the coordinates by hand into the weapons, a process requiring as many as 51 computer keystrokes and subject to error.

The ability to rapidly exchange information generated by these networks is also dependent upon satellite data links and availability of bandwidth. Bandwidth is a term used to describe the rate at which information moves from one electronic device to another—usually expressed in terms of bits per second—over phone lines, fiber optic cable, or wireless telecommunications systems. Increases in this capacity have enabled the rapid exchange of large visual and data files, giving commanders increasing access to more real-time surveillance, intelligence, and targeting information than in previous conflicts. For example, according to the Joint Forces Command, U.S. forces in Iraq had access to 42 times the bandwidth available in Desert Storm. However, despite this improvement

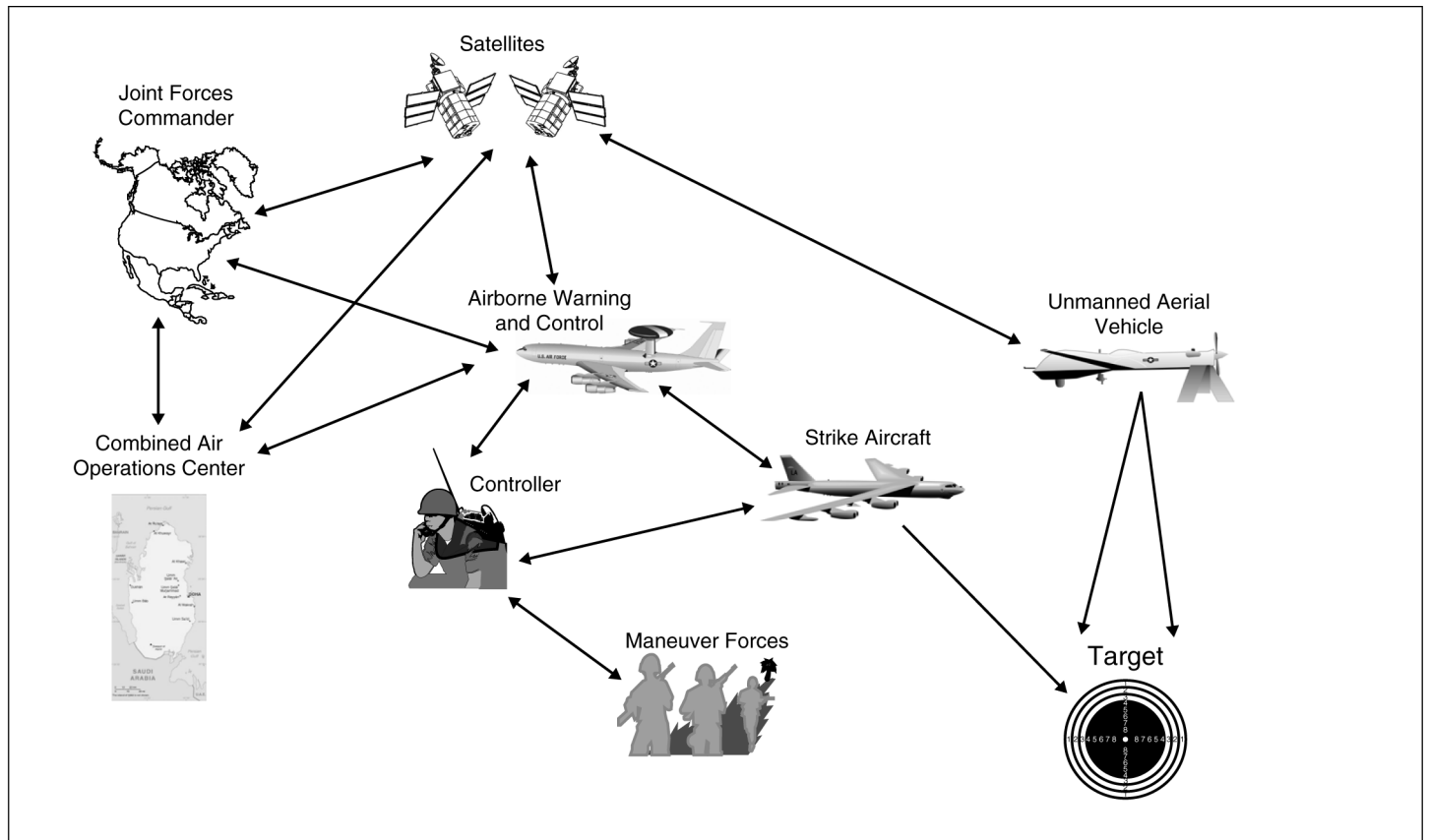
⁵ U.S. Department of Defense, Defense Science Board Task Force on Operation Enduring Freedom Lessons Learned, *Precision Targeting and Joint Close Air Support* (Washington, D.C.: Mar. 25, 2003).

the Army and others have experienced continuing shortages in the availability of bandwidth.⁶

Despite some limitations, technological advances have also made it possible to manage conflicts from command centers located far away from the battlefield, using so-called reach back techniques, where some commanders, analysts, and other support personnel remain at home stations and communicate with commanders at the battlefield using the networks described above. For example, during Operation Allied Force in Kosovo the center used to direct air operations was located in Vicenza, Italy. Images from Predator aircraft located over the battlefield in Kosovo were transmitted by satellite communications to a ground station in England, then by fiber optic cable to a facility in the United States for analysis. The information was then transmitted to the District of Columbia area, where it was up-linked to a satellite and transmitted back to controllers aboard an airborne command and control aircraft in Kosovo. The information was then provided to controllers, who provided the information to aircraft poised to strike the targets (see fig. 3).

⁶ Congressional Budget Office, *The Army's Bandwidth Bottleneck* (Washington, D.C.: August 2003).

Figure 3: Notional Networked Operations



Source: GAO, based on information from DOD.

The reach back technique not only provides for more centralized control of operations but also provides the opportunity for savings in logistical support requirements. For example, in previous conflicts, command centers—comprised of perhaps 1,500-2,000 commanders, analysts, and others, and the equipment needed to do their jobs—had to be transported into the war zone. This requirement created major demands on transportation and other support elements during the early phases of an operation and reduced the air and sealift available to move soldiers and supplies. Now, networking permits commanders at the battlefield to reach back to analysts and other staff located thousands of miles away for guidance and support. During operations in Afghanistan and Iraq, the joint forces commander remained at U.S. Central Command headquarters in Tampa, Florida, while air operations were directed from centers in Saudi Arabia and Qatar. Electronic map displays at these locations provided near

Full Impact of Networking Is Unclear

continuous tracking of ground, air, and naval units, with Predator drones and other aircraft feeding live video imagery from the battlefield.

While it seems clear that networking has speeded operations, the full impact on operations is unclear because of the absence of detailed measures of their effects. For example, U.S. Central Command officials told us that while the targeting process was slowed by requirements for additional command approvals for some targets, they believed that overall, the targeting process was more efficient during Operation Iraqi Freedom than previous conflicts. However, statistics were not maintained by the Central Command to measure this improvement.

Several experiments and exercises provide some information on this issue. For example, according to a recent DOD report⁷ to Congress, an Army exercise in 1997 using computer simulation to determine the war-fighting effectiveness of a digitized division-sized force found that the time required to process calls for fire was reduced from 3 minutes to 30 seconds and that the planning time for attacks at the company level was cut from 40 to 20 minutes. Similarly, a 1998 experiment involving networked Army helicopter units and a range of Navy and Marine units to counter a simulated attack by North Korean special operations boats found that the average decision time was reduced from 43 to 23 minutes and that shooter effectiveness measured in kills per shot was increased by 50 percent. DOD also reported that a special Air Force project in the mid-1990s found that F15-C fighter aircraft networked with digital communication packages increased their success rate in air-to-air combat exercises by more than 150 percent over aircraft equipped with voice only communications. The increase was attributed to the benefits of shared situation awareness provided by the digital networks. According to DOD's report, pilots with voice only communications can only see enemy aircraft in the radar zone directly in front of their aircraft, and they cannot see supporting friendly aircraft to their rear. To attack enemy aircraft, the voice only aircraft must hold verbal conversations with supporting aircraft to understand the entire combat picture and develop a coordinated attack plan. However, fighter aircraft networked with digital communications are able to see the entire picture of enemy and friendly support aircraft locations on their screens without the need for time-consuming conversations. According to the report, this shared mental picture of the

⁷ U.S. Department of Defense, *Network Centric Warfare, Department of Defense Report to Congress* (Washington, D.C.: July 27, 2001).

battlefield reduces the cognitive load on the pilots, enabling them to concentrate more on the battle, react quicker, and make synchronized, mutually reinforcing decisions with their supporting aircraft.

These examples provide illustrations of the potential effects of network-centric operations. However, DOD's report acknowledges that evidence of its full impact is limited and often scattered, rather than focused and systematic. Having a fuller, more precise understanding of the effects of network-centric operations is important because of its potential impact on issues such as the ability to model the speed of combat operations and the resources needed to support them. An official from DOD's Office of Force Transformation told us that the office is conducting a series of case studies of operations in Afghanistan and Iraq and exercises at the National Training Center and elsewhere to better understand these effects.

Precision Weapons Increase Flexibility and Accuracy

The development of technologies such as laser-guided and Global Positioning System-guided precision weapons has provided military commanders with increased flexibility and accuracy in bombing operations, making them increasingly lethal.

Precision Weapons Provide Increased Flexibility

Precision weapons reduce limitations created by poor weather and visibility, enable bombing operations from higher and safer altitudes, and allow aircraft to be used in new ways. For example, bombing operations have always faced limitations due to targets being obscured by bad weather or other limitations on visibility. Traditionally, the process of locating and marking a target was dependent on the controllers' ability to see the target, judge distances, and accurately find coordinates using paper maps. Targeting objectives were marked using smoke grenades, flares, or other such techniques. However, Global Positioning System-guided bombs help reduce these limitations by providing an all-weather delivery capability enabled by satellite-aided navigation. The system is a constellation of 24 orbiting satellites emitting continuous navigation signals that handheld receivers on the ground can translate into time, location, and velocity of targets. Time can be calculated to within a fraction of a second, location to within 100 feet, and velocity within less than a mile per hour. According to DOD officials, laser-guided bombs—which follow a narrow beam of pulsed energy trained on a target by aircraft or operators on the ground—are more precise than Global Positioning System-guided bombs, and have a capability for attacks on moving targets that Global Positioning System-guided bombs do not. However, laser-guided bombs are subject to limitations presented by rain,

clouds, or other visibility conditions since there must be a clear line of sight between the laser designator and the target.

From Operation Allied Force to Operation Enduring Freedom, DOD increased the use of Global Positioning System-guided bombs by about 45 percent and decreased the use of laser-guided bombs by about 32 percent. Conversely, between Operations Enduring Freedom and Iraqi Freedom, DOD decreased the use of Global Positioning System-guided bombs by about 13 percent and increased the use of laser-guided bombs by about 10 percent. DOD officials stated that there is a need for both laser-guided and Global Positioning System-guided bombs in today's environment and that the use depends on such factors as nature of the target being struck, theater of operations, weather conditions, availability, and cost. Frequently used guided munitions such as the Global Positioning System Guided Bomb Unit 31 have a unit cost of about \$21,100 to \$28,400, depending on the version used, while laser-guided bombs such as the Guided Bomb Units 10/12/16 have unit costs ranging from \$14,600 to \$23,000. Unguided bombs such as the 500-pound MK-82 and 1,000-pound MK-83 have unit costs ranging from about \$2,000 to \$8,700.

The use of such precision-guided weapons has also made it possible for bombing operations to be conducted from higher altitudes. This tactic helps limit the threat to pilots and aircraft from air defense systems and ground fire, and provides Global Positioning System-guided bombs with more time to acquire and guide on the satellite signals. In Kosovo, where air defense systems posed a significant threat to U.S. forces, pilots conducted bombing missions at an altitude that was beyond the effective reach of the Serbian enemy air defense systems. According to DOD officials, they have continued to use this tactic in Afghanistan and Iraq because of its effectiveness. In addition to high altitude operations, Global Positioning System-guided weapons, such as the joint direct attack munition used extensively in Iraq, can also be launched miles away from a target. The operator can essentially launch the weapon and proceed on to the next target, relying on the navigation system to guide the weapon to impact. While conducting bombing operations from high altitudes is much safer for pilots and aircraft, it also becomes more difficult to properly identify and distinguish certain targets, particularly when the enemy employs denial and deception tactics. For example, during Operation Allied Force, Serbian forces made tank decoys out of milk cartons and artillery pieces out of stovepipes.

DOD has also increased the numbers of aircraft capable of delivering precision-guided munitions, allowing military planners to use aircraft in

Precision Weapons Improve Accuracy

new and different ways. According to a recent report, only about 20 percent of U.S. aircraft were equipped with the ability to put a laser-guided bomb on the target during the first Gulf War. However, nearly every combat aircraft was capable of employing precision-guided munitions during Operation Iraqi Freedom.⁸ Bombers such as B-2s are now capable of delivering large payloads of weapons in a single strike, providing more flexibility in weapons availability. These capabilities increase the ability to deliver more precision-guided weapons during each flight. Moreover, they also increase operational effectiveness by allowing the military to reduce flights by planning to strike multiple targets during each flight, as opposed to the traditional approach of carrying out multiple flights to attack one target.

Our analysis found that advances in precision weapons have improved the accuracy of bombing operations. For example, we compared data on bombing operations in Afghanistan maintained by the U.S. Central Command with data on operations in Kosovo from our classified report on Operation Allied Force. This analysis found that the percentage of attacks resulting in damage or destruction to fixed targets increased by 12 percentage points from Kosovo to Afghanistan. Further, the percentage of attacks resulting in damage or destruction to mobile targets increased by 21 percentage points. DOD officials agreed that bombing accuracy improved, and classified analyses conducted by both the Air Force and the Navy support that conclusion. According to DOD officials, there is no similar analysis of the accuracy of bombing operations during Operation Iraqi Freedom.

While DOD officials agreed that precision-guided weapons have increased the accuracy of bombing operations, they stated that it is important to note that such improvements may also be influenced by other factors. For example, differences in terrain, the relative numbers of fixed versus mobile targets (which are harder to hit), and commanders' guidance on collateral damage can all influence the accuracy of bombing operations. In addition, the experience and the training that military forces gained by near continuous combat operations since the beginning of Operation Allied Force in 1999 may also influence bombing accuracy. Such factors must be considered when interpreting bombing statistics.

⁸ Center for Strategic and Budgetary Assessments, *Operation Iraqi Freedom: A First Blush Assessment* (Washington, D.C.: 2003).

Key Barriers Inhibit Continued Progress in Implementing the New Strategy

Despite the improvements brought about by advances in networking and precision weapons, DOD has identified a variety of barriers undermining continued progress in implementing the new capabilities-based strategy. For example, concerns were raised about shortages of digital communications, commercial satellite capacity and bandwidth, and other equipment. However, four interrelated areas stood out as key barriers to continued progress: (1) the lack of standardized, interoperable systems and equipment; (2) DOD's continuing difficulty in obtaining timely, high quality assessments of the effects of bombing operations; (3) the absence of a unified battlefield data collection system to provide standardized measures and baseline data on the efficiency and effectiveness of bombing operations; and (4) the lack of high quality, realistic training to help personnel at all levels understand and adapt to changes in the operating environment brought about by the move to a highly networked force using advanced technologies.

Problems in Standardization and Interoperability Slow Operations and Reduce Effectiveness

The lack of standardized, interoperable systems and equipment during joint operations was one of the most frequently reported problems we found during our review. According to DOD officials and reports, this long-standing problem undermines many operating systems at DOD, including systems used to provide shared situation awareness of the battlefield, battle management command and control, and damage assessments of the effects of bombing operations. For example, officials from the Joint Forces and Special Operations Commands told us that during Operation Iraqi Freedom, ground forces arrived in theater with several different, non-interoperable Blue Force Tracking systems. Blue Force Tracking systems are devices carried by friendly ground units and vehicles that continuously or periodically transmit their locations to a central database, allowing their locations to be displayed on computer screens. Since there is no joint standard for such tracking systems, the joint force commander is responsible for resolving the interoperability problems created by the use of disparate systems. To provide a common picture of the location of ground forces using these systems, commanders had to develop a number of creative solutions to bridge the differences between them and integrate them into a coherent system—requiring considerable time and effort.

DOD officials also told us that the use of differing formats for processing information creates similar problems. For example, each service and unified command have their own instructions for performing operations

such as reporting on the results of bombing missions. A recent DOD report found that during joint operations in Afghanistan, the Central Command received mission reports using at least 23 different formats.⁹ This created difficulty in receiving messages and required time-consuming manual data manipulation and entry. Operations in Iraq also faced similar problems. According to the Joint Forces Command report on Iraqi Freedom, the process of evaluating the effects of attacks in Iraq was beset by a lack of commonly understood operational level standards. Integration of information was undermined by groups adopting their own standards and reporting formats, resulting in difficulties in translating information and coming to a mutual understanding because they were not able to make specific comparisons between formats or to a common format. DOD has published a number of joint publications to help standardize operations in the joint environment. These publications provide general terms of reference and descriptions of processes, such as the targeting process, for use by personnel from the various services while operating in the joint environment. However, according to DOD officials, these publications do not provide enough detailed guidance, such as standardized formats for reporting mission results, for the actual conduct of operations. As a result, each unified command must develop its own implementing procedures, with no system to ensure standardization among the commands. Further, according to DOD officials, when the pace of operations increases to high levels, there is a tendency for personnel to revert to using their own familiar service procedures.

We have also reported that a variety of equipment—such as reconnaissance aircraft, satellites, ground-based stations processing intelligence data, ground targeting equipment, and digital transmission systems used to transmit information between airborne and ground personnel—is not interoperable across the services. Similar to the examples cited above, the inability of these systems to operate effectively together can limit access to communications and other needed capabilities and confuse and slow targeting activities as less efficient alternatives must be used to achieve the mission.

DOD recognizes that improved interoperability and standardization are central to the transformation of its forces, and is attempting to address the problem. However, the problem is complex and difficult to resolve

⁹U.S. Department of Defense, Joint Battle Damage Assessment Joint Test and Evaluation, *Operation Enduring Freedom Test Report* (Washington, D.C.: December 2002).

because military operations and acquisition systems have traditionally focused on the services and the specific weapons platforms needed for their specific missions—not on joint operations with interoperable systems and equipment. DOD’s budget is organized by service and defense agencies, as we and the Defense Science Board recently reported in separate publications.¹⁰ Therefore, the process of defining and acquiring the right capabilities is dominated by the services and defense agencies. Joint force commanders’ views are considered in this process, but they have a difficult time competing with individual service interests that control the process. As a result, the acquisition of systems and equipment often fails to consider joint mission requirements and solutions, and there is no guarantee that fielded systems will operate effectively together.

DOD is addressing the need for more interoperability and standardization in several ways. For example, DOD’s April 2003 Transformation Planning Guidance requires the commander of the Joint Forces Command to develop a plan to address DOD’s interoperability priorities. These priorities include such efforts as development of a common operational picture for joint forces; improved intelligence, surveillance, and reconnaissance capabilities; improvements to selected targeting linkages; and improved reach back capabilities. The planning guidance also requires the services and the Joint Forces Command to develop plans for achieving the desired transformational capabilities, including an identification of the initiatives taken to improve interoperability. DOD is also attempting to reform the acquisition process to align it with a new capabilities-based resource allocation process built around joint operating concepts. Instead of building plans, operations, and doctrine around individual service systems, DOD is attempting to explicitly link acquisition strategy to joint concepts to provide integrated, interoperable joint war-fighting capabilities. For example, in June 2003, the Chairman of the Joint Chiefs of Staff issued Instruction 3170.01 that established the Joint Capabilities Integration and Development System. This system provides new guidelines and procedures for joint staff to review proposed acquisitions for their contribution to joint war-fighting needs.

DOD is also developing the Global Information Grid to act as the organizing framework for network-centric operations and help ensure

¹⁰U.S. General Accounting Office, *Major Management Challenges and Program Risks—Department of Defense*, GAO-03-98 (Washington, D.C.: January 2003) and U.S. Department of Defense, Defense Science Board, *Report of the Defense Science Board Task Force on Enabling Joint Force Capabilities* (Washington, D.C.: Aug. 14, 2003).

interoperability in information operations throughout DOD. Begun in the late 1990s, this effort seeks to integrate the information processing, storing, disseminating, and managing capabilities—as well as the associated personnel and processes—throughout DOD into an integrated network. DOD’s Chief Information Officer has described this network as a private military version of the World Wide Web. The effort includes programs to develop the policies and guidance needed to implement network-centric concepts across DOD, as well as programs to provide the technological improvements needed for the success of network-centric operations. Parts of this effort, such as policy and procedural guidance, bandwidth expansion, and improvements to reach back capabilities, have begun or are in place. For example, definitions of requirements for interoperable information technology that are used in developing the Global Information Grid are cited as the authoritative guidance in the requirements determination and acquisition areas—including the Joint Capabilities Integration and Development System discussed previously. However, according to officials involved in the effort, development of the grid is still in its early stages and is planned to continue to the year 2010 and beyond.

While DOD appears committed to improving interoperability, DOD officials state that such reforms require difficult cultural changes to fully succeed. However, we previously reported that various problems have undermined past reforms, including cultural resistance to change, stove-piped operations, difficulties in sustaining top management commitment (the average tenure of top political appointees is only 1.7 years), and other problems that continue to exist today.¹¹ For example, in November 1997, DOD announced the establishment of the Defense Reform Initiative, which was a major effort to modernize DOD’s business processes and ignite a “revolution” in business affairs at DOD. The initiative was overseen by the Defense Management Council composed of senior defense leaders reporting to the Secretary of Defense. However, by July 2000, we reported¹² that the initiative was not meeting its time frames and goals in a number of areas. We concluded that the most notable barrier was the difficulty in overcoming institutional resistance to change in an organization as large and complex as DOD. Moreover, the effectiveness of the Defense Management Council was impaired because members were

¹¹ See [GAO-03-98](#).

¹² U.S. General Accounting Office, *Defense Management: Actions Needed to Sustain Reform Initiatives and Achieve Greater Results*, [GAO/NSIAD-00-72](#) (Washington, D.C.: July 25, 2000).

not able to put aside their particular services' or agencies' interests to focus on departmentwide approaches.

Similarly, cultural impediments to change were also illustrated in our March 2003 report on ground-based systems for processing intelligence data.¹³ In that report, we stated that DOD's system for certifying their interoperability was not working effectively. In 1998, DOD began a program to reduce the number of ground-based systems that process intelligence data from various sensors and ensure that the remaining sensors are interoperable with other DOD systems. DOD requires that such information systems be certified, and to help enforce the certification process, the department set up a review panel to periodically review such systems and place those with interoperability problems on a "watch list." However, 5 years after the program was started, we reported that only 2 of 26 systems in the program had been certified and, despite this problem, the systems had not been placed on the watch list. DOD officials cited a number of reasons for the noncompliance, including that military services sometimes allow service-unique requirements to take precedence over joint interoperability requirements. DOD strongly agreed with our recommendations to take several steps necessary to enforce its certification process.

Timely Understanding of Battle Damages Remains a Difficult Problem

DOD's difficulty in obtaining timely, high quality assessments of the effects of bombing operations continues to be a difficult problem to overcome. Problems with battle damage assessments have been repeatedly identified since at least Operation Desert Storm in 1991. DOD has taken some steps to address these problems, but they continue to reoccur. As a result, some DOD officials have called for approaching battle damage assessments in different ways.

Battle Damage Assessments Cannot Match Pace of Operations

Reports from DOD and others have identified repeated difficulties in conducting battle damage assessments in operations in Iraq, as well as other operations dating back at least to Operation Desert Storm in 1991. Battle damage assessments are a critical component of combat operations. Slow or inaccurate assessments can result in inefficient use of forces and weapons, as targets must be struck repeatedly—but sometimes unnecessarily—to ensure their elimination as a threat. Inadequate damage assessments also slow ground advances, as units and individuals face

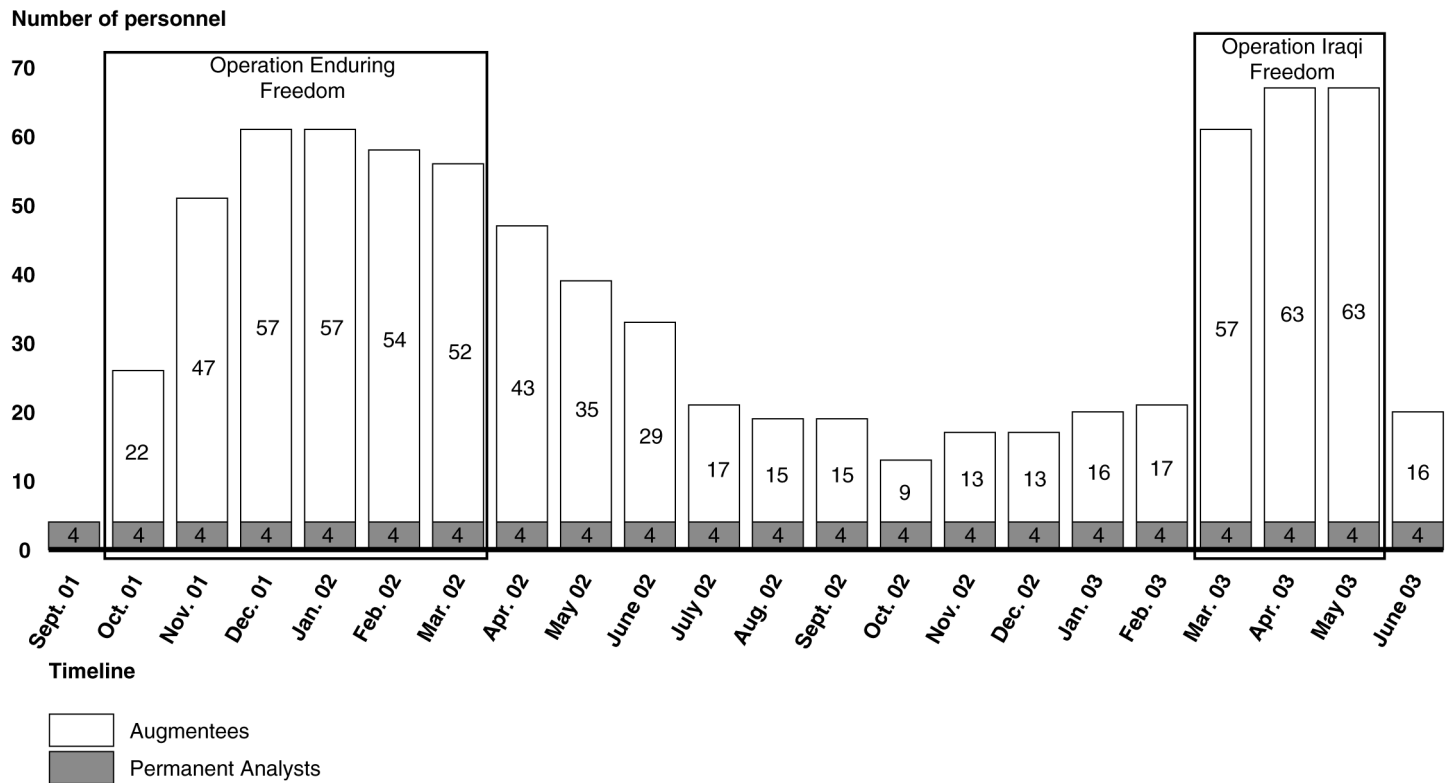
¹³ See [GAO-03-329](#).

uncertainty about enemy capabilities, which can ultimately increase their risk of death or injury since they may have to close with the enemy to understand the conditions ahead of them. However, DOD reported that battle damage assessments during operations in Iraq could not keep up with the pace of operations and failed to provide the information needed for operational decisions. Reports on operations in Afghanistan also identified similar problems during Operation Enduring Freedom. Our report on Operation Desert Storm¹⁴ found that battle damage assessments during that conflict were neither as timely nor as complete as planners had assumed they would be. Battle damage assessments were performed on only 41 percent of the strategic targets in our analysis, resulting in potentially unnecessary additional strikes to increase the probability that target objectives would be met.

The inability of damage assessment resources to keep up with the pace of modern battlefield operations is due to several factors. According to DOD officials, advances in network-centric operations and precision weapons have increased the speed at which targets are generated and attacked. At the same time, however, DOD does not have an occupational specialty for battle damage analysts. This results in shortages of trained analysts when resources are surged during operations, leaving unified commands to rely on untrained and inexperienced personnel brought in from other areas and trained on the job. For example, during operations in Afghanistan and Iraq, the Central Command experienced requirements for large manning increases in its battle damage assessment capability. While the command was ultimately able to increase its staff of analysts to about 60 (see fig. 4), this was only a fraction of the estimated requirement. Typically, the Central Command has about three to five full-time personnel assigned to its battle damage assessment group.

¹⁴ U.S. General Accounting Office, *Operation Desert Storm: Evaluation of the Air Campaign*, GAO/NSIAD-97-134 (Washington, D.C.: June 12, 1997).

Figure 4: U.S. Central Command Battle Damage Assessment Manning Levels for Recent Operations



Source: DOD.

Note: The time frames indicated as Operation Enduring Freedom and Operation Iraqi Freedom designate periods of major combat operations.

Moreover, according to Central Command officials, even when they obtained personnel they were often untrained. Operations were further slowed, as these personnel were required to receive on-the-job training. Battle damage assessment training is available at both the service and joint levels. However, according to DOD officials, the absence of a formal occupational specialty for battle damage assessment means there is little incentive for personnel to seek the training. Further, even if trained, analysts are required to use the instructions of the unified command in charge of operations during actual conflicts. DOD officials told us that there is no requirement for these instructions to be standardized, making it more difficult for personnel from the services to quickly adapt to operations. Finally, according to officials, DOD does not have a comprehensive system to track personnel who have received battle damage assessment training, further exacerbating problems in quickly locating trained analysts during surge situations.

Attempts to Address the Battle Damage Assessment Problem Have Been Limited

In recognition of the continuing problems associated with battle damage assessments, DOD has taken some steps to address these problems. However, these attempts have been somewhat limited. For example, DOD established the Joint Battle Damage Assessment Joint Test and Evaluation program in August 2000 to investigate solutions to battle damage assessment process problems. The program was focused on assessment processes used by U.S. forces in Korea, but it also analyzed processes used in Operations Enduring Freedom and Iraqi Freedom. Program officials developed a variety of enhancements that could improve the battle damage assessment process. For example, program officials developed improvements to the processes used in Korea to standardize disparate systems and speed the flow of information between analysis and command centers. To help address analyst training problems, they developed a compact disc-based course to provide quick training for untrained personnel assigned to fill shortages of analysts during conflicts. Further, they also developed an agreement with a reserve organization to develop a core of trained battle damage assessment analysts and to have those personnel available to meet surge requirements for the Korean command.

However, according to program officials, acceptance of such approaches is voluntary within DOD, and many have not been implemented outside Korea. They are trying to gain additional support for adoption of their enhancements. Program operations will be discontinued and a final report issued by December 2004. In addition to this program, DOD officials told us that a Combat Assessment Working Group was recently established at the Joint Staff to discuss ways to address problems with the battle damage assessment process. However, the group had not developed formal recommendations at the completion of our audit work in March 2004.

Officials Call for Different Approaches to Assessing Battle Damage

Some DOD officials have called for more effort to be focused on assessing battle damages from an “effects-based” framework. The effects-based operational concept calls for an increased emphasis on conducting military operations and assessing their effects, in terms of the military and nonmilitary effects sought—rather than in terms of simply the destruction of a given target or an adversary. According to a recent Defense Science Board report,¹⁵ the emergence of this concept has been influenced by the opportunity provided by precision weapons, shared situation awareness, and other advances enabling the precise use of force, as well as the needs

¹⁵ U.S. Department of Defense, Defense Science Board, *Report of the Defense Science Board Task Force on Discriminate Use of Force* (Washington, D.C.: July 28, 2003).

presented by the nature of current military campaigns. Operations from Kosovo to Iraq have been characterized by tension among multiple strategic and operational objectives: destroy enemy infantry and air defenses and drive the current regime from power, but do not injure civilians or damage necessary infrastructure.

The use of an effects-based battle damage assessment approach would mean that instead of the traditional focus only on damage or destruction of a target, battle damage assessments should also attempt to determine whether command objectives are being met by other influences in the battlefield. For example, initial bombing attacks on nearby targets may persuade enemy troops to abandon a target facility, eliminating the need to bomb the target facility at all. According to the Joint Forces Command's report on Iraqi Freedom, commanders in Iraq attempted to use an effects-based approach to analyze military operations. However, when the speed of operations exceeded their capability to analyze and assess how actions were changing the Iraqi system, they reverted to the traditional focus on simple attrition measures. Coalition forces reverted to counting specific numbers of targets destroyed to determine combat progress, rather than evaluating the broader effect created on the enemy. The command has called for recognition of problems with battle damage assessments as a major obstacle to effects-based operations, requiring a variety of changes to resolve.

DOD officials also told us that the traditional focus on damage and destruction results in leaders relying too much on visual imagery to assess battle damages. This problem can cause leaders to delay battlefield progress until full visual confirmation of the desired affect is confirmed. According to these officials, given the increasingly reliable nature of precision weapons, it may be possible in some cases to rely on predicted or probabilistic effects, rather than full visual confirmation.

Absence of a Unified Battlefield Information System Confuses Measures of Effectiveness

DOD does not have a unified battlefield data collection system to provide standardized measures and baseline data on the efficiency and effectiveness of bombing operations. According to DOD officials, the current system for collecting operational data is for the services and the unified commands to maintain their own databases, which are often quite extensive. Precisely how data is defined, gathered, and analyzed is at the discretion of each individual component and addresses specific needs. These unique requirements lead to different purposes for conducting analyses, different data collection approaches, and different definitions of key data elements.

For example, to better understand the impact of the tactical and technological changes on the efficiency and effectiveness of bombing operations, we analyzed the number of attacks and bombs required to damage or destroy a given target for operations in Kosovo and Afghanistan. A number of DOD officials told us that advances in the accuracy of bombing operations have raised the expectation that fewer attacks and bombs are now required to damage or destroy targets. Instead of traditional operations—where multiple sorties and multiple bombs were required to destroy one target—some officials now believe one bomb per target and multiple targets on one sortie should be the norm. The results of our analyses tended to support the idea that it took fewer attacks to damage or destroy targets in Afghanistan than in Kosovo. However, we could not gain agreement from the services on the results of these analyses because each had its own system for measuring operations, and the measures also differed from the ones used in our analysis.

Different Approaches Used to Measure the Number of Attacks Needed to Destroy Targets

The question of how many attacks are required to damage or destroy a target is basic to understanding battlefield effectiveness; however, we found no consistency among the services and the unified commands as to which of several basic measures should be used. Some group information about attacks based on “sorties”—defined as the takeoff and landing of one aircraft, during which one or more aim points¹⁶ may be attacked. Others do not attempt to group information based on sorties, making comparisons of information between databases difficult and confusing. For example, because the Central Command was in charge of operations in Afghanistan, we used its database to analyze bombing operations during Operation Enduring Freedom and compare those with the results of our classified review of Kosovo bombing operations. The Central Command’s database provides information about aircraft attacks and damages to aim points, since it is focused primarily on assessing battle damages. However, it does not provide the information needed to analyze by sortie, since it does not identify activities that took place between a given takeoff and landing. To compare the Central Command’s data with our data on Kosovo, we grouped the information on the basis of attacks. An attack was defined as each time that a single aircraft dropped one or more weapons on any single aim point. Based on this definition, our analysis found that it took fewer attacks to damage or destroy both fixed and mobile targets during operations in Afghanistan than during operations in Kosovo.

¹⁶ A precise point on a target that is assigned for weapon impact.

Similar comparisons could not be made with the Air Force's and Navy's databases on Operation Enduring Freedom because their data are not maintained based on this definition of an attack. Both services list data by aircraft sortie. More specifically, each record in the Air Force's database corresponds to one delivery of a specific weapon type against an aim point, with each weapon delivery linked to a particular sortie and mission in the air tasking order. For the Navy's analysis, which describes the percentage of sorties that dropped weapons, each sortie can have one or multiple attacks, defined as one run at a given target. Because both the Air Force's and the Navy's analyses are primarily assessments of weapons and not intended to measure battle damage information, the main focus is assessing data for and based on specific weapon drops. As a result, they contain no analysis that links the relationship between the number of sorties flown and the corresponding damage.

Effects Also Measured Differently

A second basic element of effectiveness is whether or not bombing actions resulted in the desired effects. The services and the Central Command also differed in their approaches to measuring this element, further complicating analysis. The Central Command's database provides information on effects based on battle damage assessments, since measuring battle damage is the primary responsibility of the unified commands. However, the service databases are geared toward measuring the performance of specific systems.

The Air Force, for example, primarily focused its analysis of operations in Afghanistan on a munitions effectiveness assessment. This analysis measures the actual success of individual weapons against predicted results and does not address battle damage assessments. The analysis measures whether the bomb landed outside an area around the target within which the bomb was predicted to hit, known as the circular error probable. Air Force officials stated that it is possible for a weapon to be scored a miss for Air Force munitions effectiveness assessment purposes, but still cause significant damage to a target. According to the Air Force's analysis, the vast majority of munitions employed in Operation Enduring Freedom performed significantly better than expected. This could mean that the Air Force can adjust its planning and modeling assumptions to lower the number of sorties expected to be required to destroy a target.

Similar to the Air Force's analysis, the Navy measured effects based on weapon hit rates. However, the Navy's analysis assessed what fraction of Navy bombs that were dropped impacted the intended target and had a high order detonation, determined primarily by reviewing weapons system videos. According to officials, if a weapon hit the target and had a high

Basic Target Characteristics Defined Differently

order detonation, it was counted as a successful hit for analysis purposes. The Navy's analysis did not measure whether a weapon fell within the planned circular error probable, nor did it measure battle damages.

The services and the U.S. Central Command also differ in their treatment of the basic question of how to define a target as fixed or mobile. This distinction is important to considerations of effectiveness because it is much harder to hit mobile than fixed targets. Moreover, mobile targets may be becoming more numerous as adversaries attempt to use mobility to avoid the effectiveness of precision weapons. Inconsistent definitions of fixed and mobile targets result in different classifications of like targets and disagreement among officials when attempting to measure the relative effectiveness of bombing attacks against mobile and fixed targets.

The Navy's analysis, for example, classifies mobile targets as "mobile" and "moving." According to the analysis, mobile targets are those that can move between the time of launch and the time of impact, such as vehicles and aircraft. Moving targets are those that are actually moving when they are hit. Classification results are determined by a direct review of weapon system video or documentation in mission reports. Unlike the analysis, the Central Command's database classifies all targets capable of moving as mobile whether they are moving at the time of attack or not. The classification of moving is not used because such information is more detailed than is needed for battle damage assessment purposes.

In contrast, the Air Force's database does not classify targets as fixed or mobile. The database provides a description of the desired aim point, such as the center of a runway or troops, but leaves it up to the user to define which are mobile and which are fixed. There is a field for moving targets in the database, but according to Air Force officials, very few records have an entry in this field. Targets are only classified as moving when there is available weapon system video to confirm that the target was moving at the time the weapon was dropped. As a result of these differences, an attack on a truck that is moving at the time of an attack would be classified as mobile by the Central Command, as moving by Navy officials, and as either mobile or moving to Air Force officials, depending on the availability of weapon system video.

Fixed targets are also classified differently in some cases. For example, according to Navy officials, there are several types of fixed targets. Troops are classified as a fixed, area target because individual troops are not targeted with aircraft but rather as an area occupied by troops. However, buildings are classified as fixed, point targets where there is a specific

Differences Can Cause
Confusion in Operational
Assessments and Financial
Decisions

place to hit. In contrast, the Central Command classifies fixed targets only as those that are not able to move, such as buildings.

The absence of a baseline system to bridge definitional and other differences and provide clear, consistent information about actual bombing effectiveness creates confusion in several areas. For example, this confusion was graphically illustrated when we provided the results of our analyses to the services. The results tended to support the idea that it took fewer attacks to damage or destroy targets in Afghanistan than in Kosovo. However, we could not gain agreement from the services on the results because our analyses were based on Central Command data that differed from that in their own systems, as previously discussed. Similar confusion occurred over the results of our March 2002 classified analysis of bombing operations in Kosovo. DOD did not concur with our use of the Air Force's Mission Analysis Tracking and Tabulation System database to analyze bombing operations, stating that no single database is completely accurate and contains all information needed for the analysis. However, that database was the most comprehensive available, developed specifically as a primary database for tracking airframe and weapon effectiveness during Operation Allied Force, and was used by DOD as the basis for its January 2000 report to Congress on operations in Kosovo. DOD cannot clearly resolve such confusion until baseline definitions of effectiveness measures are reconciled and a unified database developed.

Further, reliable, consistent data on such issues is needed to make procurement decisions on the number of bombs and other resources DOD will need to procure for future conflicts. In this regard, we recently reported¹⁷ that differences in battle simulation models and scenarios used by the services and the unified commands were resulting in different estimates of munitions needed for operations, and, ultimately, in reports of munitions shortages. Clear, consistent, and up-to-date measures of the effectiveness of precision weapons—such as the actual number of aircraft and bombs required to achieve targeting objectives—could help resolve such differences and improve procurement and other planning decisions. In addition, as discussed earlier, precision weapons can be considerably more expensive than traditional munitions. Without clear data on bombing effectiveness, DOD cannot analyze the return on investment from the

¹⁷ U.S. General Accounting Office, *Defense Management: Munitions Requirements and Combatant Commanders' Needs Require Linkage*, GAO-03-17 (Washington, D.C.: Oct. 15, 2002).

trade-off of fewer, but more expensive, precision weapons versus the use of more, but less expensive, traditional munitions.

Current Training Does Not Provide Realistic Preparation to Cope with Changing Operating Environment

Both the Joint Forces Command and the Defense Science Board found that current training does not provide the realistic preparation needed to cope with the emerging operating environment. DOD officials raised concerns that the changing strategy and technological improvements have created large increases in the pace of operations and volume of information that have overwhelmed commanders and other personnel at times. Further, advances in networking the force and other changes have fostered a more centralized style of management, with senior leaders increasingly involved in operations. At the same time, however, network-centric operating concepts are distributing information to lower and lower organizational levels, raising the potential for increased autonomy for small units and individual soldiers. According to DOD officials, personnel at all levels, but particularly commanders, need realistic training to understand this new environment and adapt to it to ensure that the new capabilities are used to their fullest advantage.

Operations Characterized by Increasingly High Volume and Centralized Command and Control, but More Autonomy at Lower Levels

DOD officials told us that network-centric operations have advanced to the point that the heavy flow of information and rapid pace of operations may at times overload systems and personnel. This problem can create confusion and inefficiency as systems for conducting battle damage assessments or other operations become slow and clogged while sorting and integrating large amounts of information, and officials are distracted by having to devote precious time to sorting through hundreds of e-mail messages or by attending increasingly frequent videoconferences. Moreover, officials also believe that this problem may get worse as commanders increasingly recognize the advantages of networked systems, creating a need for even more information.

The officials also stated that increased networking is fostering a more centralized style of command and control, which can create tension between command staffs and operators in the field. For example, according to officials, lawyers and senior civilian and military leaders at headquarters locations remote from the execution of operations are becoming increasingly involved in target selection and other operational areas. Historically, one of the principal tenets of U.S. command and control has been centralized direction, but decentralized execution of operations to give subordinates on the scene sufficient freedom of action to accomplish their missions. Increased centralization in the execution of operations can result in senior commanders being bogged down in

operational details and subordinates on the scene losing initiative. This development has been linked to the advances in technologies that provide the opportunity for detailed views of the battlefield and frequent videoconferences and other communications to be shared among a wide array of officials that may be located thousands of miles away. This trend is also influenced by increased concerns over sensitive issues such as the avoidance of intrusions into the airspace of neighboring countries and collateral damage to civilian structures. Such issues act as an incentive for senior leaders to increase their involvement in lower and lower levels of planning and operations.

While senior leaders are becoming increasingly involved in operations, information is also being distributed to lower and lower organizational levels, raising the potential for increased autonomy for small units and individual soldiers. For example, one of the principal organizing and operating tenets of network-centric operations is the concept called power to the edge. This concept involves empowering individuals at the “edge” of an organization—where it interacts with its operating environment—by expanding access to information and eliminating unnecessary constraints on action. According to department officials, adopting this concept requires DOD to change the way it handles intelligence and other information. For example, DOD’s current information systems are based on data requirements that are focused on the needs of the organizations supplying the data, with dissemination of the data based on a sequential process with information pushed out to customers at the end. But DOD is now moving to systems where broad arrays of information are placed on networks before any unnecessary processing at the point of collection, with total access for customers who can pull out the information that each needs simultaneously. This provides more information to lower organizational levels, enabling them to operate more autonomously with less direct control by commanders. According to officials at the Joint Forces Command, this concept helped DOD use smaller formations of personnel with flexible command and control relationships to great advantage during operations in Iraq.

Changing Operating
Environment Requires Better,
More Realistic Training

Consistent with DOD’s basic tenet that the force must train as it will fight, DOD officials have called for improved, more realistic training to match the scale and tempo of actual operations. For example, the Joint Forces Command reported that the lack of realistic training undermined theater-level intelligence, surveillance, and reconnaissance management and other

operational level capabilities during Operation Iraqi Freedom. Similarly, the Defense Science Board reported¹⁸ that the changing operating environment will have unintended human consequences that will require personnel to adapt to increasing cognitive demands at even the most junior levels, and to think and act more quickly. According to the Board, current training will not adequately prepare DOD personnel to cope with the increasing and constantly changing cognitive requirements.

DOD officials also cautioned that the joint operational effectiveness experienced in Operation Iraqi Freedom was often the result of procedures developed during 18 months of practice begun during operations in Afghanistan and that such improvements are often fleeting—needing to be reinvented in the next contingency. The Joint Forces Command called for development of an improved joint training capability to institutionalize the operating procedures developed in Iraq and allow commanders and staffs to experiment with and practice operational-level processes. Moreover, service and DOD officials also noted that expectations for the future need to be tempered with the understanding that operations in Kosovo, Afghanistan, and Iraq were conducted with other advantages—such as largely complete air superiority—that may not be available in future conflicts.

Conclusions

The development of networked surveillance and command and control systems, precision weapons, and other advances has combined to have a synergetic effect on U.S. military power—providing increased capabilities for dealing effectively with enemies operating out of nontraditional battlefields, as well as more traditional approaches to warfare. Notwithstanding these advances, the full impact of these changes is still emerging and is not fully understood. Moreover, the enemy is likely to continue to evolve and adapt its approaches in response to the continued evolution of U.S. tactics and capabilities. As a result, it is important to continue developing and refining these capabilities. However, the legacy of DOD's traditional focus on service-specific operations is inhibiting the continued evolution of the new capabilities. The lack of standardized, interoperable systems and equipment interferes with the development of force networks, slowing operations and reducing effectiveness. Difficulties in quickly obtaining sufficient numbers of trained battle damage analysts

¹⁸ U.S. Department of Defense, Defense Science Board, *Defense Science Board Task Force on Training for Future Conflicts—Final Report* (Washington, D.C.: July 11, 2003).

result in slowed assessments unable to keep up with the increased pace of operations, inhibiting battleground progress and the utility of improvements in other areas. Similarly, the absence of a unified battlefield information system also confuses the clear understanding of improvements to the efficiency and effectiveness of operations as a result of changing capabilities, slowing the rate of adaptation to changing battlefield conditions. Finally, the lack of realistic training limits the ability of leaders to understand and systems to sense changes in the operating environment—such as the increased pace of operations and flow of information, the increased centralization of command, and the increased potential for operational autonomy and self-direction of small units and individual soldiers, as well as emerging concepts such as effects-based operations—further inhibiting the ability to adapt.

Recommendations for Executive Action

To ensure continuing evolution of the capabilities demonstrated in recent conflicts, we recommend that the Secretary of Defense direct the Joint Staff, the Joint Forces Command and other unified commands, and the military departments to take the following four actions:

- identify the primary information required for bombing operations, such as targeting and battle damage assessments, ensure that planned interoperability enhancements provide the standardized definitions, mission reporting formats, and other necessary instructions for this information to be used by all unified commands during joint combat operations, and determine whether this standardized information can replace that used by the individual services;
- formulate a plan to provide sufficient numbers of personnel trained in battle damage assessment procedures when they are needed for combat operations and include in the plan the following: incentives for personnel to take the existing joint training on damage assessment, development of a system to be used by the Joint Forces Command to track and mobilize personnel who have received damage assessment training for use during surge situations, and development of guidance on the appropriate use of effects-based, probabilistic, and other nontraditional concepts in assessing battle damages;
- develop a unified battlefield information system that provides for the identification and collection of data on key, standardized measures of bombing operations needed to assess the basic efficiency and effectiveness of such operations, for use by all unified commands; and
- develop a joint operations training capability that provides commanders and staffs with a realistic simulation of the increased pace of operations and other emerging changes to the combat operating environment.

Agency Comments and Our Evaluation

In written comments on a draft of this report, DOD concurred or partially concurred with all our recommendations. DOD stated that the Joint Staff, in coordination with the Joint Forces Command, is addressing our recommendations for actions to improve standardization of information used in bombing operations, develop a unified battlefield information system, and develop realistic joint training to help personnel adapt to changes in the operating environment in various ongoing initiatives.

DOD partially agreed with our recommendation to improve the battle damage assessment process and stated that it is addressing the issues we raised in the Joint Network Fires Capability Roadmap, the Joint Close Air Support action plan, and other efforts. However, DOD believed that the section of the report titled “Timely Understanding of Battle Damages Remains a Difficult Problem” discusses battle damage assessments as if that function was detached from the broader targeting process. That was not our intent. As indicated on page 6 of the report, we agree that battle damage assessments are an integral part of the broader targeting process. The use of a separate section of the report to deal with that aspect of targeting was meant only to highlight the long-standing problems with battle damage assessments and the need to focus DOD’s attention on corrective action. Officials from the U.S. Central Command, which was in charge of operations in Afghanistan and Iraq, and the Joint Forces Command report on lessons learned in Iraq both pointed to the need to elevate recognition of problems in the battle damage assessment process and address them. Continued improvement in the speed at which targets are generated and attacked will only further increase the need for damage assessments to keep pace with operations in the future.

DOD’s comments are reprinted in appendix III. DOD also provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the Secretary of Defense; the Secretaries of the Air Force, Army, and Navy; the Commandant of the Marine Corps; and the Director, Office of Management and Budget. The report will also be available at no charge on GAO’s Web site at <http://www.gao.gov>.

If you or your staff have any questions on the matters discussed in this report, please contact me at (757) 552-8100. The major contributors to this report are listed in appendix IV.



Neal P. Curtin
Director
Defense Capabilities and Management

Appendix I: Scope and Methodology

To assess the impact on operational effectiveness of improvements in networking the force and the use of precision weapons and identify the key barriers to continued progress in implementing the new strategy, we followed a three-phased approach.

To identify Department of Defense (DOD), military service, and unified command policies and approaches to implementing the new strategy, we obtained briefings, reviewed DOD and unified command directives and regulations, the Operation Enduring Freedom Campaign Plan, lessons learned reports, and prior reports by us and others. A bibliography of key reports on issues related to our review is included. We also interviewed officials from the Office of the Secretary of Defense; the Office of the Joint Chiefs of Staff; the U.S. Central Command; the U.S. Joint Forces Command; the U.S. Special Operations Command; headquarters offices of the Army, Navy, and Air Force; and other offices as appropriate.

We accompanied this work with a detailed analysis of bombing data developed for our March 2002 classified report on air operations in Kosovo and bombing data on operations in Afghanistan provided by the U.S. Central Command. Prior to conducting these analyses, we discussed the appropriate databases to use, the time frames to measure, and other such methodological issues with officials from the Central Command. We used Central Command data because its commander was in charge of joint operations in both Afghanistan and Iraq. To determine whether bombing accuracy and effectiveness had improved, we compared changes in the percentage of attacks resulting in damage or destruction to fixed and mobile targets, the number of attacks and the number of bombs during a given attack that were required to damage or destroy a given target, and other such measures of operations in Kosovo and Afghanistan. We then provided the results of these analyses to officials from the Office of the Secretary of Defense; the Office of the Joint Chiefs of Staff; the U.S. Central Command; the U.S. Joint Forces Command; the U.S. Special Operations Command; and the Army, Navy, and Air Force for their review and comment. We also obtained analyses of Operation Enduring Freedom from the Navy and the Air Force for comparison purposes. We requested data from the Army, but officials were unable to provide such data. We also requested copies of any similar analyses of operations in Iraq, but officials were unable to locate any such analyses. We did not conduct our own detailed analysis of operations in Iraq because of the extremely resource intensive and time-consuming nature of these analyses.


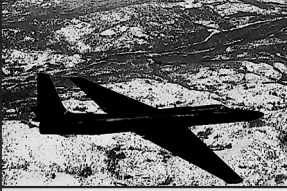





To assess the reliability of the Central Command's database for Operation Enduring Freedom, we (1) performed electronic testing for obvious errors

in accuracy and completeness; (2) reviewed related documentation, including tracking target files to specific data entries, and interviewed agency officials knowledgeable about the data; and (3) worked closely with agency officials to identify any data problems. When we found discrepancies such as missing or incorrect data, we brought them to the command's attention and worked with it to correct the discrepancies before conducting our analysis. We determined that the data were sufficiently reliable for our reporting purposes.

Following this analysis, we conducted a series of roundtable discussions with officials from the offices of the Secretary of Defense, Joint Chiefs of Staff, unified commands, and the services contacted previously. We conducted these discussions to gain a detailed understanding of the results of our analyses and officials' perspectives on the impact of the changing strategy on operations in Kosovo, Afghanistan, and Iraq and the key barriers to continued progress in implementing the new strategy. We focused our analysis on combat bombing operations. We did not attempt to analyze whether larger operational and strategic objectives were achieved.



Appendix II: DOD Reconnaissance Aircraft, Precision Weapons, and Other Technologies Used in Recent Operations

Aircraft



	<p>The RC-135 Rivet Joint is a reconnaissance aircraft that supports theater and national level consumers with near real-time on-scene intelligence collection, analysis, and dissemination capabilities. Its onboard sensor suite allows the crew to detect, identify, and locate signals throughout the electromagnetic spectrum, which it can then forward to a wide range of consumers.</p>
	<p>The U-2 provides continuous day and night, high-altitude, all-weather surveillance and reconnaissance in support of ground and air forces. The U-2 is capable of collecting multi-sensor photo, electro-optic, infrared and radar imagery, as well as collecting signals intelligence data, with imagery, real-time down linking of data anywhere in the world.</p>
	<p>The E-8C Joint Surveillance Target Attack Radar System is an airborne battle management, command and control, intelligence, surveillance, and reconnaissance aircraft. Its radar and computer systems allow it to provide ground and air commanders with detailed information on ground forces to support attack operations and targeting.</p>
	<p>The EP-3E (Aries II) is the Navy's only land based signals intelligence reconnaissance aircraft. Its sensitive receivers and high-gain dish antennas allow it to detect a wide range of electronic emissions from deep within targeted territory.</p>
	<p>The E-3 Sentry is an airborne warning and control system aircraft that provides all-weather surveillance, command, control, and communications to command and control centers. Its radar and computer systems enable it to provide positions and tracing information on enemy aircraft and ships, and location and status of friendly aircraft and ships.</p>
	<p>The Predator is a medium-altitude, long-endurance unmanned aerial vehicle reconnaissance system composed of four aircraft with sensors, a ground control station, a satellite link, and some 82 personnel providing 24-hour operations. Its primary mission is interdiction and conducting armed reconnaissance against critical targets.</p>
	<p>The Global Hawk unmanned aerial vehicle is a reconnaissance aircraft that provides battlefield commanders near real-time, high-reconnaissance imagery. Typically cruising at high altitudes for 24 continuous hours, it uses its cloud penetrating radar and other sensors to survey large geographic areas and relay imagery about enemy locations and resources to commanders.</p>

**Appendix II: DOD Reconnaissance Aircraft,
Precision Weapons, and Other Technologies
Used in Recent Operations**

Precision Weapons Systems

<p>(picture not available)</p>	<p>Guided Bomb Units-10, 12, and 16 are laser-guided bombs. These bombs consist of guidance packages bolted to traditional free-fall bombs (2,000, 500, and 1,000 pounds, respectively), enabling the bombs to analyze laser energy shone on a target by an operator, and then to adjust the path of the bomb as it descends on a target.</p>
	<p>The Joint Direct Attack Munitions Guided Bomb Unit-31/32 consists of a guidance tail kit attached to a traditional 2,000-pound free-fall bomb, enabling it to be navigated in flight to the selected target using Global Positioning System satellite technology.</p>
	<p>The Cluster Bomb Unit 87/B Combined Effects Munitions is a 1,000-pound unguided, air-delivered cluster bomb consisting of a cluster of about 200 bomblets that disperse over the target area and explode on impact. This bomb is effective against armor, personnel, and material, enabling a single payload attack against a wide variety of targets.</p>

Technologies

	<p>The Navstar Global Positioning System is a constellation of 24 orbiting satellites operated by the Air Force that provides navigation data to military and civilian users all over the world. The satellites orbit the earth every 12 hours, emitting navigation signals that are picked up by receivers and used to calculate time, location, and velocity.</p>
	<p>A laser designator/rangefinder (U.S. Marine Corps AN/PAQ-3 pictured) is used to locate targets and guide laser-guided weapons to the target. Designators radiate a narrow beam of pulsed energy that is used to mark a spot on the target that is then picked up by acquisition devices mounted on aircraft or directly on laser-guided bombs.</p>

Sources: DOD and other publicly available sources.

Appendix III: Comments from the Department of Defense



ACQUISITION,
TECHNOLOGY
AND LOGISTICS

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

MAY 26 2004

Mr. Neal P. Curtin
Director, Defense Capabilities and Management
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Curtin:

This is the Department of Defense (DoD) response to the GAO draft report GAO-04-547, "MILITARY OPERATIONS: Recent Campaigns Benefited from Improved Communications and Technology, but Barriers to Continued Progress Remain" dated April 5, 2004 (GAO Code 350358).

The DoD concurs with the comment on the draft report's first recommendation, partially concurs with the second recommendation, and concurs with the third and fourth recommendations. The rationale for the DoD's position is provided at enclosure 1. Enclosure 2 provides additional comments and suggested changes to the report.

The Department appreciates the opportunity to comment on the draft report.

Sincerely,

A handwritten signature in black ink, appearing to read "Glenn F. Lamartin".

Glenn F. Lamartin
Director
Defense Systems

Enclosures:
As stated



GAO DRAFT REPORT – DATED APRIL 5, 2004
GAO CODE 350358/GAO-04-547

“MILITARY OPERATIONS: Recent Campaigns Benefited from Improved
Communications and Technology, but Barriers to Continued Progress Remain”

DEPARTMENT OF DEFENSE COMMENTS
TO THE RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense direct the Joint Staff, the Joint Forces Command and other unified commands, and the Military Departments to identify the primary information required for bombing operations, such as targeting and battle damage assessments, and ensure that planned interoperability enhancements provide the standardized definitions, mission reporting formats, and other necessary instructions for this information to be used by all unified commands during joint combat operations, and determine whether this standardized information can replace that used by the individual services. (Page 29/GAO Draft Report)

DoD RESPONSE: The DoD concurs, but recommends adding “and other fires and effects” to the phrase “bombing operations.” The Joint Staff, in coordination with Joint Forces Command, is addressing these issues in the Joint Network Fires Capability roadmap, Joint Fires Initiative (JFI), Joint Close Air Support (JCAS) action plan, Joint Targeting School (JTS), and various other actions. In addition, DoD is changing its approach to resolving the Joint interoperability issue by focusing at the data level. On May 9, 2003, the ASD (NII) issued the DoD Net-Centric Data Strategy, outlining a new approach that manages data within Communities Of Interest (COIs) which are defined as “... collaborative groups of users who must exchange information in pursuit of their shared goals, interests, missions, or business processes ...”.

RECOMMENDATION 2: The GAO recommended that the Secretary of Defense direct the Joint Staff, the Joint Forces Command and other unified commands, and the Military Departments to formulate a plan to provide sufficient numbers of personnel trained in battle damage assessment procedures when they are needed for combat operations and include in the plan the following: incentives for personnel to take the existing joint training on damage assessment, development of a system to be used by the Joint Forces Command to track and mobilize personnel who have received damage assessment training for use during surge situations, and development of guidance on the appropriate use of effects-based, probabilistic, and other non-traditional concepts in assessing battle damages. (Page 30/GAO Draft Report)

DoD RESPONSE: The DoD partially concurs. The Joint Staff, in coordination with Joint Forces Command, is addressing these issues in the Joint Network Fires Capability roadmap, JFI, JCAS action plan, JTS and various other actions. The Department does not make a distinction of Battle Damage Assessment (BDA) separate from the targeting process, as does the GAO. The section of the report titled "Timely Understanding of Battle Damages Remains a Difficult Problem," deals with BDA from a perspective outside of the joint targeting process. The report discusses the BDA function as if it were detached from the broader targeting process; when in actuality, BDA can only be executed properly if it is undertaken as a fully integrated (i.e., kinetic and non-kinetic) activity within the targeting process. The products of the first three phases of the targeting cycle, depicted in Figure 1, page 6, define the basis for assessments performed in BDA.

RECOMMENDATION 3: The GAO recommended that the Secretary of Defense direct the Joint Staff, the Joint Forces Command and other unified commands, and the Military Departments to develop a unified battlefield information system that provides for the identification and collection of data on key, standardized measures of bombing operations needed to assess the basic efficiency and effectiveness of such operations, for use by all unified commands. (Page 30/GAO Draft Report)

DoD RESPONSE: The DoD concurs, but recommends adding "and other fires and effects" to the phrase "bombing operations." The Joint Staff, in coordination with Joint Forces Command, DOT&E, and the ASD(NII)/DoD CIO is addressing these issues in the Joint Network Fires Capability Roadmap, JFI, JCAS action plan, JTS and various other actions.

RECOMMENDATION 4: The GAO recommended that the Secretary of Defense direct the Joint Staff, the Joint Forces Command and other unified commands, and the Military Departments to develop a joint operations training capability that provides commanders and staffs with a realistic simulation of the increased pace of operations and other emerging changes to the combat operating environment. (Page 30/GAO Draft Report)

DoD RESPONSE: The DoD concurs. The Joint Staff, in coordination with Joint Forces Command, is addressing these issues in the Joint Network Fires Capability roadmap, JFI, JCAS action plan, JTS and various other actions.

Appendix IV: GAO Contacts and Staff Acknowledgments

GAO Contacts

John Pendleton (404) 679-1816
John W. Nelson (404) 679-1949

Acknowledgments

In addition to those named above, Katherine Chenault, Steve Pruitt, R.K. Wild, and Kristy Williams made key contributions to this report.

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