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# Report for Congress



# Iraq War: Defense Program Implications for Congress

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# Iraq War: Defense Program Implications for Congress


## Summary

The recent war against Iraq may have implications for various defense programs of interest to Congress. This report surveys some of those potential implications, and will be updated periodically as new information becomes available. Three cautionary notes associated with post-conflict "lessons-learned" reports apply to this report: Information about the Iraq war is incomplete and imperfect, so early lessons are subject to change. Each war is unique in some ways, so observers should avoid "overlearning" the lessons of the Iraq war. And potential U.S. adversaries can derive lessons from the Iraq war and apply them in future conflicts against U.S. forces, possibly devaluing U.S.-perceived lessons. It can also be noted that some persons or organizations offering purported lessons of the Iraq war may have a financial, institutional, or ideological stake in the issue.

Many observers have concluded that the Iraq war validated the Administration's vision for defense transformation, or major parts of it. Other observers disagree. The issue is potentially significant because implementing the Administration's vision could affect the composition of U.S. defense spending, and because the Administration may invoke the theme of transformation to help justify or seek rapid congressional consideration of legislative proposals, including proposals that could affect Congress' role in conducting oversight of defense programs. The Iraq war may influence debate on whether active-duty U.S. military forces are sufficiently large to carry out current U.S. military strategy, and on whether greater emphasis should be placed on forces that are less dependent on access to in-theater bases.

One of the most significant defense-program debates going into the Iraq war – and potentially one of those most significantly influenced by the war – concerns the future size and composition of the active-duty Army. Both supporters and opponents of maintaining at least 10 active-duty Army divisions may find support in the Iraq war for their positions, as may both supporters and opponents of the current Army plan to shift toward a mix of fewer heavy armored units and a larger number of lighter and more mobile units.

The Iraq war validated the effectiveness of combat-aircraft armed with precision-guided weapons, and may influence discussions about current plans for investing in specific aircraft and munitions programs. The Iraq war may reinforce support generated by the war in Afghanistan for increased investment in U.S. special operations forces. It may also highlight questions concerning reserve combat divisions and the potential consequences of extended callups of large numbers of reserve forces.

The war appears to have demonstrated the value of network-centric operations and timely battlefield intelligence, and the potential value of psychological operations. It appears to have confirmed the importance of preparing for urban combat. The war offered a limited real-world test of the Patriot missile defense system. The war may lead to renewed discussions about strategies for reducing friendly fire incidents. It may reinforce support for investing in aerial refueling capabilities, and increase interest in potential new airlift and sealift technologies.

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# Iraq War: Defense Program Implications for Congress

## Introduction[1]

The recent war against Iraq, known formally as Operation Iraqi Freedom (OIF), was the largest U.S. military operation since the 1991 Persian Gulf war, and may have implications for various defense programs of interest to Congress. This report, which is similar to one that CRS prepared following the 1991 Persian Gulf war,[2] surveys some of those potential implications. It will be updated periodically as new information becomes available.

### Scope of Report

This report focuses on how the Iraq war may affect defense programs that Congress may address in acting on defense authorization and appropriation bills for FY2004 and subsequent fiscal years. It does not cover broader defense policy issues such as U.S. national security strategy or Congress' role in declaring war. Nor does it cover the post-war occupation and reconstruction efforts in Iraq or the potential impact of the war on U.S. foreign relations and the U.S. role in the world. Issues like those are covered in other CRS products.

### Deriving "Lessons" of the War: Some Cautionary Notes

Although the Department of Defense (DoD) and other organizations customarily produce "lessons learned" reports following the conclusion of a major military operation like the Iraq war, this report for the most part avoids using the term "lessons" because it can imply the making of recommendations – something that CRS reports do not do. Even so, certain cautionary notes associated with "lessons-learned" reports apply to this report. These include the following:

- **Information is imperfect; early lessons are subject to change.** Public information about the Iraq war is currently incomplete, and will likely remain so for some time. Although certain aspects of the war, such as the operations of U.S. Army and Marine Corps ground forces moving from Kuwait to Baghdad, received extensive press coverage, many details of these operations are not known. Other aspects of the war, such as coalition air operations, were reported in less detail. And some aspects of the war, such as the activities of

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[1]This section prepared by Ronald O'Rourke, Specialist in National Defense.

[2]CRS Report 91-421 F, *Persian Gulf War: Defense-Policy Implications for Congress*, coordinated by Ronald O'Rourke. Washington, 1991. (May 15, 2001) 82 p.

special operations forces, have received very little press coverage. Knowledge about the war at this point is thus fragmentary and unbalanced. Historically, moreover, early information that is publicly available about a war often proves to be inaccurate. Attempts to identify lessons should be tempered by an appreciation for gaps and imperfections in the available information. As information becomes more complete and accurate with time, early lessons may need to be modified or dropped.

- **Each war is unique; avoid "overlearning" the lessons of this war.** Particularly for U.S. military forces, which fight conflicts in different parts of the world against various adversaries, each war is characterized by a unique combination of variables such as geographic setting, pre-conflict warning and preparation time, U.S. and enemy war aims, the size and composition of enemy military forces, the quality of enemy military training and leadership, the amount and kind of military assistance that the United States or the enemy receives during the war from other governments or groups, the enemy government's degree of popular support among its own population, and the presence or absence of factional divisions within the enemy country's population due to ethnic differences or other factors. Given how at least some of these factors usually change for the United States from one war to the next, it has long been a staple of U.S. lessons-learned reports to note that lessons from one conflict may not necessarily apply to the next, might need to be applied with caution, or might contradict lessons of previous conflicts. Some of the lessons of the Iraq war, for example, may differ from lessons of the U.S.-led war in Afghanistan in 2001-2002 or the U.S. military operation in Kosovo in 1999. In short, the lessons of the Iraq war should not be "overlearned" because the Iraq war in some ways might not serve as an accurate template for future conflicts.

- **Non-U.S. observers derive lessons as well, possibly devaluing U.S.-perceived lessons.** The United States is not the only country that derives lessons from U.S. military operations; observers in other countries do so as well. Non-U.S. observers keenly observe the U.S. way of war and draw conclusions about its strengths and weaknesses. These conclusions, if correct, can be applied by potential U.S. adversaries to improve their ability to contest U.S. forces in a future conflict. Serbia, for example, observed the 1991 Persian Gulf war and drew lessons from it on how to counter the effects of U.S. air power. These lessons were applied with some success by Serbian forces in Kosovo in 1999. In short, lessons that U.S. observers reach about a given U.S. military operation can be devalued by lessons that potential adversaries draw from that same operation. This is another reason to avoid "overlearning" the lessons of a given U.S. military operation.

Numerous persons or organizations may offer what they contend are the lessons of the Iraq war. In evaluating purported lessons offered by various sources, one factor to consider is whether those sources have a potential financial, institutional, or ideological stake in the issue. Persons or organizations identifying the lessons of a war can be influenced, perhaps strongly, by such a stake. Indeed, some persons or organizations may deliberately identify and publicize purported lessons with the aim of influencing policy decisions on defense programs in a way that promotes their own

interests. Although lessons offered by persons or organizations with a stake in the issue in many cases may be reasonable or correct, policymakers may wish to take such interests into account in evaluating lessons put forward by such sources.

## Organization of Report

The remainder of this report consists of a series of discussions on various defense program issues that might have been affected in one way or another by the Iraq war. The discussions are designed to be fairly self-contained, so that readers may browse topics using the Table of Contents and read those of interest. A footnote at the start of each discussion identifies the CRS analyst who prepared that section.

# Issues for Congress

## Defense Transformation[3]

**Iraq War Viewed As A Test.** In the weeks leading up to the Iraq war, many observers anticipated that the conflict would serve as a test of the administration's vision for defense transformation – its concept for overhauling the U.S. military to exploit new technologies and counter 21st-Century security threats.[4] Following the war, many of these observers concluded that the war validated this vision, or at least major parts of it, and also strengthened Secretary of Defense Donald Rumsfeld's authority to implement this vision over the objections of persons or organizations opposed to parts of it. Some observers speculated that the war may encourage the administration to increase the scope of its planned defense transformation or implement it more quickly.[5]

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[3]This section prepared by Ronald O'Rourke, Specialist in National Defense.

[4]Defense transformation generally refers to large-scale, discontinuous, and possibly disruptive changes in military weapons, organization, and concepts of operations (i.e., approaches to warfighting), that are prompted by significant changes in technology or the emergence of new and different international security challenges. For more on defense transformation, see CRS Reports RS20787, *Army Transformation and Modernization: Overview and Issues for Congress*, by (name redacted); RS20859, *Air Force Transformation: Background and Issues for Congress*, by (name redacted); RS20851, *Naval Transformation: Background and Information for Congress*, by Ronald O'Rourke, RL31922, *Military Transformation: Issues for Congress and Status of Effort*, by Lloyd D. DeSerisey, and RL31425, *Military Transformation: Intelligence, Surveillance and Reconnaissance*, by Judy G. Chizek.

For examples of pre-war articles anticipating that the war would test the administration's vision for defense transformation, see Cooper, Richard T., and John Hendren. Strategy Boiled Down To Light Vs. Heavy. *Los Angeles Times*, March 19, 2003; Gordon, Michael R. A Sequel, Not A Rerun. *New York Times on the Web*, March 18, 2003 (Dispatches: A Web-Exclusive Column); Towell, Pat. The War Agenda: Military Operations. *Congressional Quarterly Weekly*, March 15, 2001: 601; Ricks, Thomas E. War Plan For Iraq Largely In Place. *Washington Post*, March 2, 2003: 1; Barry, John, and Evan Thomas. Boots, Bytes And Bombs. *Newsweek*, February 17, 2003; Sinnreich, Richard Hart. War Could Test Transformation The Hard Way. *Lawton (Oklahoma) Constitution*, February 16, 2003; Jaffe, Greg. Getting U.S. Forces Together Poses Challenge For War Plan. *Wall Street Journal*, February 11, 2003: 1; Thompson, Mark, and Michael Duffy. Pentagon Warlord. *Time*, January 27, 2003; Jaffe, Greg. War Plan Aims To Balance Roles Of Ground Forces, New Weapons. *Wall Street Journal*, November 27, 2002: 1.

[5]See, for example, Jonson, Nick. Cebrowski: Emerging Global Threats Require New Methods Of Operation. *Aerospace Daily*, May 14 2003; Scarborough, Rowan. 'Decisive Force' Now Measured By Speed. *Washington Times*, May 7, 2003: 1; Hanson, Victor Davis. Don Rumsfeld, Radical For Our Time. *National Review*, May 5, 2003; Moniz, Dave, and John Diamond. Rumsfeld Is Perched At 'Pinnacle Of Power.' *USA Today*, May 1, 2003: 10; Stern, Seth. Pentagon Iconoclasts. *Christian Science Monitor*, April 29, 2003:1; Burlas, Joe. 'Iraqi Freedom' Proves Transformation Concepts. *Army News Service*, April 28, 2003; Schlesinger, Robert. War May Provide Ammunition For Rumsfeld To Pursue Vision. *Boston Globe*, April 25, 2003: 18; Whittle, Richard. Military Mulls Lessons Of

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**Potential Significance for Congress.** These conclusions and speculations, if correct – and not all observers agree with them[6] – are potentially of great significance to Congress, for at least two reasons:

- Implementing the Administration's vision for defense transformation could substantially affect the composition of U.S. defense spending, shifting defense funding toward defense programs that are judged to be transformational and away from defense programs that are judged to be non-transformational or "legacy." Such shifts could significantly affect revenues and employment levels at companies associated with the affected programs.

- The Administration may be encouraged to invoke the theme of transformation to help justify or seek rapid congressional consideration of legislative proposals affecting DoD that may or may not be transformational, depending on one's definition of transformation, including proposals which could, if implemented, affect Congress' role in conducting oversight of U.S. defense activities. A potential case in point is the "Defense Transformation for the 21st Century Act," a 205-page legislative proposal that the administration submitted to Congress on April 10, 2003 that would, among other things, permit DoD to establish its own policies for hiring, firing, and compensating its civil service employees; change the terms in office for certain senior generals and admirals; give DoD increased authority to transfer funds between

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[5](...continued)
War. *Dallas Morning News*, April 22, 2003; Ricks, Thomas E. Rumsfeld Stands Tall After Iraq Victory. *Washington Post*, April 20, 2003: 1; Purdy, Matthew. After The War, New Stature For Rumsfeld. *New York Times*, April 20, 2003; Knickerbocker, Brad. Iraq War As A Blueprint For Next One. *Christian Science Monitor*, April 16, 2003: 1; Bowman, Tom. U.S. Demonstrates 'New Style Of War' In Iraq. *Baltimore Sun*, April 13, 2003; Cooper, Richard T., and Peter Pae. Battle For Military's Future Unresolved. *Los Angeles Times*, April 12, 2003; Squeo, Anne Marie, and Greg Jaffe. War's Early Lessons May Curb Enthusiasm For Older Weapons. *Wall Street Journal*, April 11, 2003; Jaffe, Greg. Rumsfeld's Vindication Promises A Change In Tactics, Deployment. *Wall Street Journal*, April 10, 2003; Knickerbocker, Brad. War Boosts Rumsfeld's Vision Of An Agile Military. *Christian Science Monitor*, April 11, 2003; Cushman, John H. Jr., and Thom Shanker. War In Iraq Provides Model Of New Way Of Doing Battle. *New York Times*, April 10, 2003; Bender, Bryan. Maturing Approach Called Guide. *Boston Globe*, April 9, 2003; Jenkins, Holman W., Jr. Two Wars Of CEO Rumsfeld. *Wall Street Journal*, April 9, 2003; Bender, Bryan, and Robert Schlesinger. Arms And The Man: The Rumsfeld Vision. *Boston Globe*, April 6, 2003. See also Trimble, Stephen. Cebrowski: Iraq War Offers Clues For Transformation Agenda. *Aerospace Daily*, April 23, 2003.

[6]For examples of articles that take issue in varying degrees with the conclusion that the Iraq war validated the administration's transformation vision, see Stern, Seth. Military 'Transformation' May Not Mean Smaller Forces. *Christian Science Monitor*, May 7, 2003; Helprin, Mark. Analyze This: Civilian Officials Reached A Point Of Sufficiency Only Because They Were Pushed To It. *National Review*, May 5, 2003; O'Hanlon, Michael. A Reality Check For The Rumsfeld Doctrine. *London Financial Times*, April 29, 2003: 13; Arkin, William M. It Ain't Broke After All. *Los Angeles Times*, April 27, 2003.

DoD budget accounts; and eliminate many DoD reporting requirements that were instituted to assist Congress in conducting oversight of DoD activities.[7]

**The Administration's Transformation Vision.** The administration identified defense transformation as a major goal for DoD soon after taking office and has since worked to define its transformation vision. In general, that vision calls for shifting U.S. military planning away from a reliance on massed forces, sheer firepower, military services operating in isolation from one another, and attrition-style warfare,[8] and toward a greater reliance on speed and agility, stealth, precision application of firepower by widely distributed forces, information technology, joint (i.e., integrated multi-service) operations, and effects-based warfare.[9] Some transformation advocates characterize these changes as shifting from an Industrial Age approach to war to an Information Age approach. Transforming the military along these lines, the administration and its supporters argue, will permit the United States to apply military power more rapidly and flexibly in distant parts of the world, outpace enemy decisionmaking on the battlefield, more effectively counter so-called asymmetric military threats,[10] and generally achieve U.S. military combat goals with fewer forces, more quickly, and at lower cost. The Administration's transformation vision also includes proposals for changing DoD's business practices, particularly with an eye toward streamlining those practices so as to accelerate the fielding of new weapons and generate savings that can be used to invest in them.

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[7]See, for example, Donnelly, John M. Hill Rebuffing Rumsfeld Plan To Kill Reports To Congress. *Defense Week Daily Update*, May 15, 2003; Liang, John. House Democrats Object To DOD Transformation Legislation. *InsideDefense.com*, May 14, 2003; Matthews, William, and Gopal Ratnam. Transformation Act Draws U.S. Lawmakers' Fire. *DefenseNews*, May 5, 2003: 1; and Korb, Lawrence. Pentagon Independence. *DefenseNews*, June 2, 2003: 29.

[8]Attrition-style warfare refers to a traditional warfighting strategy that focuses on seeking out the enemy's military forces, wherever they might be, and then using firepower to destroy them piece by piece, through a process of gradual attrition, until the enemy is no longer capable of fighting effectively.

[9]Effects-based warfare, also called effects-based operations, refers to a warfighting strategy that has been proposed as an alternative to traditional attrition-style warfare. Rather than focusing on seeking out and destroying enemy forces wherever they might be, effects-based operations focuses on attacking selected key elements of the enemy's ability to fight in a coordinated manner. Under an effects-based strategy, U.S. forces might attack the enemy's military leadership, its military command-and-control systems, and the most politically and militarily significant elements of the enemy's fielded military forces while bypassing less significant enemy military forces. The goal of effects-based warfare is to create specific effects on the enemy that lead to a rapid collapse of the enemy's willingness and ability to fight, without having to go through a time-consuming and potentially costly effort to destroy the bulk of the enemy's military forces through a gradual process of attrition.

[10]Asymmetric threats refer to military capabilities that adversaries may field as part of a strategy to avoid directly attacking perceived U.S. strengths and instead attack perceived U.S. weaknesses. Potential asymmetric strategies include terrorism, use of nuclear, chemical, or biological weapons, and development of so-called anti-access/area-denial forces that are intended to prevent U.S. forces from establishing an initial foothold in a contested overseas area of military operations.

**Transformational vs. Legacy Programs.** Within the discussion on defense transformation, there has been significant debate over which programs qualify as transformational and which do not. Advocates of various defense programs have argued that their programs should be viewed as transformational, or at least not as legacy – a label that in some eyes has become synonymous with obsolescence and suitability for reduction or termination.

Defense program areas that have frequently been identified as closely associated with the administration's transformation vision include the following:

- precision-guided air-delivered weapons,
- lighter and more mobile Army ground forces,
- special operations forces,
- unmanned vehicles,
- smaller and faster Navy surface ships,
- space systems and missile defense,
- forces for countering terrorists and weapons of mass destruction, and
- C4ISR systems that link U.S. and coalition military units into highly integrated networks possessing superior battlespace awareness.[11]

Defense program areas that have been identified by various observers, correctly or not, as non-transformational or legacy include the following:

- unguided weapons,
- heavy armored forces for the Army,
- manned tactical aircraft,
- large, slower-moving Navy surface ships, and
- weapons and associated C4ISR systems that operate in an isolated, stand-alone manner rather than as part of a network.

**The Pre-War Debate.** Prior to the Iraq war, the Administration had identified transformational programs as a high defense investment priority. In submitting its proposed FY2004 defense budget to Congress in February 2003, the Administration stated that the request was the first to fully reflect its transformation vision and included more than $24 billion in acquisition funding for transformational programs.

Some transformation advocates outside the administration argue that the administration, though rhetorically supportive of transformation, has continued to place too much emphasis on legacy programs and not enough on transformational programs. They argue, for example, that the administration's defense budget plans devote too much funding to manned tactical aircraft programs and not enough funding to programs for upgrading or replacing the Air Force's long-range bombers

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[11]C4ISR stands for command and control, communications, computers, intelligence, surveillance and reconnaissance. C4ISR systems include things such as ground-based, airborne, and spaced based sensors for locating, identifying and tracking friendly and enemy forces, and computers, datalinks, and networking software for rapidly processing and sharing information among networked friendly forces. Battlespace awareness refers to having a real-time understanding of the location, identity, and movement of friendly and enemy forces within a military area of operations.

(which can deliver large numbers of precision-guided weapons) or for acquiring unmanned vehicles.

In the weeks leading up to the Iraq war, some observers speculated that the conflict would test important elements of the Administration's transformation vision, including its increased reliance on precision-guided air-delivered weapons, special operations forces, unmanned vehicles, and joint operations; the use of advanced C4ISR systems for networked operations and improved battlespace awareness; reduced reliance on massed ground forces; and a war plan reflecting an effects-based approach more than traditional attrition-style warfare. Pre-war speculation that the conflict would test the Administration's transformation theories was strengthened by reports that Secretary of Defense Rumsfeld had played a strong role in shaping the war plan to make it more in keeping with the Administration's transformation vision, particularly in terms of reducing the planned number of conventional ground forces to be used in the invasion.

**Debate Following the Iraq War.** Those who support the idea that the Iraq war validated the Administration's transformation vision, or at least important elements of it, could argue one or more of the following:

- The U.S.-led war effort, which produced a quick victory with low casualties, featured a significant and successful use of precision-guided air-delivered weapons, special operations forces, unmanned vehicles, joint operations, and advanced C4ISR systems. It also employed a strategy that avoided attrition-style warfare where possible and focused more on effects-based operations directed against the key leadership and command-and-control targets and the most politically and militarily significant elements of the enemy's fielded military forces.
- The number of conventional ground forces making up the invasion force was not only fairly small compared to the 1991 Persian Gulf war, but even smaller than the administration had planned, due to Turkey's decision not to permit the Army's 4$^{th}$ Infantry Division to use Turkish territory to invade Iraq from the north and the administration's decision to begin the war before this division was redeployed to Kuwait.
- The speed and precision of the U.S.-led war effort significantly reduced Iraq's ability to mount a coordinated response, leading to scattered and largely ineffective Iraqi defensive efforts and to many instances of Iraqi military units in the field that were hopelessly uninformed about the location and movements of U.S. forces.
- Lighter and more air-mobile Army forces, which the Army is currently developing as part of the Administration's transformation plan, would have been useful, following Turkey's decision, for quickly establishing a more significant U.S. ground presence in northern Iraq.

Those taking a more skeptical view on whether the war validated the Administration's transformation vision could argue one or more of the following:

- The U.S. military force employed in the war was largely a product of investment decisions made prior to the Bush administration. Although the force incorporated some elements of the administration's transformation plan,

it represented only a partial or embryonic version of the administration's vision for a transformed force. A more fully transformed force would have featured, for example, more (and more capable) unmanned vehicles, a more completely networked C4ISR environment, and the use of lighter, more mobile Army forces that are now in development. The war thus did not provide a pure test of a force fully transformed along the lines of the administration's vision.

- Iraq's military was significantly inept in mounting a defense of the country.[12] In light of Iraqi military ineptness, it is not clear that the war amounted to a serious test of the Administration's transformation plan. A more traditional U.S.-led war effort, or an effort reflecting a transformation plan significantly different from the Administration's, might also have succeeded.
- The number of conventional ground forces making up the invasion force was greater, according to some press reports, than some transformation advocates had proposed during the early stages of planning for the Iraq war. And the larger force that was used came close to being insufficient: If Iraqi forces had mounted a more effective effort to cut the extended and thinly defended supply lines linking U.S. ground forces to supply areas further south, the invasion might have experienced a significant setback. In this sense, the relatively small ground invasion force may have introduced greater risk into the war plan than anticipated.
- Although heavy armored ground forces are not closely associated with the Administration's transformation plan and have been characterized as legacy forces, the war underscored the value of heavy armored ground forces. Heavy armored units were successful both in breaking through Iraqi defenses in the south and in urban combat operations in Baghdad and other cities. They were largely invulnerable to Iraqi rocket-propelled grenades and other light arms and, in drawing fire from such weapons, proved valuable in uncovering the locations of hidden Iraqi fighters, who could then be killed. More lightly armored ground forces like those being developed by the Army as part of the

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[12] Among other things, Iraq's air force did not take to the air; important bridges in most cases were not destroyed; armored units were left out in the open, where they would be vulnerable to U.S. air attack (repeating a mistake made from the 1991 Persian Gulf war); ineffective human-wave tactics were used to attack U.S. armored vehicles; and few apparent preparations were made to mount an organized defense of Baghdad. In addition, Iraq did not make use of options that might have complicated U.S. and coalition operations, such as attacking the buildup of U.S. and British forces in Kuwait, igniting large numbers of oil wells, blowing dams to flood likely invasion routes, and employing any available chemical weapons.

An alternative but similar argument is that Iraq's response to the invasion reflected not Iraqi military ineptness, but rather a decision by Iraq's leaders to forego making a serious attempt to resist the invasion in favor of a strategy of allowing the invasion effort to succeed, going into hiding, and then reemerging after the withdrawal of U.S. and other foreign forces to win back control of the country through the efforts of a reorganized Baath party. This scenario is consistent with the sudden and apparently planned disappearance of much of Iraq's top leadership as U.S. forces entered Baghdad. For articles discussing this possibility, see Sale, Richard. CIA Reported To Believe Saddam Is Alive. *UPI.com*, June 2, 2003; Saddam Plotting Return To Power, Ex-Generals Say. *New York Times on the Web*, May 19, 2003. (Reuters wire service story)

Administration's transformation plan would have been more vulnerable to fire from the kinds of weapons used by Iraqi defenders.

- Even if Iraqi military operations had been better planned and executed, the war could not provide a major test of certain elements of the Administration's transformation plan. For example, although Iraq laid mines in the Persian Gulf and may have attempted to fire antiship cruise missiles at coalition naval forces, Iraq's military capabilities and geographic options for countering enemy naval forces were very limited. The war therefore could not pose a significant test of the Administration's programs for transforming U.S. naval forces so as to make them effective against significant enemy maritime anti-access/area-denial forces.

A potential intermediate view would combine arguments from both sides of the debate. This view, while noting the success of the war effort and its significant use of force elements associated with the Administration's plan, would also acknowledge that the U.S. force used in the war represented only a partial fulfillment of the administration's transformation plan, that Iraqi military ineptness was a significant factor, that the war may offer mixed evidence concerning the Administration's plan for transforming Army forces, and that the war did not significantly test other elements of the Administration's transformation plans.

It should also be noted that observers who take a skeptical view on whether the war validated the Administration's transformation vision are not necessarily opposed to that vision. They may support the vision but conclude that the war did not happen to offer a clear validation of it.

An additional potential implication concerns asymmetric military threats. By demonstrating to the world the formidable capabilities of conventional U.S. military forces, the Iraq war may encourage other countries to place increased emphasis on developing asymmetric means of countering the United States, including terrorism, nuclear, chemical, and biological weapons, cyberwarfare against U.S. military and civilian computer systems, and anti-access/area-denial weapons (such as theater-range ballistic missiles) that are intended to prevent U.S. forces from gaining a foothold in an overseas operating area. In this sense, the success of the U.S.-led war effort, it might be argued, may strengthen the need for U.S. defense transformation to focus on developing capabilities for countering such asymmetric threats.[13]

Some of the program areas mentioned above, including Army ground forces, special operations forces, and unmanned vehicles, are discussed in more detail in subsequent sections of this report.

## Size of Military Needed For National Military Strategy[14]

**Concern Regarding Size of U.S. Forces.** Prior to the Iraq war, some observers had expressed concern that active-duty U.S. military forces are

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[13]See, for example, Tiboni, Frank. War Game Stuns U.S. Strategists. *DefenseNews*, May 12, 2003: 1.

[14]This section prepared by Ronald O'Rourke, Specialist in National Defense.

insufficiently sized to execute the administration's national military strategy, at least not without placing an undue strain on military personnel and equipment or taking undue risks in time of war. The Administration and its supporters argued in response that U.S. forces were of sufficient size to carry out the strategy.

**Administration's Military Strategy.** The administration's military strategy is sometimes called the 1-4-2-1 strategy because it calls for maintaining U.S. military forces sufficient for:

- [1] "protect[ing] the U.S. domestic population, its territory, and its critical defense-related infrastructure against attacks emanating from outside U.S. borders,"
- [4] "maintaining regionally tailored forces forward stationed and deployed in [the four regions of] Europe, Northeast Asia, the East Asian littoral, and the Middle East/Southwest Asia to assure allies and friends, counter coercion, and deter aggression against the United States, its forces, allies, and friends,"
- [2] "swiftly defeating attacks against U.S. allies and friends in any two theaters of operation in overlapping timeframes," and
- [1] "decisively defeating an adversary in one of the two theaters in which U.S. forces are conducting major combat operations by imposing America's will and removing any future threat it could pose. This capability will include the ability to occupy territory or set the conditions for a regime change if so directed."[15]

**Pre-War Debate.** Prior to the Iraq war, those who were concerned about whether U.S. forces were sufficiently sized to carry out this strategy pointed to the high operational tempo that certain parts of the military have maintained in recent years, the large number of reserve forces that have been activated since the terrorist attacks of September 11, 2001 (and the extended length of certain reserve-unit tours of duty since that time), the interest among certain Army officers for increasing the Army's active-duty end strength so as to better support ongoing commitments in various locations, gaps in forward deployments of Navy ships to certain overseas regions, and the relationship of the total number of active air wings, divisions, and ships to the potential requirements of fighting two regional wars in overlapping time frames.

Some observers expressed concern that going to war in Iraq would stretch certain active-duty U.S. forces too thinly. They argued that a war with Iraq could reduce forces available for pursuing the global war on terrorism or leave the United States with insufficient forces to deter or respond to potential aggression by North Korea. Forces that were cited as at risk of being in short supply in the event of a war with Iraq included special operations forces, certain kinds of aircraft (cargo planes, tankers, jamming aircraft, surveillance aircraft, and battle-management aircraft), and

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[15]U.S. Department of Defense. *Quadrennial Defense Review Report.* Washington, 2001. (September 30, 2001) p. 17-21. The quoted passages are taken from pages 18, 20, and 21. The strategy also calls for the United States "to maintain and prepare its forces for smaller-scale contingencies in peacetime, preferably in concert with allies and friends." (page 21)

specialized infantry vehicles, combat-support troops, and support gear for the Army.[16] These concerns continued as the Iraq war began.[17]

**Force Commitments During the War.** Fighting the Iraq war while also performing other duties – including war-on-terrorism operations in Afghanistan and elsewhere, regional-deterrence operations, and homeland-defense operations – resulted in the following commitments of active-duty U.S. forces:

- **Army:** A large fraction of the Army's 10 active-duty divisions and additional independent combat units were deployed or stationed outside the United States. Three divisions (the 3rd Infantry Division, the 101st Airborne Division, and the 4th Infantry Division), parts of two other divisions (the 82nd Airborne Division and the 10th Mountain Division) and one or two independent combat units (the 173rd Airborne Brigade and possibly the 2nd Cavalry Regiment) were deployed to Iraq, part of a division (the 82nd Airborne Division) was deployed to Afghanistan, two divisions (the 1st Armored Division and the 1st Infantry Division) were stationed in Germany, and most of another division (the 2nd Infantry Division) was stationed in Korea.
- **Air Force:** A high percentage of the Air Force's cargo aircraft, tankers, and certain other specialized aircraft, and a high percentage of the military's radar-jamming aircraft (which are operated by the Navy and Marine Corps), were deployed to Iraq.
- **Marine Corps:** About 67% of the Marine Corps' operating forces were forward-deployed in Iraq and elsewhere, and almost 80% were either forward-deployed, forward-based, or forward stationed. Two of the Marine Corps' three Maritime Prepositioning Ship (MPS) squadrons were committed to the Iraq war. On April 2, 2003, General Michael Hagee, the Commandant of the Marine Corps reportedly stated: "So, what we have done is we have provided, in my opinion, sufficient combat power to do what needs to be done in Iraq.... We have sufficient forces positioned to swiftly defeat the effort if North Korea decides to do something. And what are we doing in the other areas – we are taking risks."[18]
- **Navy:** The Navy put to sea 67%-68% of its ships (54% or 55% in deployed status and another 13% in non-deployed operations),[19] including 7 or 8 of its

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[16]See, for example, Tyson, Ann Scott. If More Duty Calls, Can US Military Deliver? *Christian Science Monitor*, September 9, 2002; Richter, Paul. Two-War Strategy Faces Test. *Los Angeles Times*, February 13, 2003.

[17]See, for example, Infield, Tom. War Leaves Little In Reserve For Military. *Philadelphia Inquirer*, April 3, 2002.

[18]As quoted in Brown, Malina. Hagee: Marine Corps 'Taking Risks' In Areas Other Than Iraq, N. Korea. *Inside the Navy*, April 7, 2003.

[19]On March 24, 2003, 167 of the Navy's 305 ships were at sea. The figures for April 1, 2003 were 164 of 303 ships. Non-deployed status can include training operations and other short-term operations. Normally, about 40%-45% of the Navy is at sea, including 25%-30% in deployed status and the remainder in non-deployed operations.

12 aircraft carriers,[20] 7 of its 11 carrier air wings,[21] 25 to 29 of its 38 amphibious ships[22] and, within the amphibious-ship total, 9 or 10 of the Navy's 12 "large-deck" amphibious assault ships.[23] Admiral William Fallon, the Vice Chief of Naval Operations, testified on March 18, 2003, on the eve of the war, that "today's surge [in deployments] has put a significant strain on every Navy resource."[24]

- **Special Operations Forces (SOF):** A very high portion of the country's 10,000 or so combat SOF personnel[25] were committed to either Iraq, Afghanistan, or other overseas locations.

In addition to these active-duty forces, 62% of the Military Sealift Command's prepositioning and surge sealift ships were involved in supporting the Iraq war.[26]

**Post-War Debate.** Supporters of the view that active-duty U.S. military forces are sufficiently sized to execute the 1-4-2-1 strategy could argue the following:

- Even while U.S. forces were preparing for and fighting the Iraq war, the military was able to augment its forces in Korea and the Western Pacific for purposes of deterring possible North Korean aggression.
- Had a major conflict on the Korean Peninsula occurred while the Iraq war was in progress, substantial additional combat forces were available for use there, including Air Force bombers and tactical aircraft, Navy carriers and other ships, Marine forces, and Army forces. Available Marine forces included units based in Okinawa and Hawaii and the Marine Corps' third MPS squadron, which is based in the Western Pacific. Available Army units included the 25th Infantry Division in Hawaii, the 1st Cavalry Division in Texas, the remaining part of the 2nd Infantry Division in Washington, and the remaining parts of the 10th Mountain Division in New York, plus one or more independent combat units based in other U.S. locations.
- The quick and relatively low-cost victory gained by the relatively small U.S.-led force in the Iraq war, together with further technological improvements planned for U.S. military forces planned in the future, suggests that future regional conflicts on average might require fewer U.S. forces than currently

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[20]Five of these carriers were used to fight the Iraq war. A sixth was on its way to the Persian Gulf to replace one of the carriers operating in the Gulf, a seventh was deployed to the Western Pacific, in part to deter potential aggression by North Korea, and an eighth was for a time at sea apparently for training purposes.

[21]The Navy has 10 active-duty carrier air wings and 1 reserve carrier air wing.

[22] Twenty-eight on March 24, 2003; 29 on April 1, 2003; 25 on April 7, 2003.

[23]Ten ships on March 24 and April 1, 2003, 9 on April 7, 2003.

[24]As quoted in Infield, Tom. War Leaves Little In Reserve For Military. *Philadelphia Inquirer*, April 3, 2002.

[25]U.S. SOF forces total about 47,000 personnel. About 10,000 of these personnel are combat forces; the rest are civil-affairs and support forces.

[26]Information provided to CRS by Military Sealift Command via e-mail and telephone , May 23, 2003.

planned. If so, the current size of U.S. forces might be more than sufficient for fighting two regional conflicts in overlapping time frames.
- Post-war demands for peacekeeping and constabulary forces in Iraq, while substantial, are not permanent and can be met in part by forces from allied and friendly countries. Some countries have already offered to provide such forces.[27]

Those skeptical of the view that active-duty U.S. military forces are sufficiently sized to execute the 1-4-2-1 strategy could argue the following:

- Fighting the Iraq war while performing other duties left the country with a reduced capability for responding to an additional major emergency on the Korean Peninsula or elsewhere, particularly with regard to specialized Air Force aircraft, Navy carriers and air wings, Navy amphibious ships and Marine Forces, and special operations forces.
- While sufficient ground forces may have been available for fighting an additional conflict in Korea, transporting those forces to Korea in a timely manner might have been very difficult, given the large commitment of U.S. airlift and sealift assets to the Iraq war.
- Iraqi military ineptness contributed to the quick and relatively low-cost victory of the U.S.-led war effort. Future adversaries may not be as inept, and may learn and apply their own lessons from the Iraq war, suggesting that future regional conflicts on average might require U.S. forces at least as large as those used in the Iraq war. If so, the size of U.S. forces needed in the future to fight two regional conflicts in overlapping time frames might be larger than suggested by the Iraq war.
- In February 2002, the Air Force was forced to begin making exceptions to the rotational cycle for its 10 Aerospace Expeditionary Forces (AEFs) so as to meet overseas demands for Air Force personnel in certain career fields. As a result, some Air Force personnel have had to deploy longer or more frequently than the AEF standard.
- The Iraq war has created a post-war demand for maintaining tens of thousands of Army soldiers in Iraq for peacekeeping and constabulary purposes,[28] adding to existing demands for Army peacekeeping and constabulary forces in Afghanistan, the Balkans, and other locations. Maintaining significant numbers of peacekeeping and constabulary forces in Iraq and elsewhere might require the Army to use large numbers of activated reserve forces for extended periods of time – a signal that the active-duty force is not sufficiently sized.

The Iraq war, coming at a time of elevated tensions on the Korean Peninsula, may highlight the difference between conflicts that occur *in overlapping time frames* vs. those that occur *simultaneously*. U.S. strategy is to have forces sufficient for winning two major regional conflicts that occur in overlapping time frames, but not

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[27]Bowman, Tom. Few Allies Offer Help On Policing In Iraq. *Baltimore Sun*, May 31, 2003; Squitieri, Tom. Relief For U.S. Troops Lacking. *USA Today*, May 30, 2003: 1.

[28]Moniz, Dave. Ex-Army Boss: Pentagon Won't Admit Reality In Iraq. *USA Today*, June 3, 2003: 1; Gordon, Michael R. How Much Is Enough? *New York Times on the Web*. May 30, 2003.

necessarily for winning two such conflicts that occur simultaneously. The distinction, though important, is often overlooked in popular descriptions of U.S. strategy.

The requirement for winning two conflicts that occur in overlapping time frames refers in part to an assumption that the second conflict will start some number of weeks after the first, and that certain U.S. forces that are needed primarily or most urgently in the early stages of a regional conflict – such as certain airlift and sealift forces, some kinds of aircraft, cruise-missile-armed Navy ships, and perhaps Marine amphibious forces – can therefore be rotated from the first conflict to the second. Such forces are sized closer to the requirements for fighting one conflict rather than two. If this assumption proves incorrect – if the second conflict begins before such forces can be rotated from the first conflict to the second – the U.S. ability to prosecute the second conflict successfully or at acceptable cost could be reduced. The combination of the Iraq war and the tense situation on the Korean Peninsula provides policymakers with a potential case study for reviewing the planning assumption of overlapping time frames and the potential risks of planning U.S. forces on that basis.

## Overseas Base Access[29]

**Uncertain Access as a Planning Issue.** The Iraq war, like the war in Afghanistan in 2001-2002, appears to have underscored how, in the post-Cold War era, U.S. access to foreign bases and territory in time of war can be uncertain and, when provided, can come with restrictions from host nations on how the bases and territory can be used. This is potentially significant, because some military analysts have argued that U.S. defense programs must take uncertain access to foreign bases into account in planning U.S. military forces.

**War in Afghanistan.** In the war in Afghanistan, few air bases in countries close to Afghanistan were made available to support U.S. military operations, and bases in Pakistan that were made available had to be used in a low-profile manner, with a limited U.S. presence and a preference for conducting operations at night rather than during the day. As a result of these limitations, sea-based forces operating in the Northern Arabian Sea – carrier-based Navy and Marine Corps aircraft, Marine forces on Navy amphibious ships, and special operations forces deploying from a Navy carrier – played a significant role in U.S. military operations in Afghanistan, particularly in the earlier stages of the conflict.

**Iraq War.** In the case of the Iraq war, protracted negotiations with Turkey ended with a decision by the Turkish government to deny U.S. ground forces and aircraft the use of bases and territory in Turkey. Turkey's decision forced significant alterations to the U.S. war plan: The plan to have the Army's 4th Infantry Division invade northern Iraq from Turkey, and thereby confront Iraqi leaders with significant ground invasions from both the north and south, had to be abandoned. The 4th Infantry Division was instead redeployed to Kuwait, and the United States conducted the war with a much smaller U.S. ground presence in northern Iraq that consisted

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[29]This section prepared by Ronald O'Rourke, Specialist in National Defense.

primarily of a few hundred U.S. special operations forces personnel and 2,000 personnel from the Army's 173rd Airborne Brigade who parachuted into the area. Fighting the war this way reportedly complicated the U.S. politically sensitive goal of preventing Turkish forces from entering northern Iraq and may have broadened escape options for Iraqi leaders fleeing from U.S. forces that were advancing into Baghdad from the south.

Turkey's decision not to allow its air bases to be used by U.S. combat and support aircraft similarly complicated U.S. air operations during the war. Air Force combat aircraft could not fly into northern Iraq directly from Turkish bases, forcing them to fly into that area from more distant bases, and sorties of Navy aircraft flying into Iraq from two carriers in the Eastern Mediterranean were reportedly reduced because Air Force tankers needed to refuel the Navy planes had to fly from more distant bases in Eastern Europe and consequently could provide them with less on-station in-flight refueling capacity.

U.S. war plans were also complicated by, among other things, Saudi Arabia's reported unwillingness to allow its air bases and its territory near Iraq to be used by most types of U.S. strike aircraft[30] and invading U.S. ground forces, its decision to not permit its ports on the Persian Gulf to be used by U.S. military sealift ships (which reportedly contributed to a bottleneck at Kuwaiti port facilities for unloading equipment and supplies from those ships),[31] and Jordan's reported unwillingness to allow its bases and territory to be used, at least overtly, by U.S. aircraft and regular ground forces.

In the weeks leading up to the war, there was uncertainty about whether Saudi Arabia would permit the United States to use the large U.S.-built air operations command center at Prince Sultan Air Base south of Riyadh. Although the Saudi government decided to permit the facility to be used, U.S. military planners, as a hedge against the possibility that the Saudi government would decide otherwise, quickly built, at substantial cost, a substitute facility at Al Udeid Air Base near Doha in Qatar.

During the war, the failure of several Navy Tomahawk cruise missiles using certain flight paths over Turkey and Saudi Arabia prompted a decision by both countries to close down those flight paths for use by Tomahawk missiles for the remainder of the conflict, possibly complicating U.S. planning for subsequent Tomahawk cruise missile attacks.

**Potential Program Implications.** Analysts who stress uncertainties about access to foreign bases argue that U.S. defense programs should be restructured to

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[30]Saudi Arabia reportedly did allow its air bases to be used by F-16CGs armed with weapons for attacking Iraqi radar systems. Gertz, Bill, and Roman Scarborough. Inside the Ring. *Washington Times*, April 25, 2003: 5. (Item entitled "Saudi versatility II")

[31]Josar, David. Transportation Groups Tackle Oversized Load. *European Stars and Stripes*, April 8, 2003; Wilkinson, Jeff. U.S. Supply Loads Are Taxing Kuwait's Ports, Airports. *Philadelphia Inquirer*, March 19, 2003.

place greater emphasis on forces that are less dependent on such bases. Examples of such forces that are usually cited include the following:

- manned and unmanned aircraft with long operating ranges, fuel-efficient engines, and large payloads (i.e., aircraft that can operate from distant bases, including bases in the United States, loiter over distant battlefields for long periods of time, and attack many targets before having to return home, while requiring a minimum amount of in-flight refueling),
- aircraft that can operate from short or austere airfields (which might be the only kind of air bases available in certain locations),
- sea-based forces, such as Navy and Marine Corps forces, that can conduct in-theater operations from nearby international waters; and
- long-range weapons such as cruise missiles and, potentially, directed-energy weapons such as lasers, that can destroy targets hundreds of miles away.

Advocates of both long-range aircraft and naval forces have long cited their relative independence from in-theater land bases as an important characteristic in their favor.[32]

Some observers believe the experience with base access during the Iraq war may lead to increased interest in a new operational concept (i.e., a new approach to warfighting) referred to as sea basing, or more formally as enhanced networked sea basing.[33] Although Navy and Marine Corps forces have long been referred to as sea-based forces, Navy and Marine Corps officials are now using the term sea basing more specifically, to refer to a proposed new approach for launching, directing and supporting expeditionary military operations directly from ships at sea.[34] Navy and Marine Corps officials began to discuss the sea basing concept at about the time of the war in Afghanistan. Although the sea basing concept has been proposed primarily by Navy and Marine Corps officials, it can be expanded into a joint concept under which Army or Air Force units might also be staged from bases at sea. DoD officials have expressed some interest in the concept.[35] Restructuring U.S. forces in

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[32]Some advocates of defense transformation argue that in-theater land bases, even if made available to U.S. forces, might become vulnerable in the future to attack by enemy theater-range ballistic missiles. For this somewhat different reason, they argue that DoD plans should place less emphasis on forces requiring access to in-theater land bases, and more emphasis on forces that are less dependent on access to such bases.

[33]See, for example, Hodge, Nathan. Iraq War Seen As Test of Sea Basing. *Defense Week*, April 21, 2003: 6; Brown, Malina. Navy, Marine Officials Argue Iraq War Validates Need For Sea Basing. *Inside the Navy*, April 14, 2003: 1.

[34]Under the sea basing concept, U.S. forces based at sea, rather than beginning an expeditionary operation by first establishing or gaining control of an intermediate land base somewhere in the theater of operations, would instead launch, direct and support the operation directly from the ships at sea. Functions normally performed from the intermediate land base – including command and control, indirect fire support, and logistics support – would instead be performed from the ships at sea, while the expeditionary force proceeds directly from the ships to the inland objective.

[35]MacRae, Catherine. Aldridge Wants Top Defense Scientists To Study Future Of (continued...)

accordance with the sea basing concept could lead to numerous changes in DoD ship, aircraft, and weapon acquisition programs.

Other observers argue that the issue of overseas base access, while a concern, has been exaggerated. They could argue that although the United States encountered challenges with base access in Iraq and Afghanistan, the United States in both cases was able to secure sufficient base access to support its operations, in part by capturing air bases inside both countries. They can also note that, following the 1991 Persian Gulf war, many observers argued that Iraq had erred by allowing the U.S.-led coalition to build up forces in the Persian Gulf for 6 months without challenge, and that U.S. adversaries in the future would not repeat this mistake. In the Iraq war, they could argue, this expectation proved inaccurate, as Iraq once again allowed U.S. and British forces several months to build up forces in the Persian Gulf. Observers who believe the base-access issue has been exaggerated can also note that, other things held equal, long-range systems can be more expensive than short-range systems. They could argue that given the cost of long-range systems and the likelihood that the United States will be able to gain at least some access to in-region bases, DoD should maintain its current mix of long- and short-range capabilities.

## Army Forces[36]

**A Pre-War Controversy.** One of the most significant defense-program debates going into the Iraq war – and potentially one of those most significantly influenced by the war – concerns the future size and composition of the active-duty Army. Issues involved in this debate include, among other things:

- the number of active-duty Army divisions to be maintained in the future;
- programs for upgrading the Army's M1 Abrams tanks and other heavily armored vehicles; and
- the Army's plan to shift to a mix of combat forces that includes fewer heavily armored combat units and a greater number of lighter and more mobile combat units.

**The Army's Transformation Plan.** The Army currently includes 10 active-duty divisions, as well as some additional independent active-duty combat brigades. Several of the divisions and independent brigades are heavily armored units.

The Army's transformation plan, which was initiated in 1999 by Army Chief of Staff Eric K. Shinseki, would leave the number of active-duty Army divisions unchanged at 10 but shift the composition of the Army toward a mix featuring fewer heavily armored units built around armored vehicles like the M1 Abrams tank and

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[35](...continued)
Seabasing. *Inside the Pentagon*, November 14, 2002: 1; Castelli, Christopher J. DOD Panel Mulls Seabasing Ideas, Including Mobile Offshore Bases. *Inside the Navy*, November 18, 2002: 1; Ma, Jason. Seabasing Concept Pursued As A Way To Support Entire Joint Force. *Inside the Navy*, November 25, 2002.

[36]This section prepared by (name redacted), Specialist in National Defense.

the M2 Bradley fighting vehicle, and a greater number of more-mobile Army combat units built around more lightly armored combat vehicles.

The principal goal of the transformation plan is to significantly improve the Army's ability to rapidly deploy significant ground combat forces to conflicts in distant areas. The plan was prompted by the 1999 U.S. military operation in Kosovo, which exposed inadequacies in the Army's ability to rapidly deploy heavy forces, and by the Army's initial reaction to Iraq's invasion of Kuwait in August 1990. In the latter instance, the Army was able to quickly deploy some lightly armed units, such as the 82nd Airborne Division, to northeast Saudi Arabia to defend against a potential Iraqi follow-on attack into that country,[37] but some observers at the time said that those forces would serve as little more than "speed bumps" in slowing down any such attack.

The first step in the Army's transformation plan is to create 6 new mobile combat brigades over the next few years. These brigades are to be built around the lightly armored Stryker wheeled combat vehicle and consequently are called Stryker Brigade Combat Teams (SBCTs) or simply Stryker Brigades. The 6 Stryker Brigades would constitute the core of the Army's "Interim" transformation force.

The second step in the Army's transformation plan would be to create a group of more technologically advanced mobile combat units that would be the eventual successors to both the legacy force[38] and the Stryker Brigades. These more high-tech combat units would be built around the Future Combat System (FCS), a collection of advanced combat vehicles and supporting systems that is now in development. The first FCS-equipped unit is to enter service in FY2008. Army units built around the FCS would constitute the Army's longer-term "Objective" transformation force.

To help finance programs for the Interim and Objective forces, funding has been reduced for many programs related to the Army's current "Legacy" force, including programs for upgrading some of the Army's M1 tanks and other armored vehicles.

**Reported Tensions with OSD.** Although the intent of the Army's transformation plan – shifting toward forces with greater mobility – appears broadly consistent with the Administration's vision for defense transformation, the Office of the Secretary of Defense (OSD) reportedly is dissatisfied with Army transformation efforts, believing them to be insufficiently aggressive. OSD is widely rumored in the

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[37]Immediately following Iraq's invasion of Kuwait, U.S. officials were concerned that Iraqi forces might continue their advance into northeastern Saudi Arabia so as to seize important Saudi oil fields and port facilities located there. If they had done so, it would have given Iraq control over a major source of oil and significantly complicated for U.S. military planners the task of mounting a counter-offensive to expel Iraqi forces from territory they had seized.

[38]The Army uses "legacy force" as a neutral term for referring to Army units built around weapons and equipment procured in previous years. Although, as mentioned earlier in the report, the term "legacy" has become synonymous in some eyes with obsolescence and suitability for reduction or termination, the Army's use of the term does not carry that meaning.

defense trade press to be interested in reducing the total number of Army active-duty divisions from 10 to 8. OSD also expressed interest last year in reducing the number of Stryker Brigades from 6 to 4, in part to make more funding available for programs for the Objective force.

There have been numerous press reports of tension between OSD and the Army's senior leadership over the future size and composition of the active-duty Army. Many observers believe that Secretary of Defense Donald Rumsfeld's announcement in early 2002 of his preferred choice for General Shinseki's successor, which was made more than a year before the end of Shinseki's term as Army Chief of Staff, reflected this tension and was intended to prematurely turn Shinseki into a lame duck. Some observers believe that OSD's views on Army transformation efforts are conditioned by a general OSD preference for air power over ground power. Others believe OSD's perceived tepid support for the Army's transformation plan is due in part to the fact that it was initiated in 1999, during the Clinton Administration.[39]

**Pre-War Debate Over the Plan.** Independent of reported tensions between OSD and the Army's leadership, the Army's transformation plan has generated significant debate among military analysts.

***Merits of Maintaining 10 Divisions.*** Supporters of the Army's intention to maintain 10 active-duty divisions have argued that this is the correct number for carrying out the Army's portion of the U.S. national military strategy. Ten active-duty Army divisions, together with 3 active-duty Marine Corps divisions, will be sufficient, they have argued, for fighting two regional conflicts in overlapping time frames while carrying out additional responsibilities in other areas. If additional U.S. ground forces are needed, they have argued, they can be mobilized from the Army and Marine Corps reserves.

Some opponents of the 10-division figure have argued that it is insufficient to carry out the Army's portion of the national military strategy. The high operational tempo of active-duty Army forces in recent years, and the need to mobilize large numbers of Army reserve personnel for extended periods of active duty since September 11, 2001, they have argued, is evidence that a 10-division force is insufficient to carry out the Army's various ongoing duties around the world, particularly after 9/11. Other opponents of the 10-division figure (including, reportedly, officials within OSD) argue that a 10-division force is larger than what the Army will need in the future to carry out its portion of the national military strategy. They argue that advances in U.S. warfighting technology, and changes in U.S. military doctrine, might permit the Army to be reduced to as few as 6 active-duty divisions – 2 divisions for each of 2 overlapping regional conflicts, and 2 more divisions for carrying out smaller-scale operations elsewhere.

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[39]For recent examples of articles reporting tension between OSD and the Army, see Bowman, Tom. Rumsfeld Conducting War On Army. *Baltimore Sun*, May 7, 2003; Caldwell, Robert J. Rumsfeld Vs. The Army. *San Diego Union-Tribune*, May 4, 2003.

***Merits of Planned Shift to Lighter Forces.*** Supporters of the Army's plan to shift to a greater reliance on lighter forces have argued that it represents a good strategy for making the Army more mobile and responsive. They have argued that Stryker vehicles can be transported to distant locations aboard Air Force airlift aircraft much more easily than the Army's current heavily armored vehicles, that Stryker-equipped units will derive their survivability on the battlefield from superior situational awareness, stand-off capabilities, and agility rather than from armor, that Stryker vehicles would be more useful than heavily armored vehicles for maneuvering through countryside featuring poor roads and bridges, and that they would be highly effective for combat operations in congested urban areas.

Opponents of the Army's plan for shifting to lighter forces have questioned the survivability in combat of more lightly armored vehicles like the Stryker. The Stryker Brigades, they argue, could prove to be a good way for rapidly deploying Army personnel into combat situations where they will be defeated by opposing forces. Opponents of the Army's transformation plan have also expressed doubts about the technical feasibility of the FCS, which is to be significantly more mobile than the Army's current heavily armored vehicles while at the same time offering a degree of protection against enemy fire similar to that of heavily armored vehicles. Even using new technology, opponents have argued, it will not prove possible for the FCS to offer both things at the same time.[40]

**Army Operations in the Iraq War.** Active-duty Army combat units, along with Marine Corps and British combat units, played a central role in the Iraq war. Major Army units involved in the war included the 3rd Infantry Division (Mechanized), the 101st Airborne Division, a brigade from the 82nd Airborne Division, and (in northern Iraq) the 173rd Airborne Brigade. The Army's main fighting forces for most of the war thus totaled less than 3 full divisions. U.S. war plans originally called for an additional Army unit, the 4th Infantry Division (Mechanized), to invade Iraq from Turkey. Following Turkey's decision not to allow its territory to be used by U.S. forces for staging an invasion of Iraq, this division was redeployed to Kuwait and participated in a few combat operations toward the end of

[40]For more on the Army's transformation plan, see CRS Report RS20787, *Army Modernization and Transformation: Overview and Issues for Congress*, by (name red acted). Washington, 2003. (Updated periodically) 6 p.

conflict.[41] Thousands of additional Army special operations forces were also involved in the war (see the section on special operations forces.)

The Iraq war demonstrated that U.S. ground forces are highly capable on the battlefield in conflicts against opposing ground forces. The U.S. and British ground campaign benefitted from well-trained soldiers and Marines, good equipment, effective air support from Air Force and Navy, and superior situational awareness. U.S. and British ground forces appeared to have achieved some tactical surprise at the start of the war, in spite of the lengthy pre-war buildup, by starting their attack before the 4th Infantry Division deployed to Kuwait and before the start of extensive U.S. air attacks. Once the invasion was underway, U.S. and British ground forces achieved further tactical surprise through their high speed of advance, which involved bypassing some Iraqi towns and military units, and their use of unexpected routes. The flexible battle plan and rapid maneuvers used by U.S. ground forces kept Iraqi forces off-balance. Some ground engagements involved fierce fighting, but most weapons used by Iraqi forces were no match for the Army's M1 tanks and M2 Bradley fighting vehicles.

### Potential Program Implications.

***Number of Active-Duty Army Divisions.*** Following the Iraq war, those who support reducing the Army to less than 10 active-duty Army divisions could argue that the relatively small number of Army divisions used for most of the war – the equivalent of less than 3 full divisions – and the dominance achieved by those units in combat, demonstrate that the Army can safely be reduced to less than 10 active-duty divisions while still retaining a capacity, in conjunction with Marine Corps divisions, for fighting two regional conflicts in overlapping time frames and performing additional duties elsewhere. The Iraq war, they could argue, is consistent with the planned path of U.S. defense transformation, which envisages the United States fighting future conflicts with less reliance on massive ground forces like those assembled for the 1991 Persian Gulf war.

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[41]On March 21, 2003 the 3rd Infantry Division (Mechanized) (3ID) and the Marine Corp's 1st Expeditionary Force (I MEF) entered Iraq from Kuwait and began their drive north to Baghdad while British forces concentrated on southern Iraq, including the city of Basrah. On March 28, the 101st Airborne Division joined the attack. On April 4, U.S. ground forces were more than 300 miles into Iraq, and 3ID captured Saddam International Airport on the outskirts of Baghdad. That same day, the Iraqi Republican Guard Nida Division was declared combat ineffective and the Republican Guard Baghdad Division surrendered 2,500 soldiers to I MEF. On April 7, 3ID conducted a raid into the center of Baghdad with about 70 Abrams Tanks and 60 Bradley fighting vehicles. On April 9, U.S. Central Command announced that Saddam Hussein's regime no longer controlled Baghdad. By April 15, the 4th Infantry Division (Mechanized) was engaged in combat operations north of Baghdad and U.S. special operations forces, Marines, and U.S. Army airborne forces occupied various cities in northern Iraq, including Kirkuk and Tikrit. On April 15, 25 days after the ground attack began, U.S. Central Command declared major combat to be over. At that point, another two Army armored divisions and an Army armored cavalry regiment were still deploying into the theater.

Those who support the idea of maintaining at least 10 active-duty Army divisions could argue, following the war, that the original U.S. war plan called for using an additional division (the 4th Infantry Division) throughout the war, that Army supply lines were stretched to the breaking point and thinly defended as a result of the rapid advance to Baghdad, that the number of U.S. ground forces needed for the invasion was reduced by the contribution of an additional division by a coalition partner (Britain), which is something the United States cannot count on happening in future conflicts, that about 148,000 Army National Guard and Army Reserve members were activated to help fulfill Army commitments during the war, and that the commitment of Army forces for the Iraq war exacerbated an ongoing situation of high worldwide operational tempo for both active and reserve Army units.[42]

***Programs for Upgrading Armored Vehicles.*** Supporters of reinstituting funding for upgrading the Army's M1 tanks and other heavily armored vehicles would argue that the Iraq war dramatically demonstrated the continuing value of heavy armor in modern warfare, not only for defeating enemy forces in open terrain, as many expected, but for conducting combat operations in urban areas, which many observers did not anticipate. Given the importance of operations by heavily armored units in the Iraq war, they could argue, the United States should ensure that all of its armored forces are fully upgraded, particularly for fighting two regional conflicts in overlapping time frames against capable enemy forces. They could also argue that upgrading all the Army's armored vehicles will provide more time to develop the FCS, and thus reduce technical risk in the FCS development program.

Opponents of reinstituting funding for armor upgrades could argue that the war demonstrated that U.S. armored units are already vastly superior to enemy forces and that expending funds on further upgrades would therefore be unnecessary and wasteful. They can note that the armored vehicles that were used successfully by the Army and Marine Corps for most of the war are not the most upgraded versions in the U.S. inventory, and that the Army already has a substantial number of more highly upgraded versions that can be used, if needed, to fight more capable enemy forces in the future.[43] In light of this, they might argue, the Army can successfully rely on its current plan to maintain a force that includes a mix of highly upgraded and somewhat less upgraded (but still very capable) armored vehicles.

***Plan to Shift to Lighter Forces.*** Supporters of the Army's plan to shift to a mix of forces including fewer heavily armored combat units and a greater number of lighter and more mobile combat units could argue that the battlefield dominance achieved by the relatively small number of Army and Marine Corps armored units

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[42]For an article discussing this issue in the context of the Army's post-war constabulary responsibilities in Iraq, see Gordon, Michael R. How Much Is Enough? *New York Times on the Web*. May 30, 2003.

[43]The main Army and Marine Corps units involved in the Iraq war, such as the 3rd Infantry Division and 1st Marine Expeditionary Force, were not equipped with the most upgraded armored vehicles in the U.S. inventory. The Army's most upgraded armored vehicles belong to the 4th Infantry Division, which was redeployed from the Eastern Mediterranean to Kuwait while the war was underway and did not participate in combat operations until the final days of the conflict.

in the Iraq war demonstrated that the United States currently has more than enough heavily armored combat units to fight future conflicts. They might also argue that lighter and more mobile units like the planned Stryker Brigades would have been valuable during the Iraq war in helping the United States establish a more formidable ground presence in northern Iraq following Turkey's decision not to allow its territory to be used as a staging area for U.S. forces. From their perspective, in the days following the end of major fighting in the war, Stryker vehicles would have been useful in Iraqi cities for helping to reestablish civil order. The effectiveness of the M1 tank in combat operations in Baghdad, they could argue, resulted in part from Baghdad's broad avenues and sizeable public plazas and other open areas, which gave the M1s room to maneuver and long lines of sight. Future urban combat situations, they are likely to maintain, may take place in cities and towns with narrower roads and shorter lines of sight, which could make M1s less effective and potentially more vulnerable to enemy attack.

Opponents of the Army's plan to shift the mix of its forces could argue that the Iraq war, by demonstrating the continued value of heavy armor in modern combat, suggests that the United States should think twice about reducing the number of Army armored units, particularly given the requirement for being able to fight two regional conflicts in overlapping time frames. They could also argue that Stryker vehicles would have been vulnerable to some of the weapons that Iraqi forces used ineffectively against M1 tanks and M2 Bradley fighting vehicles, and that the war thus demonstrated the inadvisability of shifting the Army toward more lightly armored combat units. In particular, they might argue that the Army should be cautious in its planning for the FCS to use situational awareness as compensation for less armor protection. They may also argue that, although heavily armored units are more difficult to transport, the United States was able to deploy sufficient numbers of them to start the war in a reasonable amount of time, and that given the potential vulnerability to enemy fire of lightly armored vehicles, the need to improve the Army's rapid-response capability should be met not by lightening Army forces, but by investing in improved airlift and sealift capabilities, such as wing-in-ground aircraft[44] and very high-speed sealift ships (see sections on air mobility and sealift).

## Combat Aircraft and Precision-Guided Munitions[45]

**Program Issues Going Into the War.** The Iraq war occurred as Congress was considering a number of significant issues relating to programs for combat aircraft and precision-guided munitions, including the following:

- the degree to which air power can substitute for ground forces in future conflicts;
- the balance of funding for manned aircraft vs. unmanned air vehicles (UAVs);
- the balance of funding for shorter-ranged tactical aircraft vs. long-ranged bombers;

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[44]Wing-in-ground aircraft are aircraft that fly very close to the surface so as to reduce drag, increase lift, and thereby transport heavy loads more efficiently.

[45]This section prepared by (name redacted), Specialist in National Defense.

- funding for specific tactical aircraft programs, including the F/A-22 fighter, the F/A-18E/F strike fighter, the F-35 Joint Strike Fighter, the V-22 tilt-rotor aircraft; and the RAH-66 Comanche helicopter program;
- funding for specialized combat-support aircraft;
- funding for specific UAV programs, including the Global Hawk and Predator UAVs; and
- funding for various precision-guided munition programs.

**Combat Aircraft Operations in the Iraq War.** The Iraq war was the latest in a series of U.S. military operations dating back to the 1980s where the United States has thoroughly dominated the air war.[46] U.S. and British combat aircraft played a central role in the Iraq war, as expected, destroying thousands of Iraqi targets of various kinds. Unlike the 1991 Persian Gulf war, when some Iraqi aircraft flew against U.S. and coalition aircraft, Iraq in this conflict, with one reported exception,[47] apparently did not put any manned aircraft into the air.[48]

An Air Force statistical summary of the war states that a total of about 1,801 U.S., British, Australian and Canadian aircraft (excluding U.S. Army helicopters) were involved in the conflict. These aircraft flew a total of 41,404 sorties (excluding sorties by special operations and Army helicopters, and "coalition sovereignty flights").[49] At the height of the war, roughly 1,500 to 2,000 sorties, including roughly

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[46]In addition to the Iraq war, the war in Afghanistan in 2001-2002, and the operation in Kosovo in 1999, this series includes operations in Bosnia in 1995, the 1991 Persian Gulf war, the operation in Panama in 1989, strikes against targets in Libya in 1986, and the operation in Grenada in 1983.

[47]According to one report, "At least two Iraqi ultralight aircraft flew over a patch of desert Friday [March 28, 2003] where thousands of U.S. soldiers and several command and control facilities are located.... Both of the small, prop-driven aircraft spotted here evaded a tight air defense system and flew over an assembly area packed with helicopters, tanks, Bradley fighting vehicles and other military equipment. They flew off before the anti-aircraft crews could get permission to shoot them down.... The aircraft were probably being flown by pilots drawn from one of the paramilitary forces loyal to the Hussein regime, or by Iraqi special forces, [one officer] said....Although none could be certain, officers here believe this is the first time an enemy aircraft has flown over American ground forces since the Korean War. (Naylor, Sean D. Iraqi Ultralights Spotted Over U.S. Troops. *ArmyTimes.com*, March 29, 2003.)

[48]Various theories have been advanced as to why the Iraqi Air Force did not fly during the war, including the following: (1) Few Iraqi aircraft were in condition to fly, and rapid U.S. attacks at the start of the war prevented these aircraft from taking to the air before being destroyed or pinned down. (2) Iraqi officials decided that attempting to put their aircraft into the air to contest U.S. and British aircraft would be pointless or was not necessary to the success of their military strategy, which relied on contesting U.S. and British forces in cities, in which case it was better to preserve the aircraft for potential post-war use following the hoped-for defeat of U.S. and British forces. (3) Iraqi officials feared that Iraqi pilots, if allowed to fly, might in some cases fly their aircraft to Iran (as some did in the 1991 Persian Gulf war) or turn against their own leaders and attack Iraqi leadership targets.

[49]U.S. Department of Defense. *Operation IRAQI FREEDOM – By The Numbers*. (Assessment and Analysis Division, USCENTAF, T. Michael Moseley, Lt Gen, USAF
(continued...)

750 to 1,000 strike sorties, were reportedly flown each day. Coalition forces dropped or fired a total of 29,199 bombs and missiles. Of these, about 19,948, or about 68%, were precision guided – about the same as the 69%-share in the war in Afghanistan, and many times higher than the 9%-share in the 1991 Persian Gulf war, but less than the 90%-share that some observers had predicted prior to the Iraq war. The total of 19,948 precision-guided weapons includes 802 Tomahawk cruise missiles fired by U.S. Navy surface combatants and submarines.[50]

Preliminary DoD estimates are that aircraft-delivered precision-guided weapons found their targets as much as 98% of the time, and that the percentage of Tomahawk missiles that found their targets might be almost as high.[51] Past experience, however, suggests that as combat records are reviewed in more detail, these percentages may well be revised downward. The success rate for the Tomahawk missile in the 1991 Persian Gulf war, for example, was reduced significantly after the results of Tomahawk attacks in that war were reviewed in detail.

As expected, U.S., British, and Australian combat aircraft in the Iraq war attacked various kinds of targets in Iraq, including leadership targets, command-and-control facilities, air-defense systems, and fielded military forces. Perhaps more surprising to some, fixed-wing aircraft armed with precision-guided weapons proved useful in providing close air support to U.S. and British ground forces engaged in urban combat operations.[52] Perhaps more than the public realized at the time, U.S. air power decimated key Iraqi Republican Guard divisions defending the southern approaches to Baghdad, facilitating the rapid advance to the city by U.S. ground forces.[53] U.S. and British air operations benefitted from networking technology that permitted information about Iraqi targets to be passed quickly from surveillance aircraft to strike aircraft.

DoD reports that 7 aircraft – 1 A-10 Warthog attack plane, 4 AH-64 Apache helicopters, and 2 AH-1W Cobra helicopters – were shot down by Iraqi ground fire. Another 13 aircraft were lost due to other causes, including 2 fighters (1 U.S. and 1

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[49](...continued)
Commander, April 30, 2003, Unclassified) 16 p.

[50]*Operation Iraqi Freedom - By The Numbers*, op cit.

[51]See, for example, Capaccio, Tony. Raytheon Tomahawks Miss Few Iraqi Targets, Navy Says. *Bloomberg.com*, April 12, 2003; Weisman, Jonathan. Pentagon Says Some Missiles Strayed. *Washington Post*, March 30, 2003: 23.

[52]See, for example, Lowe, Christian. Urban Combat Role Grows For Airstrikes. *DefenseNews*, April 21, 2003: 19.

[53]Some air power supporters are concerned that the relatively low amount of wartime reporting on air operations in the Iraq war compared to the extensive wartime reporting on ground operations could disadvantage air power programs in post-war deliberations on U.S. defense programs. (Scott, William B. Out Of Sight. *Aviation Week & Space Technology*, April 21, 2003: 24; Cooper, Christopher, and David Cloud. Branches Of U.S. Military Fight Over Media Attention In Iraq. *Wall Street Journal*, March 26, 2003.)

British) lost in friendly-fire incidents and several aircraft lost due to accidents.[54] The small number of aircraft lost due to enemy fire was consistent with U.S. experience in other recent military operations.[55]

U.S. and British strike operations were supported by a variety of specialized combat-support aircraft, including Air Force E-3 Airborne Warning and Control System (AWACS) aircraft, Navy E-2C Airborne Early Warning aircraft (the Navy's analogue to the E-3), Air Force E-8 Joint Surveillance, Targeting and Reconnaissance System (JSTARS) ground-surveillance aircraft, and Navy and Marine Corps EA-6B radar-jamming aircraft.

The United States used more than 10 kinds of UAVs in the Iraq war,[56] compared with 3 kinds in the war in Afghanistan and a single kind in the 1991 Persian Gulf war. UAVs proved especially valuable in providing persistent (i.e., round-the-clock) overhead surveillance of Iraqi forces, something that cannot be done with satellites and might be too risky to attempt with manned surveillance aircraft. UAVs were used to draw attention from Iraqi air defense systems, permitting those systems to be located and attacked. Unmanned combat air vehicles (UCAVs), which are UAVs armed with weapons, were used to attack targets on the ground.

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[54] *Operation IRAQI FREEDOM – By The Numbers*, op cit. An Air Force F-15E fighter was also lost, but whether due to Iraqi ground fire or some other cause is still unknown. It was also reported that a UH-60 Black Hawk helicopter was possibly lost to enemy fire. McIntyre, Jamie. U.S. Crew Missing After F-15 Goes Down. *CNN.Com*, April 17, 2003; U.S. Army Helicopter Shot Down; 7 Killed, *New York Times*, April 3, 2003; Sack, Kevin. Accidents Chief Foe For Allied Aircraft, *Los Angeles Times*, April 3, 2003.

[55]Despite flying tens of thousands of combat sorties in military operations dating back to the 1980s, U.S. aircraft losses per conflict generally have either been zero or in single digits. An exception is the 1991 Persian Gulf war, in which 33 coalition aircraft were lost to enemy fire. No U.S. military aircraft has been shot down by an enemy aircraft since 1991. All aircraft losses in subsequent conflicts have been to surface-based air defenses. For more information on losses of U.S. aircraft in recent military operations, see CRS Report RS21124, *Military Suppression of Enemy Air Defenses (SEAD): Assessing Future Needs*, by (name redacted). Washingt on, 2003. (Updated periodically) 6 p.

[56]Among the types of UAVs used in the Iraq war were the Army's Hunter, Pointer, and Shadow, the Air Force's Global Hawk, Predator, Desert Hawk, and Force Protection Surveillance System, and the Marine Corps' Dragon Eye, Pioneer, and Silver Fox. For an article listing all of these but Desert Hawk and Silver Fox, see Selinger, Marc. U.S. Using More Than 10 Types of UAVs In Iraq War, Official Says. *Aerospace Daily*, March 27, 2003. The article said that in addition to the UAV systems it named, "several other small systems are supporting specialized requirements." For an article mentioning Desert Hawk, see Kirsner, Scott. Eye In The Sky. *Boston Globe*, March 24, 2003: B9. For articles mentioning Silver Fox, which was originally used to spot whales before starting Navy exercises, see Brown, Malina. Cohen Expects To Draw Lessons From Iraq on Unmanned Drones. *Inside the Navy*, April 21, 2003; Sagara, Eric. New, Tucson-Made Drone Scans Mideast. *Tucson Citizen*, April 16, 2003; Morris, Jefferson. Four New Silver Fox UAVs Deployed For Iraq. *Aerospace Daily*, April 14, 2003; Brown, Malina. Marines Receive New Silver Fox UAV For Surveillance Missions In Iraq. *Inside the Navy*, April 14, 2003.

**Potential Program Implications.** The Iraq war has potential implications for several issues relating to the Air Force as a whole, combat and combat-support aircraft programs, and precision-guided weapon programs.

***Size and Structure of the Air Force.*** The recent war in Iraq has raised questions regarding whether the U.S. Air Force is appropriately sized and organized for meeting operational demands. Prior to the terrorist attacks of September 11, 2001, the Air Force deployed approximately 7,000 personnel globally to meet worldwide commitments. By December 2002, that figure had increased to about 24,000.[57] Continued U.S. military operations in Afghanistan, stabilization efforts in Iraq, anti-terrorism activities in the Horn of Africa and in South East Asia, deterrence operations in North East Asia, and unforseen disaster relief and humanitarian assistance scenarios suggest that this deployment level may not subside soon.

In 1999, the Air Force reorganized itself into a service composed of 10 Aerospace Expeditionary Forces (AEFs). The purpose of the reorganization was to create an organizational structure and rotational deployment schedule that would permit the Air Force to effectively meet worldwide contingency demands without placing undue strains on equipment and personnel. Each AEF includes approximately 175 aircraft and 20,000 people from both the active and reserve components.[58] The 10 AEFs rotate on a 15-month training and deployment cycle, during which they may be deployed for up to 90 days. The Air Force wants to be able to deploy an AEF in 48 hours, and up to 5 AEFs within 15 days. Each AEF is tailored to the regional commander's needs.

Prior to the Iraq war, signs emerged that the Air Force was being tasked to do more than its reorganized force structure would easily allow. In February 2002, it was reported that Air Force leaders had begun making exceptions to the AEF deployment schedule to meet overseas demands for personnel in certain career fields, and that as a result some Air Force personnel would have to deploy longer or more frequently than the AEF standard.[59] In September 2002, it was reported that the Air Force plans to modify the AEF structure by embedding personnel and materiel from two on-call air wings in the 10 AEFs while expeditionary combat-support assets from throughout the Air Force are "leveled."[60] In January 2003, the Air Force again made exceptions to the AEF rotational scheme by deploying indefinitely several aircraft squadrons of various types (bombers, fighters, helicopters, UAVs) to augment AEFs

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[57]Rolfsen, Bruce. Deployment Outlook. *Air Force Times,* April 28, 2003: 14.

[58]The 10 AEFs, together with two newly created rapid-reaction Aerospace Expeditionary Wings, form the heart of what Air Force officials now refer to as the Expeditionary Air Force (EAF). The EAF also includes airlift and aerial refueling aircraft, and so-called high-demand/low-density (HD/LD) forces such as U-2 surveillance aircraft and E-8 Joint Surveillance, Targeting and Reconnaissance (JSTARS) aircraft.

[59]Dougherty, Tim. Air Force Remains Committed to AEF Rotation Cycles. *Air Force Print News,* February 5, 2002.

[60]Elliot, Scott. Major AEF Changes Coming in June." *Air Force Print News*, September 23, 2002.

7 and 8, which were deploying to the Persian Gulf.[61] Normally, Air Force personnel are not allowed to serve temporary duty of more than 180 days in one location. In April 2003, however, Secretary of the Air Force James Roche issued a blanket waiver authorizing all Air Force personnel supporting contingency operations to exceed the180 day limit.

What do these recent events suggest for the size and organization of the Air Force? Should Air Force end strength be increased to more easily satisfy demands for personnel in certain career fields? If so, what changes, if any, need to be made to Air Force recruitment, training, and retention programs? Are there alternatives to increasing Air Force end strength? Could more cooperation with other services help alleviate this shortfall? Air Force military policemen (MPs), for example, have reportedly been in high demand. Could increased numbers of Army personnel be used to help guard Air Force air bases?[62]

When conceived, the AEF concept was lauded as the key organizational component to the Air Force's transformation strategy. Do the recent exceptions to the AEF rotational schedule suggest that the AEF concept is broken? If so, how should the AEF concept be modified?

***Aircraft Carriers and Sea-Based Aircraft.*** Five Navy aircraft carriers and a total of 408 Navy aircraft (almost all of them operating from the carriers) were involved in the Iraq war. Another 372 Marine Corps aircraft (many operating from Navy amphibious ships) were also involved. The combined naval (i.e., Navy and Marine Corps) total of 780 aircraft represented about 43% of the 1,801 aircraft (excluding Army helicopters) used in the war. Naval aircraft flew 13,893, or about 34%, of the 41,404 sorties (excluding sorties by special operations and Army helicopters, and "coalition sovereignty flights") in the war.[63] The contribution of naval aircraft to U.S. air operations in the war in Afghanistan was even more pronounced. Supporters of aircraft carriers and sea-based aircraft could argue that the Iraq war, like the war in Afghanistan, demonstrated the value of aircraft carriers and carrier-based aircraft for conducting U.S. military operations where access to in-theater land bases is limited.

***Balance of Air and Ground Forces.*** Some observers argued that a primary lesson of the U.S. military operation in Kosovo in 1999 was that air power alone could now be used to defeat U.S. adversaries. They argued that while air power in previous U.S. military operations had supported ground operations, the U.S.

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[61]Chapman, Suzanne. USAF to Exceed AEF Rotations. *Air Force Magazine.* February 2003: 15.

[62]Some Army MPs are already used for this purpose. See Hafemeister, Rod, and Jim Tice. Army Guard To Secure Air Force Bases. *Army Times*, December 30, 2002: 10.

[63]In the 1991 Persian Gulf war, only a small percentage of carrier-based combat aircraft were equipped to drop precision-guided munitions, and a lack of proper electronic links forced the air tasking order (ATO) to be sent each day from the land-based air operations center to the aircraft carrier in physical rather than electronic form. In the Iraq war, in contrast, all Navy and Marine Corps carrier-based strike fighters were equipped to use precision-guided weapons, and the ATO could be transmitted to the carriers electronically.

operation in Kosovo had demonstrated that air power by itself could achieve U.S. war aims.[64] Air power advocates argued that the war in Afghanistan in 2001-2002, which employed few ground forces relative to air forces, reinforced this argument.

Debate following the Iraq war over the relative value of air power vs. "boots on the ground" has been muted to date. The prominent use and success of U.S. heavy ground forces appears to have suppressed arguments from air power advocates that air power "can do it all." Even so, analysts may debate the relative contributions of air operations and operations by U.S. armor and artillery in destroying Iraq's army. This debate could influence views on how much air power can or should replace armor and artillery in future conflicts, and thus views on how much funding to invest in each area.

Reports suggest that U.S. and British air strikes severely weakened Iraq's Republican Guard Divisions – Iraq's toughest ground forces – making them easy prey for advancing Army and Marine Corps divisions. Some observers estimate that the Republican Guard divisions lost half their tanks, armored personnel carriers and artillery before their first encounter with U.S. ground forces on April 1, 2003.[65] Other observers estimate that by April 4, U.S. air power had reduced Republican Guard Divisions to between 18 and 44 percent of their full strength.[66]

Other observers, however, caution that the effectiveness of air operations in destroying Iraqi ground forces is still being assessed. They note that many of the early assessments of the effectiveness of air operations against Iraqi ground units in the 1991 Persian Gulf war were later downgraded. Some analysts, for example, now estimate that coalition aircraft were responsible for only 17 percent of the Iraqi tanks that were destroyed in the 1991 war.[67] These observers also point out that even though Iraqi ground forces in the Iraq war were destroyed by U.S. and British air strikes, U.S. Army and Marine Corps forces still encountered stiff resistance from some Iraqi units.

Armor, artillery, ammunition, and fuel are among the most challenging military materiel to transport long distances. Some observers argue that if U.S. ground forces begin relying more on combat aircraft than on armor and artillery, U.S. forces in the future could be more rapidly deployable and remain just as lethal. Advocates of shifting to a greater reliance on aircraft note that the Marine Corps fields fewer large artillery pieces than does the Army, and relies more on Marine Corps combat aircraft (AV-8B attack planes and F/A-18 strike fighters) for fire support. Those skeptical of substituting aircraft for Army armor and artillery note that unlike aircraft, the

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[64]Other analysts demurred, arguing that the enemy leaders capitulated only when ongoing air operations were joined by a threat to introduce ground forces, or when it became clear to the enemy leaders that Russia would not support their effort.

[65]Scarborough, Rowan. Rulers of the Air. *Washington Times*, April 27, 2003: 1.

[66]Graham, Bradley, and Vernon Loeb. An Air War of Might, Coordination and Risks. *Washington Post*, April 27, 2003: 1.

[67]Wheeler, Winslow. Iraq War: Drop the Myths, Learn the Lessons. *Defense Week*, April 28, 2003.

availability and effectiveness of artillery is not degraded by adverse weather. Recent combat in the mountains of Afghanistan, they could argue, suggest that ground forces might have been more effective and might have suffered fewer casualties if they were supported by artillery rather than solely combat aircraft.

***Close Air Support (CAS) vs. Other Missions.*** The military strategy pursued in the Iraq war may add fuel to a long-running discussion on the relative balance, within U.S. air power operations, between close air support (CAS) missions vs. attacking more strategic targets in attempts to topple enemy governments and power centers. Was the Iraqi regime toppled by the strategic bombing that destroyed key regime targets in Baghdad, or because of CAS missions that contributed to the rapid destruction of Iraqi military forces in the field? Views on this debate could influence decisions on the kinds of aircraft and associated systems DoD should acquire in coming years.

***Long-Range Bombers.***[68] Long-range B-1, B-52, and B-2 bombers played a significant role in the Iraq war, as they did in the war in Afghanistan in 2001-2002. In both conflicts, relatively small numbers of bombers dropped large numbers of precision-guided bombs and traditional unguided bombs, destroying many enemy ground targets,[69] and were able to loiter over the battlefield for extended periods of time, which made them readily available for attacking so-called time-sensitive targets – targets that emerge suddenly and remain susceptible to attack for only short periods of time. For example, the B-1 bomber that carried out the April 7, 2003 bombing attack on a building in Baghdad where Saddam Hussein and his close associates were thought to be located had been loitering above Iraq waiting for just such an emerging target, and dropped its bombs just 12 minutes after being given the coordinates.

The performance of long-range bombers in the Iraq war and the war in Afghanistan may influence a long-simmering the debate on the balance of funding for bomber programs vs. tactical aircraft. Specific questions relating to this debate include the following:

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[68]For more on long-range bomber programs, see CRS Report RL31544, *Long-Range Bombers: Background and Issues for Congress*, by Pierre Bernasconi and (name redac ted). Washington, 2002. (August 22, 2002) 44 p.

[69]In the Iraq war, for example, Air Force B-1s, reportedly flew only about 2% of total aircraft sorties, but dropped 50% of all the Joint Direct Attack Munitions (JDAMs) dropped by aircraft in the war. (Fulghum, David, and Robert Wall. Baghdad Confidential. *Aviation Week & Space Technology*, April 28, 2003.) The B-1 bomber was a major contributor to the U.S.-led war effort in Afghanistan; some observers have called it the "workhorse" of that conflict. B-1s flew only 5% of all aircraft sorties in the conflict, but accounted for 40% of the ordnance that was dropped from all aircraft. Observers have also lauded the B-52's performance in the war in Afghanistan. Operating from Diego Garcia, B-52s were able to loiter for extended periods over Afghanistan, and dropped many precision-guided weapons on targets that had been designated by ground forces, destroying Taliban positions and providing air cover for outnumbered Northern Alliance troops. The fall of Taliban/al Qaeda forces at the northern Afghan city of Mazar-e Sharif has been attributed by some observers in large part to the B-52s' support of pro-U.S. Northern Alliance fighters.

- What is the best mix of long-range bombers and shorter range tactical combat aircraft?
- Should bombers be emphasized more in the overall structure of the Air Force?
- Is DoD shortchanging bomber modernization to finance its tactical combat aircraft programs?
- Should planned early retirements of B-1s be slowed, or even reversed?[70]
- Should the Air Force implement a proposal it is now considering to replace the engines on its B-52s?

Prior to the Iraq war, bomber supporters argued that programs for modernizing the bomber force are underfunded relative to tactical aircraft programs in DoD budgets,[71] that DoD's current plan to retire certain B-1 bombers early is unwise,[72] and that the current DoD plan for developing a next-generation bomber to replace the aging bombers in the current fleet is not sufficiently aggressive.[73] Supporters of current DoD plans argued that the force-structure and modernization needs of the bomber force are properly reflected in DoD planning and budgeting.

Bomber supporters could argue that the Iraq war and the war in Afghanistan demonstrated that the value of bombers in combat operations has been significantly enhanced by the advent of precision-guided weapons. They could also argue that the two conflicts underscored the value of bombers for reducing the need for in-theater bases and for maintaining aircraft with precision-guided weapons over the battlefield for long periods of time. In light of the enhanced role of bombers, they could argue, DoD should place greater emphasis on bomber programs in its plans and budgets.

Supporters of DoD's current plans for modernization of the bomber force could argue the Iraq war and the war in Afghanistan show that the United States has enough, or more than enough, long-range bombers for fighting regional conflicts, particularly given how precision-guided weapons have multiplied the number of targets that each bomber can attack during a single sortie. They could also argue that the good reviews given to bomber operations in both of these wars shows that these aircraft are receiving sufficient amounts of modernization funding and that there is no urgent need to develop and procure a next-generation bomber. Rather than devoting funding to maintaining a larger bomber force or developing a new bomber design now, they could argue, the successful use of bombers in Iraq and Afghanistan shows that funding should instead be used to maintain the readiness of the currently

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[70]Many bomber supporters argue that in light of the B-1's contributions in the Iraq war and the war in Afghanistan, B-1 retirements should be truncated so as to maintain a force of about 70 B-1s.

[71]For decades, DoD funding levels for tactical combat aircraft have been much greater than funding levels for bombers. In FY04, for example, DoD is requesting $363.2 million in bomber funding and $100.3 billion in funding – 276 times as much money – for tactical aviation programs. (U.S. Department of Defense. Comptroller. *Program Acquisition Costs by Weapon System*. Washington, 2003. [Department of Defense Budget for Fiscal Years 2004/2005, February 2003])

[72]In 2001, the Air Force began retiring B-1 bombers, reducing the fleet from 92 aircraft to 60 aircraft.

[73]Current DoD plans don't call for a new bomber to be fielded until 2037.

planned bomber force and increase its effectiveness by funding additional improvements to precision-guided weapons and associated targeting systems.

***Tactical Fighter Aircraft in General.***[74] Prior to the Iraq war, proponents of DoD's three main tactical aircraft modernization programs – the F/A-22 Raptor, the F/A-18E/F Super Hornet, and F-35 Joint Strike Fighter – have argued that proceeding with all three programs as currently planned represents the best way to guarantee continued U.S. air dominance in future conflicts. They have argued that the successful operations of current U.S. aircraft in recent military operations does not imply that they would achieve similar success in future conflicts. Air-defense technology, they have argued, is developing and proliferating rapidly, making tomorrow's adversaries potentially more capable than yesterday's. Stealthy, agile tactical aircraft with advanced avionics, they have argued, will be required in the future for successful operations against adversaries armed with highly-capable air-defense systems such as the Russian-built long-range SA-10 and SA-12 surface-to-air missile systems. The F/A-22, F/A-18E/F, and JSF, they have also argued, will field flexible technologies that will permit these aircraft to take on new capabilities, if needed, for responding to changes in the international security environment. For example, they have argued, if cruise-missile defense becomes a much more prominent mission for tactical aircraft, these new aircraft will be well suited to incorporate this mission.

Critics of DoD's tactical aircraft modernization program have argued that DoD simply cannot afford to proceed with all three tactical aircraft programs as now planned, at least not without requiring significant cutbacks in other critical DoD programs. They have argued that the tremendous success in recent U.S. military operations of current U.S. aircraft such as the F-15 and F-16 fighter demonstrate that the margin of U.S. superiority in air operations is so significant that it is likely to last for some number of years.[75] They have also argued that with the growing importance to U.S. air operations of precision-guided weapons, associated surveillance and targeting systems, and technologies for networked air operations, investing in new tactical aircraft designs is now less critical for insuring future success in U.S. air operations than investing in these other air-related technologies. In optimizing investments in future air power capability, they have argued, DoD should move away from its traditional "platform-centric"focus on developing new aircraft designs, and toward a "system-of-systems" approach that more fully recognizes the importance of these supporting technologies in contributing to total U.S. air power capability.

***F/A-22 Program.***[76] As the most capable, most expensive, and most air-to-air oriented aircraft in DoD's tactical aircraft modernization plan, the F/A-22 has often been at the center of the debate over the merits of DoD's tactical aircraft

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[74]For more on tactical fighter aircraft programs in general, see CRS Issue Brief IB92115, *Tactical Aircraft Modernization: Issues for Congress*, by (name redacted). Washington, 2003. (Updated periodically) 15 p.

[75]See, for example, Montgomery, Dave. Critics: Iraq War Shows New Jets Aren't Needed. *Miami Herald*, May 5, 2003.

[76]For more on the F/A-22 program, see CRS Report RL31675, *F/A-22 Raptor*, by (name redacted). Washington, 2003. (Updated periodically) 18 p.

modernization plan. Following the Iraq war, critics of the F/A-22 program could argue that the degree of U.S. air dominance in the Iraq war and other recent conflicts demonstrates that the F/A-22 program has become the "Seawolf of the sky" – i.e., a program, like the Navy's Seawolf submarine program, that was initiated in the 1980s with the goal of producing an expensive, high-capability platform for addressing a projected Soviet military threat that never materialized.[77] Successful U.S. air operations in the Iraq war and previous conflicts, they could argue, demonstrate that today's tactical combat aircraft are more than sufficiently effective, and that upgrades to these aircraft can therefore maintain DoD's air power dominance until less-expensive manned aircraft such as the JSF or unmanned combat aerial vehicles (UCAVs) are fielded. As a result, they could argue, the F/A-22 program can either be terminated or procurement of the aircraft can be reduced from the currently planned total of about 276 to a smaller "silver bullet" force of no more than 100 aircraft.

Supporters of procuring 276 or more F/A-22s could argue that the air-to-air capabilities of Iraq, like those of Afghanistan and enemy Serbian forces operating in Kosovo, were known to be virtually nonexistent, and that none of these wars consequently do anything to invalidate the projected future threat for which the F/A-22 will be needed – an enemy equipped with modern, highly capable fighters and surface-to-air missile systems. In addition, F/A-22 supporters could argue, the F-22 was recently redesignated the F/A-22 to reflect the fact that it is no longer a pure air-superiority fighter, but a rather strike fighter that can also perform valuable air-to-ground strike missions like those conducted in Iraq, Afghanistan, and Kosovo.[78]

***F/A-18E/F and F-35 (JSF) Programs.***[79] Some observers, including Admiral Vernon Clark, the Chief of Naval Operations, argue that the Iraq war, like the war in Afghanistan, has underscored the need for the Navy to replace its shorter-ranged F/A-18C/D strike fighters with longer-ranged F/A-18E/F strike fighters and F-35 Joint Strike Fighters. In both Afghanistan and Iraq, Clark and others have argued, Navy F/A-18C/Ds performing long-range, long-duration missions (including missions in which aircraft orbit over target areas while waiting for targets of

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[77]The Seawolf-class submarine is a large, powerful attack submarine designed by the Navy in the 1980s to counter advanced Soviet submarines that were projected to enter service in the 1990s and beyond. A total procurement of 29 or more Seawolf submarines was originally planned. In the 1990s, following the end of the Cold War, DoD halted the Seawolf program after procuring 3 boats and shifted to developing and procuring the Virginia-class attack submarine, a smaller and less expensive design. For more on the Seawolf and Virginia-class programs, see CRS Report RL30045, *Navy Attack Submarine Programs: Background and Issues for Congress*, by Ronald O'Rourke. Washington, 2000. (June 1, 2000) 37 p.

[78]For more on debate on the F/A-22 program following the Iraq war, see Kaufman, Gail. Iraq War Arms Both Sides Of F/A-22 Debate. *DefenseNews*, April 28, 2003: 13.

[79]For more on the F/A-18E/F and F-35 JSF programs, CRS Reports RL30624, *Military Aircraft, the F/A-18E/F Super Hornet Program: Background and Issues for Congress*, by (name redacted). (Updated periodically) 15 p., and RL30563, *Joint Strike Fighter (JSF) Program: Background, Status, and Issues*, by (name redacted). (Updated periodically) 25 p.

opportunity to emerge) required multiple in-flight refuelings per sortie. F/A-18E/Fs or F-35s, he and others argue, can perform such missions with fewer in-flight refuelings or none at all, reducing the Navy's need for aerial refueling, which was in short supply in the Iraq war. During the Iraq war, the number of strike sorties flown from carriers was reduced in some instances due to insufficient in-flight refueling assets. Replacing F/A-18C/Ds with F/A-18E/Fs and F-35s, they now argue, will reduce the chances of such problems occurring in future operations.

***V-22 Tilt-Rotor Aircraft.***[80] Current DoD plans call for procuring a total of 458 V-22 tilt-rotor aircraft, mostly for use by Marine Corps forces as replacement for aged Marine Corps transport helicopters. Supporters of the V-22, which has experienced considerable controversy over the years due in part to fatal crashes during testing, argue that the V-22 offers numerous operational advantages over helicopters, including a higher cruising speed for transporting Marine personnel and equipment from ship to operating area.

Supporters of the V-22 tilt-rotor aircraft could argue that in both the Iraq war and the war in Afghanistan, Marine forces conducted ground combat operations 350 or more miles from shore, and perhaps 450 or more miles away from their Navy amphibious ships at sea. These are much longer operating distances than Marine forces have traditionally experienced. V-22 supporters could argue that the Marines' deep-inland operations in Iraq and Afghanistan could be repeated in future conflicts, which would underscore the value of replacing the Marine Corp's aged helicopters with faster-flying V-22s. V-22 supporters could also argue that difficulties experienced in the Iraq war with maintaining the readiness of the aged heavy-lift helicopters underscores the need to proceed with V-22 procurement.

Other observers could argue that although the V-22 can be of value in replacing aged heavy-lift helicopters and in supporting deep-inland Marine Corps operations, the Iraq war, like the war in Afghanistan, does nothing to alter the need for the strict testing program for the V-22 DoD established in the wake of fatal V-22 crashes. They could argue that although there may be a need, even an urgent need, for the V-22, this V-22 program's past development difficulties resulted in part from efforts to rush its development. If the V-22 is to serve as an effective replacement for today's helicopters, they could argue, the V-22 testing program must continue to proceed as planned.

***Helicopters.*** The Iraq war is the third consecutive major U.S. military operation, following the operation in Kosovo in 1999 and the war in Afghanistan in 2001-2002, where helicopter performance was mixed. In Kosovo, the Army was criticized for not being able to quickly deploy and use Task Force Hawk, a group of 24 AH-64 Apache attack helicopters. Critics emphasized that the task force had grown into a 5,000-soldier force that required 500 C-17 sorties to deploy, and that the Army had kept its helicopter operations separate from the daily air tasking order (ATO) – the document issued each day by the air operations center that coordinated the operations of most U.S. aircraft. Keeping Army helicopters out of the ATO,

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[80]For more on the V-22 program, see CRS Report RL31384, *V-22 Osprey Tilt-Rotor Aircraft*, by (name redacted). Washington, 2003. (Updated periodically) 20 p.

critics argued, made Army helicopter operations in Kosovo less integrated with the operations of other U.S. forces and thereby reduced helicopter effectiveness.[81]

In Afghanistan, critics noted a similar lack of coordination between Army helicopter operations and the operations of other U.S. forces, especially during a combat operation in March 2002 called Operation Anaconda.[82] In addition, the high elevation of the Afghanistan theater of operations made some helicopter operations difficult, and U.S. special operations forces experienced a shortfall in MH-47 heavy-lift helicopters, leading some observers to argue more strenuously in favor of the V-22 Osprey as one potential solution to both of these problems.

In the Iraq war, helicopters encountered problems with survivability and maintainability. With regard to survivability, an attack on a Republican Guard division by 34 AH-64 helicopters from the Army's 11th Attack Helicopter Regiment has been described as a near disaster: Every helicopter was hit by ground fire, one helicopter was lost, and 27 of the 33 that returned to base were too damaged to fly again without repair.[83] Some observers suggest that, reminiscent of problems with Army helicopter operations in Kosovo and Afghanistan, an Army failure to coordinate the Apache attack with supporting Air Force and Navy aircraft operations may have played a significant role in the poor outcome of this attack.[84] By using different tactics and by more closely integrating their efforts with fixed-wing attack aircraft and Army artillery, AH-64s from the 101st Air Assault Division conducted a raid on the city of Karbala four days later with much less damage.[85]

One traditional role for Army attack helicopters is conducting close air support – i.e., attacking enemy forces that are directly in contact with, or near contact with, friendly forces. Early in the Iraq war, attack helicopter pilots complained that they were being sidelined – that U.S. war planners were relying more on fixed-wing aircraft (many armed with precision-guided weapons) than on helicopters for performing close air support missions.[86] This perceived preference for fixed-wing aircraft, if accurate, may have been due in part to concerns regarding helicopter survivability following results of the attack by the 11th Attack Helicopter Regiment.

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[81]Lambeth, Benjamin. Task Force Hawk. *Air Force Magazine,* February 2002.

[82]Grant, Rebecca. The Clash About CAS. *Air Force Magazine,* January 2003.

[83]Scarborough, Rowan. Apache Operation a Lesson In Defeat. *Washington Times,* April 22, 2003. p.1

[84]See, for example, Scarborough, Rowan. Apache Operation A Lesson In Defeat. *Washington Times*, April 22, 2003.: 1.

[85]Atkinson, Rick. A Flotilla of Army Helicopters Joint Attack on Karbala. *Washington Post,* March 29, 2003: 23. See also Baumgardner, Neil. Apache Longbow Battalion Destroyed Two Republican Guard Battalions During OIF. *Defense Daily*, May 12, 2003: 4; Burger, Kim. US Army Reviews The Way It Operates The Apache. *Jane's Defence Weekly*, May 21, 2003; Sheridan, Mary Beth. Copter Unit Retools Tactics After Fight. *Washington Post*, March 26, 2003: 22.

[86]Frank, Thomas. Back-Seat Role for Apaches. *Long Island Newsday, April 15, 2003.*

With regard to helicopter maintainability, keeping helicopters flying in the harsh desert conditions of Iraq appears to have been a challenge. Early reports indicate that many different helicopters, but perhaps especially Marine Corps heavy-lift CH-53Es, were frequently grounded due to sand-induced engine problems. While some maintenance difficulties may always be expected for forces operating in the field in time of war, some observers argue that little improvement in helicopter maintainability has been made since the 1991 Persian Gulf war, and that the desert conditions in which these helicopters must operate are well known.[87]

In light of the mixed results with helicopter operations in Iraq and other recent operations, there is speculation that DoD may consider the option of placing less emphasis on helicopters in its plans and budgets. The helicopter program that might most be affected by this is the Army's RAH-66 Comanche helicopter program. The Comanche is a stealthy, armed reconnaissance helicopter that the Army has been developing for about 20 years, during which time it has been a frequent topic of debate. In late 2002, DoD restructured the program, reducing the Army's planned procurement of the helicopter by about half, from about 1,200 to about 600, and including in the program a new effort to develop companion UAVs for each helicopter. These companion UAVs could be used to improve situational awareness for the crews flying the Comanches, or to attack targets on the ground that might threaten Comanches.[88]

Supporters of reducing the planned procurement of Comanche programs further, or of terminating the program entirely, could argue that the Iraq war demonstrated that attack helicopters can be significantly vulnerable to ground fire in modern combat operations, and that missions previously performed by helicopters can now be performed by higher-flying fixed-wing aircraft armed with precision-guided munitions.

Supporters of the Comanche program could argue that the problems with helicopter survivability in the Iraq war reflected incorrect tactics (including lack of coordination with Air Force and Navy fixed-wing aircraft) rather than inherent problems with helicopters, and that adjusting tactics produced better results. They could also argue that the Comanche helicopter, with its stealth features and support from companion UAVs, will be much more survivable on the modern battlefield than today's attack helicopters. Helicopters, they could argue, will retain their effectiveness relative to fixed-wing aircraft in responding with agility to enemy maneuvers on the battlefield – something that Iraqi forces did little of in the Iraq war, but which enemy forces on future conflicts could do significantly.[89]

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[87]Wall, Robert. Woes Encumber Helo Ops. *Aviation Week & Space Technology*, April 14, 2003. p.75.

[88]For more on the RAH-66 Comanche helicopter program, see CRS Report RS20522, *Army Aviation: The RAH-66 Comanche Helicopter Issue*, by (name redacted). Washington, 2003. (Updated periodically) 6 p.

[89]For more on how the Iraq war may affect views on the Comanche helicopter programs and helicopters in general, see Wall, Robert, and David A. Fulghum. Coming Under Fire. *Aviation Week & Space Technology*, May 12, 2003: 63.

Some observers argue that difficulties with helicopter maintenance in the Iraq war were due in part to the advanced age of the helicopters in question. The Marine Corps' heavy-lift helicopters (i.e., its CH-53s and CH-46s) are generally quite old, in part because acquisition of the V-22 Osprey tilt-rotor aircraft, which is to replace these helicopters, has been slowed. Following the Iraq war, one potential issue concerns what contingency plans DoD has in place for modernizing or replacing existing heavy-lift helicopters if the V-22 program is delayed further or cancelled.

***Combat-Support Aircraft.***[90] The Iraq war highlighted the effectiveness of specialized combat-support aircraft such as the U-2 surveillance plane and the E-8 Joint Surveillance, Targeting and Reconnaissance System (JSTARS) aircraft. The JSTARS' ground-surveillance radar proved particularly useful, in one instance detecting and tracking Iraqi armored vehicles that were attempting to use a sandstorm to evade detection by U.S. forces. Specialized combat-support aircraft like the U-2, the E-8, and the Navy/Marine Corps EA-6B radar-jamming aircraft, however, are examples of so-called high-demand, low-density (HD/LD) assets – assets that are in great demand, but which exist in limited numbers. In the wake of the Iraq war, supporters of combat-support aircraft programs could argue that funding for modernization and procurement of such aircraft should be increased.

***Unmanned Air Vehicles.***[91] The value of UAVs was highlighted by the war in Afghanistan, and following that war, unmanned vehicles became a more prominent element in DoD's defense transformation plans. Some observers expect that the successful use of more than 10 kinds of UAVs in the Iraq war will reinforce support generated by the war in Afghanistan for expanding and accelerating DoD's UAV programs.[92] UAV programs that might be affected include the Global Hawk and Predator long-range UAV programs, several programs for developing and procuring smaller and shorter-ranged UAVs for all the services, and the joint Air Force-Navy program to develop a high-capability unmanned combat air vehicle (UCAV).

***Air-Delivered Precision-Guided Munitions.*** During the war in Afghanistan, some observers expressed concern for inventory levels of certain

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[90]For more on combat-support aircraft programs, see CRS Reports RL30639, *Electronic Warfare: EA-6B Aircraft Modernization and Related Issues for Congress*, by (name redac ted). Washington, 2001. (Update d December 3, 2001) 53 p., and RL30841, *Airborne Electronic Warfare: Issues for the 107th Congress*, by (name redacted). Washington, 2001. (February 9, 2001) 26 p.

[91]For more on UAV programs, see CRS Report RL31872, *Unmanned Aerial Vehicles: Background and Issues for Congress*, by Elizabeth Bone and (name redacted). Washington, 2003. (April 25, 2003) 48 p.

[92]For examples of articles describing the successful use of UAVs in the Iraq war, including some concluding that the Iraq war will reinforce support for UAV programs, see , Cantlupe, Joe. Military Sees Growing Role For Unmanned Planes. *San Diego Union-Tribune*, April 20, 2003; Brzezinski, Matthew. The Unmanned Army. *New York Times Magazine*, April 20, 2003; Schmitt, Eric. In The Skies Over Iraq, Silent Observers Become Futuristic Weapons. *New York Times*, April 18, 2003; Fulghum, David A. Opening Night In Baghdad. *Aviation Week & Space Technology*, April 24, 2003: 24; Schmickle, Sharon. Eye In The Sky Helps Troops On The Ground. *Minneapolis Star Tribune*, March 28, 2003.

precision-guided munitions, particularly the relatively new GPS-guided Joint Direct Attack Munition (JDAM).[93] Following the highly successful use of JDAMs and other precision-guided munitions in the war in Afghanistan, production rates for these weapons were increased. As a result, U.S. military planners expressed less concern about the size of the inventory at the start of the Iraq war, and after it was completed.[94] DoD plans to procure large numbers of JDAMs and other precision-guided weapons in coming years, and the success of these weapons in the Iraq war may reinforce support for funding these plans.

The JDAM currently exists in 2,000-pound and 1,000-pound versions. A 500-pound version, now in development, was not available at the time of the Iraq war; some pilots reportedly believe it would have been useful, particularly for attacking certain targets while limiting damage to nearby non-targeted structures. The Iraq war may thus reinforce support for proceeding with development and procurement of the 500-pound version of the weapon.

An even smaller GPS-guided weapon, the 250-pound Small Diameter Bomb (SDB), is now being developed. Large numbers of SDBs could be carried by strike aircraft, permitting aircraft to attack even more aim points in a single sortie than is now possible. Following the Iraq war, supporters of this weapon could argue that it might prove particularly useful for supporting ground forces in urban combat operations – a mission for fixed-wing aircraft that was elevated in prominence by the Iraq war, and one where concern for avoiding damage to civilians and civilian infrastructure can be paramount.

Prior to the start of the Iraq war, it was well known that the Iraqi regime had built an elaborate network of bunkers, command centers, living quarters and tunnels deep under Baghdad. The effectiveness of U.S. attempts to destroy such targets with "bunker-busting" weapons is not yet known. Post-war analysis of these attacks, when complete, may influence views on whether to proceed with development of improved bunker-busting weapons.

***Tomahawk Cruise Missile.*** A total of 802 Tomahawk land- attack missiles (TLAMs) were used in the Iraq war,[95] or more than 40% of the reported pre-war inventory of 1,890 to 2,000 TLAMs,[96] which itself may have been much smaller than

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[93]GPS stands for the Global Positioning System, a constellation of satellites that allow people and weapons equipped with the proper GPS receivers to almost instantly know their precise geographic location.

[94]See, for example, Butler, Amy. Air Force Chief Says Munition Stockpiles Are Sound. *Inside the Air Force*, April 11, 2003.

[95]*Operation IRAQI FREEDOM – By The Numbers*, op cit.

[96]Pae, Peter. Raytheon's Task: More Missiles, On The Double. *Los Angeles Times*, April 3, 2003; Squeo, Anne Marie. Navy's Tomahawk Arsenal Dwindles. *Wall Street Journal*, April 3, 2003; Infield, Tom. Tomahawks Used Heavily In War's First 12 Days. *Philadelphia Inquirer*, April 2, 2003.

called for in DoD plans.[97] The most capable version of the Tomahawk in the inventory is called the Block III. Most of the Tomahawks used in the Iraq war were likely Block IIIs. Procurement of new Block IIIs ended in FY1999. Procurement of the next version of the Tomahawk, called the Block IV or the Tactical Tomahawk (TacTom for short), began in FY2002. Thirty-two Block IVs were procured in FY2002, and another 167 were procured in FY2003. The missiles take roughly 18 months to build, so the first Block IVs may enter the inventory in 2004.

The FY2004-FY2009 Future Years Defense Plan (FYDP), submitted to Congress in February 2003, prior to the start of the Iraq war, calls for procuring 267 Block IVs in FY2004, 218 in FY2005, 422 in FY2006, 406 in FY2007, 471 in FY2008, and 410 in FY2009. Given the large number of Tomahawks used in the Iraq war, and the currently low remaining inventory of Tomahawks, some observers have proposed increasing the planned number of Block IVs to be procured in FY2004 and subsequent years, so as to replenish the Tomahawk inventory sooner. To support this plan, they have proposed increasing the capacity of the Tomahawk production line from 38 missiles per month (456 missiles per year) to 50 missiles per month (600 per year) or 75 missiles per month (900 missiles per year).[98]

## Special Operations Forces[99]

**SOF Profile Elevated By Afghanistan Operations.** The successful use of significant numbers of SOF personnel in the war in Afghanistan elevated the profile of special operations forces in U.S. defense planning. Following the war in Afghanistan, enhancing the capabilities U.S. SOF came to be viewed as a key element of the administration's plans for transforming the U.S. military to meet 21st-Century threats. The Administration's proposed FY2004 defense budget, which was submitted to Congress in February 2003 (i.e., before the Iraq war) proposes increasing the number of U.S. SOF personnel (currently about 47,000) by 1,890, and increasing the non-personnel portion of the SOF budget by 48% over the FY2003 figure. Much of the proposed funding increase will support efforts to modernize the

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[97]For a discussion of reported desired and estimated Tomahawk inventory levels, see CRS Report RS20162, *Cruise Missile Inventories and NATO Attacks on Yugoslavia: Background Information*, by Ronald O'Rourke. Washington, 1999. (April 20, 1999) 6 p.

[98]See, for example, Brown, Malina. Raytheon Prepared To Accelerate Tactical Tomahawk Production. *Inside the Navy*, April 7, 2003; Pae, Peter. Raytheon's Task: More Missiles, On The Double. *Los Angeles Times*, April 3, 2003; Squeo, Anne Marie. Navy's Tomahawk Arsenal Dwindles. *Wall Street Journal*, April 3, 2003; Raytheon In Talks For Possible Production Increase. *Defense Daily*, April 3, 2003; Selinger, Marc. Navy Chief Looking At Ways To Remedy Tomahawk Shortage. *Aerospace Daily*, April 2, 2003; Keeter, Hunter. Clark Calls For Accelerating TLAM Production. *Defense Daily*, April 2, 2003; Brown, Malina. Navy Officials Warn Congress Of Urgent Tomahawk Shortfalls. *Inside the Navy*, March 31, 2003; Keeter, Hunter. Mullen Argues Against Remanufacturing Tomahawks, Prefers Block IV. *Defense Daily*, March 31, 2003;.

[99]This section prepared by Ronald O'Rourke, Specialist in National Defense.

fleet of specialized helicopters and C-130 fixed-wing aircraft that support U.S. SOF operations.[100]

**SOF in the Iraq War.** As many observers had expected, U.S. special operations forces (SOF), along with British, Australian, and Polish SOF units, played a significant role in the Iraq war, conducting operations in southern, western, and northern Iraq, and in and around Baghdad. The total number of U.S. SOF personnel involved – more than 9,000 or 10,000 personnel from the Army, Navy, and Air Force, according to press reports – was considerably larger than the 6,000 or so reportedly used in Afghanistan in 2001-2002, and much larger than the number used in the 1991 Persian Gulf war.[101] Although relatively few details about SOF operations in the Iraq war have been reported, observers have generally concluded that SOF operations in the Iraq war, like those in Afghanistan, were highly effective and made a disproportionately large contribution to the success of the U.S.-led war effort.[102]

**Potential Program Implications.** Some observers believe the successful use of significant numbers of SOF in the Iraq war will reinforce the support generated by the war in Afghanistan for increasing the size and budget of U.S. special

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[100]For more on U.S. special operations forces, see CRS Report RS21048, *U.S. Special Operations Forces (SOF): Background and Issues for Congress*, by Ronald O'Rourke. Washington, 2003. (Updated periodically) 6 p.

[101]A few U.S. and coalition SOF units, along with some CIA officers, were reportedly inserted into Iraq in late 2002. Large numbers of additional U.S. and coalition SOF personnel reportedly were inserted starting a day or two prior to the onset of overt hostilities. Among other things, U.S. and coalition SOF units reportedly seized airfields and oil facilities, engaged Iraqi forces in various parts of the country, designated Iraqi targets for air attack, conducted psychological warfare operations, rescued a U.S. soldier who had been captured by Iraqi forces, and searched for Iraqi leaders. They reportedly worked with Kurdish forces and regular U.S. Army units in northern Iraq, and with regular U.S. Army units in the assault on Baghdad.

[102]See, for example, Cuningham, Henry. Special Forces Soldiers Prove They're Special. *Fayetteville (NC) Observer*, May 24, 2003; Muradian, Vago. Allied Special Forces Took Western Iraq. *DefenseNews*, May 19, 2003: 1; Robinson, Linda. The Men In The Shadows. *U.S. News & World Report*, May 19, 2003; Jehl, Douglas. In Iraq's Remote Corners, A Few Americans Seemed '10 Feet Tall.' *New York Times*, April 18, 2003; Thomas, Evan, and Martha Brant. The Secret War. *Newsweek*, April 21, 2003; Robinson, Linda. The Silent Warriors. *U.S. News & World Report*, April 14, 2003; Dine, Philip. Covert Ops. *St. Louis Post-Dispatch*, April 13, 2003: B1; Landay, Jonathan S. Stealthy Spotters Call In The Air Strikes. *Philadelphia Inquirer*, April 9, 2003; Scarborough, Rowan. Special Ops Steal Show As Successes Mount In Iraq. *Washington Times*, April 7, 2003; Kelly, Jack. Covert Troops Fight Shadow War Off-Camera. *USA Today*, April 7, 2003: 2; Dao, James. Swift Commando Run In The Night. *New York Times*, April 7, 2003; Shanker, Thom, and Eric Schmitt. Covert Units Conduct An Invisible Campaign. *New York Times*, April 6, 2003; Dao, James. Hoping To Confuse Iraqis, American Commandos Prepare To Enter Baghdad. *New York Times*, April 4, 2003; Graham, Bradley. U.S. Gains Ground In West Of Iraq. *Washington Post*, March 28, 2003: 25; Bender, Bryan. 10,000 Special Forces Are Waging Unseen War. *Boston Globe*, March 27, 2003: 28; Capaccio, Tony. U.S., Coalition Commandos Have Wider Role In Conflict. *Bloomberg.com*, March 26, 2003.

operations forces.[103] Advocates of such increases argue that they are not only justified by operational experience in Afghanistan and Iraq, but necessary if U.S. SOF forces are not to be stretched too thin in carrying out their recently expanded responsibilities for conducting key parts of the U.S. military's global war on terrorism.

Some observers, however, caution that the elite nature of special operations forces could make it difficult to rapidly expand the size of U.S. special operations forces without eroding their very high selection and training standards. Another potential concern is that enthusiasm for special operations forces could lead to under-investment in regular U.S. forces or support for using SOF units to carry out military operations for which they might not be well suited.

## Reserve Forces[104]

**Post-9/11 Reserve Activations.** From September 11, 2001, through April 25, 2003, the United States has involuntarily activated more than 286,000 reservists for federal service to support the ongoing global war on terrorism and more recently the Iraq war. In addition, at least 47,500 more reservists have been activated in other statuses – for example, to serve as members of the National Guard under state control, or as volunteers for active duty. Some reservists who were called up after September 11, 2001 were released from active duty and returned to civilian life prior to the start of the Iraq war. At the time of the Iraq war, roughly 220,000 reservists were on active duty.[105]

The callup of reservists since September 11, 2001 represents the second-largest reserve callup since the end of World War II in 1945. Only the Korean War mobilization of 858,000 reservists in 1950-1953 was larger.[106]

The post-9/11 reserve mobilization appears to have experienced many fewer administrative and bureaucratic problems than the somewhat smaller 1990-1991 callup for the 1991 Persian Gulf war, which involved a total of about 265,000 total reservists. Lessons learned from the 1990-1991 callup, as well from smaller activations in the 1990s for contingencies in places such as Bosnia, Haiti, and Kosovo, are likely responsible for these improvements.

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[103]See, for example, Sherman, Jason, Frank Tiboni, and Gail Kaufman. Rising Profile Profits U.S. Special Forces. *DefenseNews*, April 21, 2003: 30; Roosevelt, Ann. Special Operations Command Seeks Additional Funds. *Defense Week*, April 78, 2003: 1.

[104]This section prepared by (name redacted) , Specialist in National Defense, and (name re dacted), Analyst in National Defense.

[105]DoD states that on March 26, 2003 – 6 days after the start of the Iraq war – a total of 216,811 Reserve and National Guard personnel, including both units and individual augmentees, were on active duty. By April 16, 2003, toward the end of major combat operations in the Iraq war, the total number had grown to 223,203 personnel.

[106]The U.S. population at the time of the Korean War, moreover, was only about half as large as it is today, making the impact of the Korean War mobilization on the general population that much greater.

**Potential Program Implications.** Although the post-9/11 reserve mobilization has experienced fewer problems than previous callups, it has also highlighted, and possibly even exacerbated, two issues regarding reserve force structure and accessibility which began to emerge during the 1990-1991 callup. One of these issues concerns the Army National Guard's combat divisions and separate brigades; the other concerns reserve recruiting and retention in an era of repeated callups.

***National Guard Combat Divisions And Separate Brigades.*** The Army National Guard has 8 combat divisions and 15 "enhanced" separate brigades.[107] No Guard divisions have been called to active duty for an actual or potential foreign conflict since the 1961 Berlin Crisis, and none of the separate brigades has been called up for such purposes since the Vietnam War in 1968.

Three Army Guard combat maneuver brigades were mobilized for the 1991 Persian Gulf war. All three were "roundout" units designated to bring parent active Army divisions to full strength upon mobilization. These three brigades, however, were not activated until several months after the crisis began with Iraq's invasion of Kuwait in August 1990. The two brigades whose parent divisions fought in the war did not deploy with those divisions; none of the three brigades left the United States; and the only one to be "validated" as combat-ready was so judged on the date the war officially ended. The brigades' experience in the conflict generated much controversy about the viability of the "roundout" concept and the active Army's relationship with the National Guard, in particular engendering great bitterness in official relations between the Guard and the Army's senior uniformed leadership.[108]

None of the Guard divisions and brigades have been activated to serve as whole divisions and brigades since September 11, 2001. A substantial number of the combat battalions that make up these divisions and brigades, however, have been activated since that date, mostly to provide physical security for military installations (including Air Force bases) in the United States. (A few of the battalions have been deployed to provide rear-area security in Kuwait and Iraq.)

Given the number of active-duty Army units committed to Iraq and other locations at the time of the Iraq war, some observers suggested that some Guard divisions and brigades should be activated to reconstitute a strategic reserve against possible threats elsewhere, such as the Korean Peninsula. There is no indication, however, that DoD has contemplated taking such an action. DoD and the administration have argued that more forces have not been needed. Other observers

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[107] An Army division normally includes 3 brigades. Most of the Army's brigades belong to divisions, but some brigades are separate units that exist independent of the Army's divisions. The term "enhanced" denotes brigades that would be "organized and resourced so that they can be mobilized, trained, and deployed more quickly to the fast-evolving regional conflicts that we expect in the future." U.S. Department of Defense. *Report on the Bottom-Up Review* [of U.S. defense policy and programs]. Washington, 1993. (Les Aspin, Secretary of Defense, October 1993) p. 94.

[108] See CRS Report 91-763 F, *The Army's Roundout Concept After the Persian Gulf War*, by (name redacted). Washington, 1991. (October 22, 1991)

argue Guard divisions and brigades have not been called up because the senior uniformed leadership of the Army is anti-National Guard and Secretary of Defense Rumsfeld is anti-Army in general.

The history of the Army Guard's combat divisions and separate brigades since 1990 raises the following potential questions for Congress: If these divisions and brigades are not to be activated under circumstances short of a total national mobilization – which has not happened since World War II, 60 years ago – of what use are they in the foreseeable future? If some of the subordinate battalions of the divisions and brigades *are* considered useful during less extensive mobilizations, as their recent activations indicate, then should some or all of the smaller component units of the divisions and brigades be maintained while the expensive and officer-heavy brigade and division headquarters are eliminated? There appears to be a persistent assumption by senior active Army general officers that Guard combat brigades and divisions cannot be made combat ready without lengthy post-mobilization training. Is this belief supported by solely realistic analysis and judgment, or is it influenced by organizational and contractual relationships and loyalties?[109]

***Recruiting and Retention In Era of Repeated Callups.*** The role of the reserve components has undergone a dramatic shift since the Cold War effectively ended with the fall of the Berlin Wall in 1989. During the Cold War, the reserve components were primarily a force of last resort and were activated fairly infrequently – about once every 10 years – in response to a major war or crisis. In the post-Cold War era, however, they have been activated much more frequently. Since 1990, there have been 6 involuntary activations of reservists, several of which are ongoing today.[110] For most of these activations, affected reservists have been required to serve about 6 to 9 months before being released back to their civilian

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[109]Studies done in the mid-1990s by the Institute for Defense Analyses suggest that National Guard "heavy" – i.e., armored or mechanized infantry – brigades, with properly structured pre- and post-mobilization training, can be ready to deploy overseas into combat within 60 days after being called up, and that "light" brigades – i.e., light infantry or airborne brigades – can be ready in several weeks less. Other studies by the Rand Corporation, however, assert that such brigades might take between 96 and 154 days to be trained after activation. The reasons behind this radical difference in the two organizations' estimated readiness times remain unclear. See CRS Report 97-719 F, *The Army Reserve Components: Strength and Force Structure Issues*, by (name redacted). Washington, 1997. (Updated July 15, 1997) Passim, but especially p. 9-10.

[110]Some of these activations have been directly related to war or armed conflict. Examples include the 1990-1991 callup for the 1991 Persian Gulf war; the mostly low-intensity U.S. confrontation with Iraq of 1991-2003, which required a reserve callup starting in 1998 to support both a rapid U.S. deployment of ground troops to Kuwait and the maintenance of the U.S.-coalition "no-fly zones" over northern and southern Iraq; the global war on terrorism, which began after September 11, 2001; and the Iraq war. Other activations have been in support of missions that were primarily peacekeeping and nation-building, such as the intervention in Haiti (1994-1996) and the ongoing Bosnian peacekeeping mission (1995-present). The ongoing Kosovo mission (1999-present) has been a combination of armed conflict and peacekeeping.

lives. Many reserves mobilized after September 11, 2001, however, have been required to serve on active duty for a year, and some may have to serve for two years.

Callups can pose significant challenges for reservists. Some reservists suffer mobilization-related financial hardships due to income loss, increased expenses, or erosion of their professional practices. Others experience family problems due to the strain of separation from family members. In light of these hardships, there has been significant concern since at least 1990 that more-frequent and more-lengthy reserve callups would lead to recruiting and retention problems for the reserve components. The size and duration of the post-9/11 mobilization has increased those concerns.

To date, the data indicate that reserve recruiting and retention have not suffered due to increased use of the reserve components. Reserve recruiting in FY 2002 was very robust, with every reserve component exceeding its recruiting goals, sometimes by substantial margins. Several scholarly studies have looked at the link between the mobilization for the 1991 Persian Gulf war and reserve retention.[111] These studies found that the mobilization had no significant impact on reserve retention rates. This is consistent with studies of active-component personnel, which indicate that, provided they are well managed and not excessive, deployments do not have a negative impact on retention – and can even enhance retention by providing participants with a sense of accomplishment.[112]

Some of these active-component studies, however, also indicate that beyond a certain threshold level, deployments can have a negative effect on retention. In light of this finding, there might be reason to believe that repeated or prolonged mobilization of reservists might have an adverse affect on reserve retention, and possibly reserve recruiting as well. Some observers are concerned that, although reserve recruiting and retention has held up in recent years, the post-9/11 mobilization of reservists might begin have a negative impact on recruiting and retention, especially if it continues for an extended period of time. If the current reserve mobilization does at some point begin to erode reserve recruiting and retention, Congress may examine options for redressing the situation. Potential questions for Congress under such circumstances could include the following: Should reserve pay and benefits be increased to maintain the attractiveness of reserve service? Should active duty and reserve force structure be modified to reduce active component reliance on the reserves? Could some of the missions currently requiring reserve component support be scaled back?

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[111]Kirby, Sheila Nataraj, David W. Grissmer, Stephanie Williamson, and Scott Naftel. *Costs and Benefits of Reserve Participation: New Evidence from the 1992 Reserve Components Survey*, RAND Corporation, 1997; and Kirby, Sheila Nataraj, and Scott Naftel. *The Effect of Mobilization on Retention of Enlisted Reservists After Operation Desert Shield/Storm*, RAND Corporation, 1998.

[112]See for example Hosek, James, and Mark Totten. *Does Perstempo Hurt Reenlistment? The Effect of Long or Hostile Perstempo on Reenlistment*, RAND Corporation, 1998; Sticha, Paul, Paul Hogan and Maris Diane. *Personnel Tempo: Definition, Measurement, and Effects on Retention, Readiness and Quality of Life*, Army Research Institute, 1999; Francis, Peter. *OPTEMPO and Readiness*, Center for Naval Analysis, 1999; and Fricker, Ronald D. Jr. *The Effects of Perstempo on Officer Retention in the U.S. Military*, RAND Corporation, 2002.

## Network-Centric Warfare[113]

**A Key Element of Defense Transformation.** The Iraq war focused attention on the U.S. military's increasing ability to gather, share, and analyze information, and make rapid decisions based on it. Improvements in these areas were also demonstrated in the war in Afghanistan. These improvements reflect an initial implementation of the concept of network-centric warfare (NCW), also known as network-centric operations (NCO). NCW, which is a key element of U.S. plans for defense transformation, refers to using networking technology – computers, data links, and networking software – to link U.S. military personnel, ground vehicles, aircraft, and ships into a series of highly integrated local- and wide-area networks capable of sharing critical tactical information on a rapid and continuous basis.

Implementing NCW is expected to significantly improve the capability of U.S. military forces by giving them vastly improved battlespace awareness (i.e., real-time knowledge of the location and identify of friendly and enemy forces), an ability to more quickly pass information about enemy targets from surveillance systems to forces with the right weapons for attacking them (i.e., shortening the "sensor-to-shooter" cycle), an ability to quickly make and execute decisions on the battlefield, and an ability to use widely distributed forces to mass fires on enemy targets. NCW is also expected to improve pre-conflict planning, including intelligence preparation of the battlefield. Under NCW, the network elements can become as important to combat capabilities, if not more important, than the platforms (e.g., tanks, aircraft, and ships) that they link. Some observers suggest that under NCW, the network itself becomes a weapon.[114]

**C4ISR Programs for NCW.** The concept of network-centric warfare emerged in the late 1990s, and U.S. military forces are now in the early stages of developing and acquiring systems for forming various local- and wide-area networks. Numerous C4ISR[115] programs are considered important to achieving NCW.[116]

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[113]This section prepared by (name redacted) and Ronald O'Rourke, Specialists in National Defense.

[114]With the advent of network-centric warfare, the traditional (i.e., non-networked) approach to war – in which individual military platforms operate to a large degree in isolation from one another – is now referred to as platform-centric warfare. In platform-centric operations, a force's total capability frequently is the simple sum, more or less, of the individual capability of each unit in the force. In network-centric warfare, in contrast, a force's total capability can be something much greater – perhaps many times greater – than this simple sum.

[115]C4ISR stands for command and control, communications, computers, intelligence, surveillance and reconnaissance.

[116]Examples of DoD-wide programs for achieving NCW include the Affordable Moving Surface Target Engagement (AMSTE), Adaptive Joint C4ISR Node (AJCN), and the Transformational Communications System (TCS). Examples of Army programs for achieving NCW include the Force XXI Battle Command, Brigade and Below (FBCB2) system – a digital command and control system for forces in the field; the Tactical Airspace Integration System (TAIS) – an air traffic control system; the Army Airborne Command and

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**NCW in the Iraq War.** Many observers believe the effectiveness of U.S. forces in the Iraq war was likely due in significant part to the early stages of NCW that were implemented in time for the war. A principal case in point concerns U.S. air operations, which featured rapid transmission of information from sensors to shooters, particularly for attacking time-sensitive targets. NCW might have figured even more strongly in the Iraq war had the Army's 4th Infantry Division – the division with the highest degree of NCW implementation – played a more significant role in the war.[117]

**Potential Program Implications.** The success of U.S. forces in the Iraq war may serve to reinforce interest in implementing NCW more fully throughout the services. This is potentially significant, because investing in NCW might result in reduced investments in traditional military platforms: C4ISR programs for achieving NCW require funding that might otherwise go to traditional military platforms, and the improved force effectiveness generated by NCW may permit military tasks in the future to be performed by U.S. military forces consisting of fewer numbers of platforms. Should C4ISR programs for NCW be accelerated or expanded? If so, which other DoD programs should be reduced to serve as the "bill payers?"

Advocates of NCW could argue that DoD plans and budgets should be adjusted to place greater emphasis on C4ISR programs and less emphasis on procurement of traditional combat platforms, because funding invested in C4ISR programs will result in a greater increase in overall combat capability, dollar per dollar, than funding invested in traditional military platforms. Supporters of investing in combat platforms, while acknowledging the importance of NCW and C4ISR programs, could argue that creating a network requires platforms just as much as it requires systems to link them, that today's platforms are aging and growing increasingly expensive to operate, and that next-generation platforms will be designed to take better advantage

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Control System (A2C2S) – an airborne command post; the Army Battle Command System (ABCS) – an overarching command-and-control architecture for Army forces; and the Objective Force Battle Command System – a planned successor to the ABCS. Examples of Air Force programs for achieving NCE include the Smart Tanker program, the CAOC-X (Combined Air Operations Center); and the Advanced Tactical Targeting Technology (AT3), a joint USAF/DARPA program. Examples of Navy efforts for achieving NCW include the Cooperative Engagement Capability (CEC), which provides an improved real-time air-defense picture for Navy ships and aircraft; the Naval Fires Network (NFN), a system for coordinating information on enemy targets; the IT-21 (Information Technology for the 21st Century) program for establishing an intranet for transmitting tactical and administrative data within and between Navy ships; and the ForceNet concept – the Navy's overall approach for knitting togther various networks into a grand naval NCW architecture. (For more on Navy NCW programs, see CRS Report 20557, *Navy Network-Centric Warfare Programs: Key Programs and Issues for Congress*, by Ronald O'Rourke. Washington, 2003. [Updated periodically] 6 p.) Taken together, all these examples constitute only a short, illustrative list of NCW-related C4ISR programs.

[117]The 4th Infantry Division was originally scheduled to attack northern Iraq from Turkey but was redeployed to Kuwait following Turkey's decision not to grant base-access rights. Elements of the division did not enter the war until the final days of the conflict.

of networking technology than today's platforms, ensuring that U.S. forces gain maximum benefit from the implementation of NCW.

A key current constraint on achieving NCW concerns communications bandwidth capacity (i.e., simultaneous data transmission capacity), especially for non-line-of-sight systems. Networking systems require large amounts of bandwidth, and U.S. operations during the Iraq war placed strains on current bandwidth capacity.[118] Although steps can be taken to reduce the amount of bandwidth required by individual C4ISR systems, wider implementation of NCW will likely require DoD to substantially increase bandwidth capacity. One DoD effort to improve bandwidth capacity involves investing in satellites that transmit data using lasers rather than radio waves.

Another NCW issue concerns the potential vulnerability of NCW-related C4ISR systems to potential enemy cyberwarfare attacks. As implementation of NCW grows, the dependence of U.S. forces on NCW-related C4ISR systems could also grow. Observers concerned about this growing dependency could argue that although Iraq may not have been well prepared for conducting cyberwarfare attacks against U.S. C4ISR systems, other future potential adversaries might be. They could note that DoD computers are now being attacked on a regular and even daily basis by computer operators in foreign countries, in some cases in large-scale organized operations that suggest possible support by foreign governments. What steps is DoD taking to ensure that NCW-related C4ISR systems will remain secure against cyberwarfare attack? What is DoD's plan for ensuring the security of these systems while keeping them affordable and user-friendly?[119]

NCW also has potential implications for joint (i.e., integrated multi-service) operations and for combined operations in which U.S. military forces operate in conjunction with foreign military forces.[120]

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[118]Tuttle, Rich. C4ISR Speeded Combat in Iraq, Strained Bandwidth, Analysts Say. *Aerospace Daily*, April 30, 2003; U.S. Department of Defense. *U.S. Air Force Aim Points*, 24 April 2003. SAF/PAX (Strategic Communication); Keeter, Hunter. Cebrowski: Iraq Shows Network Centric Warfare Implementation. *Defense Daily*, April 23, 2003; Jehl, Douglas. Digital Links are Giving Old Weapons New Power. *New York Times*, April 7, 2003.

[119]For more on this issue, see CRS Report RL31787, *Information Warfare and Cyberwar: Capabilities and Related Policy Issues*, by (name redacted). Washington, 2003. (March 14, 2003) 15 p.

[120]DoD-wide C4ISR systems can contribute to joint operations, as can service-specific C4ISR systems, if designed to common DoD-wide standards. Service-specific programs, however, could make the services less joint if designed to mutually incompatible standards. (See, for example, Baumgardner, Neil. Myriad of Communications Equipment Problematic For Marine Forces in OIF. *Defense Daily*, June 2, 2003; Burger, Kim. US Marines Voice Concern Over Network Limitations. *Jane's Defence Weekly*, March 26, 2003.) Similarly, if allied or friendly countries invest in C4ISR systems compatible with those being acquired by U.S. forces, it could permit U.S. forces to operate more effectively in conjunction with foreign military forces than was previously possible. Conversely, if those countries do not invest in advanced C4ISR systems, or acquire systems that are not compatible with U.S.

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## Urban Combat[121]

**A Pre-War Concern.** In the early days of the Iraq war, many observers expressed concerns about the likelihood that U.S. and British forces would participate in urban combat operations. Such operations, they feared, could lead to significant U.S. and civilian casualties and significant damage to civilian Iraqi infrastructure. These concerns were based in part on urban combat operations in previous wars, which have often resulted in high casualty rates for invading forces, large numbers of civilian deaths, and massive damage to buildings and supporting infrastructure. Observers expressed particular concerns about the likelihood of urban combat operations in Baghdad, given the large size of the city and its importance to the Iraqi regime.[122] Iraqi officials before and during the Iraq war stated that enemy forces would be killed in large numbers in urban fighting, and that the invasion effort as a whole would be defeated in the streets of Iraq's cities.[123]

**Urban Combat in the Iraq War.** As expected, fighting in urban areas proved necessary in the Iraq war. Fighting in and around Iraqi towns and cities appears to have accounted for a sizeable share of U.S. and British combat casualties. U.S. and British forces were drawn into more extensive urban fighting in southern Iraqi cities than they had planned, but U.S. forces were able to take control of Baghdad much more rapidly, and with fewer U.S. and civilian casualties, than many observers had anticipated. Bold advances into central Baghdad by columns of U.S. Army armored forces – a tactical innovation that was created on the spot by U.S. unit commanders – proved instrumental in accelerating the collapse of organized Iraqi resistance in the city. U.S. aircraft armed with precision-guided munitions proved useful in providing an urban version of close-air support for U.S. and British ground

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systems, it could make combined operations more difficult for the United States to undertake. Foreign forces operating outside the U.S. network might need to be sidelined or given low-level tasks to ensure that those forces do not interfere with networked U.S. operations.

[121]This section prepared by Ronald O'Rourke, Specialist in National Defense.

[122]See, for example, Richburg, Keith B. Standoff At Basra Hints At Tough Time In Baghdad. *Washington Post*, March 30, 2003: 22; Rotella, Sebastian. Quick Knockout Or Street Fight? *Los Angeles Times*, March 28, 2003: 1; Jenkins, Simon. Baghdad Will Be Near Impossible To Conquer. *London Times*, March 28, 2003; Dine, Philip. The Battle. *St. Louis Post-Dispatch*, March 27, 2003; Wood, David. Saddam's 'Quagmire' May Be In Baghdad. *Newhouse.com*, March 26, 2003; Grier, Peter, and Faye Bowers. Next, The Battle For Baghdad. *Christian Science Monitor*, March 26, 2003; Galloway, Joseph L. Speed Essential To Avoid City War. *Philadelphia Inquirer*, March 26, 2003; U.S. Troops Facing Combat In Narrow Baghdad Streets. *Washington Times*, March 26, 2003 (Associated Press wire story); Richter, Paul. Risky Fight For Baghdad Nears. *Los Angeles Times*, March 24, 2003: 1; Davis, Mark. Advancing Troops Face Urban Warfare. *Atlanta Journal-Constitution*, March 24, 2003; Little, Robert. In Baghdad, A Deadly Risk Of Urban War. *Baltimore Sun*, March 24, 2003; Hedges, Stephen J., and Douglas Holt. War's Real Test Awaits In Baghdad. *Chicago Trubune*, March 23, 2003;

[123]See, for example, Burns, John F. As Allies Race North, Iraq Warns Of A Fierce Fight. *New York Times*, March 24, 2003.

forces, and unmanned air vehicles proved valuable in providing persistent overhead surveillance of urban areas for locating and tracking the movements of Iraqi forces.[124]

**Potential Program Implications.** The Iraq war may serve to highlight the importance of training and equipping U.S. forces for urban combat operations. Programs closely associated with preparing for urban combat operations include the following:

- training facilities, including mock-ups of urban areas and "laser-tag" weapon simulators, for conducting realistic training in urban combat tactics;
- UAVs and unmanned ground vehicles (UGVs) equipped with cameras, signals-intelligence-gathering equipment, other sensors, and weapons, for finding, tracking, and killing enemy forces hiding around corners and inside buildings;
- the Land Warrior program for developing an improved ensemble – a combination of protective clothing, weapons, and equipment for situational awareness – for individual soldiers;
- the Objective Individual Combat Weapon – a next-generation rifle scheduled to enter service in FY2009 that is to be capable of shooting at non-line-of-sight targets (i.e., at targets around a corner);
- small explosive charges designed for breaking through building walls, so that U.S. forces can enter and pass through buildings without using doorways that may be heavily defended or booby-trapped;
- a secure, intrasquad radio, which the Army is now developing;
- night-vision devices for operating at night (particularly when electrical power has been knocked out) or in darkened interiors of buildings;
- acoustic or other sensors for quickly determining the origin of enemy sniper fire;
- small, air-delivered, precision-guided weapons, such as the 250-pound Small Diameter Bomb now in development, that can be used to destroy enemy weapons or targeted buildings while avoiding damage to neighboring structures; and
- non-lethal weapons, also called less-than-lethal weapons, for reducing civilian casualties when attempting to counter enemy fighters interspersed among civilians.

Realistic training in urban combat tactics can prove highly useful in reducing, perhaps significantly, casualty rates for U.S. forces involved in urban operations. Some observers believe that current U.S. urban training facilities need to be larger, more realistic, and better instrumented to support joint (i.e., multi-service) training operations.

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[124]For early examples of articles reviewing U.S. and British urban combat operations in the Iraq war, see Gordon, Michael R. Five Ways To Take A City. *New York Times on the Web*, April 8, 2003; Scarborough, Rowan. Mogadishu Lessons Help Foil Saddam's Strategy. *Washington Times*, April 8, 2003: 1; Loeb, Vernon, and Thomas E. Ricks. Military Defends Risks Of Aggressive Tactics. *Washington Post*, April 9, 2003; Lowe, Christian. Air Power Increasingly Useful In Urban Fights. *Marine Corps Times*, April 21, 2003: 15; Branigin, William. 3 Key Battles Turned Tide Of Invasion. *Washington Post*, April 20, 2003: 20.

Among UAVs, smaller and miniature UAVs, including UAVs capable of perching on urban structures, may prove particularly valuable in urban settings. Among UGVs, larger models include the Marine Corp's Gladiator, which was sent to the Iraqi theater. Smaller models include the Army's MATILDA, which was also sent to the Iraqi theater, and the Marine Corps' Dragon Runner, which is now in development.

As mentioned in the section on the size and composition of the Army, supporters of heavily armored vehicles like the M1 tank and the M2 Bradley fighting vehicle could argue that the Iraq war demonstrated the value of such vehicles in urban combat situations, confounding the pre-war expectations of some observers. The M1 and M2, they can note, were largely invulnerable to the weapons Iraqi fighters used to attack them, and in drawing fire from these weapons in urban fights proved highly valuable in uncovering the location of hidden Iraqi fighters, who could then be killed. Without the M1 and M2, supporters could argue, the Army would not have been well equipped to carry out the bold advances into central Baghdad that played a critical role in rapidly collapsing organized Iraqi resistance in the city while incurring few U.S. and civilian casualties. More lightly armored vehicles like the planned Stryker wheeled combat vehicle, they could argue, would have been vulnerable to some of the weapons that Iraqi forces used ineffectively against the Army's M1 and M2 armored vehicles.

As also mentioned in the section on the size and composition of the Army, however, other observers could argue that the effectiveness of the M1 tank in combat operations in Baghdad resulted in part from Baghdad's broad avenues and sizeable public plazas and other open areas, which gave the M1s room to maneuver and long lines of sight. Future urban combat situations, they could argue, may take place in cities and towns with narrower roads and shorter lines of sight, which could make M1s less effective and potentially more vulnerable to enemy attack. They could also argue that in the days following the end of major fighting in the war, Stryker vehicles would have been useful in Iraqi cities for helping to reestablish civil order.

## Ballistic Missile Defense[125]

**Ballistic Missile Defense In The 1991 Persian Gulf War.** Missile-defense operations were a prominent component of the 1991 Persian Gulf war, during which Iraq fired a total of about 80 Scud ballistic missiles against targets in Saudi Arabia, other Persian Gulf countries, and Israel. U.S. and coalition forces in the 1991 war attempted to shoot down the Scuds with the Patriot PAC-2 missile system, an air-defense system originally designed for shooting down aircraft and then modified for shooting down short-range ballistic missiles as well. The Patriot system was initially credited with a high rate of effectiveness in shooting down Iraqi Scuds. Later analysis, however, showed that the system's effectiveness against Scuds was lower, with some analysts suggesting it was close to zero. Debate about the success rate of the Patriot system in the 1991 Persian Gulf war contributed to the general

[125]This section prepared by (name redacted), Specialist in National Defense.

debate about the technological feasibility and potential operational effectiveness of missile-defense systems.[126]

**PAC-2 and PAC-3 Patriot Missiles.** In the years since the 1991 Persian Gulf war, DoD has spent about $3 billion dollars improving the Patriot system's ability to track and intercept ballistic missiles. For the recent Iraq war, the United States deployed improved versions of the Patriot PAC-2 and the newer PAC-3. The PAC-3 is designed to fly higher and farther than the PAC-2. In contrast to the PAC-2, which attempts to destroy its target with an explosive charge, the PAC-3 attempts to destroy its target by colliding with it. The latter approach, called hit-to-kill, has been the primary U.S. technological approach to missile defense since 1984 and is now being used for almost all other U.S. missile-defense systems now in development.

**Ballistic Missile Defense in the Iraq War.** The Patriot system is currently the only operational U.S. missile defense system, and the recent Iraq war represented the first opportunity for using the PAC-3 version in combat. The success rate of the Patriot, and particularly the PAC-3 version, in the Iraq war was thus a matter of particular interest to those following missile defense programs.

DoD states that a total of 9 Iraqi ballistic missiles were targeted by the Patriot system. Another 6 missiles launched by Iraq were not targeted because they were projected to land in places where they would cause no harm.[127] The ballistic missiles that Iraq fired were not Scuds but rather shorter-ranged and slower-flying missiles such as Al Samoud-2s and Ababil-100s. It is not yet clear whether the lack of Scud attacks in the Iraq war was due to successful U.S. operations to suppress such attacks before they could occur, a decision by Iraq to withhold its purported Scuds for future use, or because Iraq at the time of the war did not have any operational Scuds.

DoD says the Patriot system successfully intercepted all 9 of the ballistic missiles that it targeted. Seven of the intercepts, DoD says, were made by PAC-2 missiles, while the remaining 2 intercepts were made by PAC-3 missiles. Most of the Patriots fired were PAC-2s; 4 of them were PAC-3s. (The standard firing doctrine is to fire two Patriots at each ballistic missile.) The one Iraqi missile that reportedly may have eluded the Patriot system's radar was a low-flying Iraqi cruise missile fired from Iraq's Faw Peninsula that hit the seawall at Kuwait City. The Patriot system was also involved in 3 friendly-fire incidents which resulted in the loss of 1 U.S. and 1 British aircraft (see discussion below on friendly fire).[128]

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[126]For more on the debate on missile defense programs, see CRS Report RL31111, *Missile Defense: The Current Debate*, Coordinated by (name redacted) and (name redacted). Washington, 2003. (Updated periodically) 56 p.

[127]DoD says 2 of them landed in the water, 3 landed in the empty desert, and 1 exploded shortly after launch. None of them, DoD says, caused any damage or loss of life. Donnelly, John M. New Patriot's Record: Success, But Only Two Attempts. *Defense Week*, April 21, 2003: 1.

[128]For articles discussing missile-defense operations in the Iraq war, see Graham, Bradley. Radar Probed In Patriot Incidents. *Washington Post*, May 8, 2003: 21; Grossman, Elaine

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**Potential Program Implications.** Advocates for and against missile defense are likely to find something from the performance of missile defense systems in the Iraq war that supports their perspective. Because of this and the still-ongoing controversy over Patriot performance in Operation Desert Storm in 1991, debate over the viability of hit-to-kill technology for missile defense today is likely to continue.

Supporters of the Patriot system and missile defense programs in general could argue that the Iraq war underscored the need for missile defense systems and demonstrated the effectiveness of the Patriot system for defending against short-range ballistic missiles. They could argue that the successful use of the PAC-3 missile in the Iraq war demonstrated that hit-to-kill technology works and is the preferred means of seeking to destroy attacking ballistic missiles. They could also argue that U.S. military operations in Western Iraq suggest that operations intended to prevent the launch of enemy ballistic missiles may contribute to an overall missile-defense effort.

Skeptics concerning missile defense programs could argue that the Iraq war involved too small a number of missile engagements to support firm conclusions, particularly about the effectiveness of the PAC-3 version and its hit-to-kill technology. They could argue that the Iraq war did not validate the effectiveness of the PAC-3 version against the Scud missile – one of the most likely systems it is designed to counter, but one that it has never been used against in either combat operations or peacetime tests. They could also argue that the successful use of PAC-3s does not necessarily validate the soundness of the hit-to-kill approach for other missile-defense systems that are being developed to shoot down intercontinental-range ballistic missiles in mid-flight, because such intercepts would take place in a different physical environment (i.e., outside the atmosphere) and at much higher intercept velocities. They could also argue that the failure of the Patriot to stop the cruise missile that hit the seawall at Kuwait City raises questions about the effectiveness of the system against low-flying cruise missiles.

Although not confirmed, the 3 friendly-fire incidents involving the Patriot system may be due primarily to operational procedures and issues associated with the complexity of the modern electromagnetic battlefield. If so, these incidents might not have implications for missile defense *per se*, but rather for modern complex weapon systems of all kinds.

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[128](...continued)
M. Most Intercepts Of Iraqi Rockets Were By Older Patriot Missiles. *Inside the Pentagon*, April 24, 2003: 7; Donnelly, John M. New Patriot's Record: Success, But Only Two Attempts. *Defense Week*, April 21, 2003: 1; Gildea, Kerry. Patriot Validating Missile Defense Concepts, DoD Officials Say. *Defense Daily*, April 10, 2003; Model Of U.S. Missile Defense Now Guarding Kuwait, Kadish Says. *Bloomberg.com*, April 9, 2003; Hsu, Emily. Kadish: Most Iraqi Missile Intercepts Achieved By Enhanced PAC-2 Missiles. *InsideDefense.com*, April 9, 2003.

## Friendly Fire[129]

**Modern Warfare and Friendly Fire.** The accidental killing or wounding of friendly forces in combat – called friendly fire or fratricide – is a tragic yet not uncommon aspect of warfare. Friendly fire incidents have been recorded throughout history.[130] Observers argue over whether modern warfare raises or lowers the risk of fratricide. On the one hand, modern weapons are very lethal, and frequently delivered over great distances. Modern combat also emphasizes conducting non-linear operations and missions behind enemy lines while simultaneously conducting strikes deep inside enemy territory. This can increase the risk of fratricide because the complex battlefield no longer is made up of clearly drawn battle lines composed of fronts and flanks and rear echelons. On the other hand, today's military has far better communication, navigation, targeting, and identification systems, which should reduce the mis-communications that often lead to friendly fire incidents. In addition, widespread use of self-protection equipment, such as new types of body armor, greatly reduces casualties, as do modern medical and evacuation capabilities.

**A Concern From the 1991 Persian Gulf War.** Casualties due to friendly fire emerged as a significant topic of discussion following the 1991 Persian Gulf war, in which about 23% of U.S. combat deaths (35 of 148) were attributed to friendly fire. Combat losses due to friendly fire can be particularly difficult to accept, especially for the families of those killed, and the percentage of combat deaths in the 1991 Persian Gulf war attributed to friendly fire was much higher than many people had anticipated. As a result of the experience with friendly-fire incidents in the 1991 Persian Gulf war, minimizing casualties due to friendly fire was elevated as an issue, and remained a topic of some concern going into the Iraq war.

**Friendly Fire Casualties in the Iraq War.** Although DoD has not officially announced the number of friendly fire casualties in the Iraq war, one press account shows that out of 151 total U.S. combat deaths, at least 15 coalition deaths were due to fratricide – a rate of about 10%. The article stated that an additional 10 incidents with 20 deaths were still under investigation, so this rate could rise over the next few months.[131] Fratricide incidents in the Iraq war suggest that modern warfare remains susceptible to equipment malfunctions and human error, and may focus attention on how much military capabilities for mitigating fratricide have improved since the 1991 Persian Gulf war.

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[129]This section prepared by (name redacted), Specialist in National Defense.

[130]One of the most famous friendly fire incidents occurred in the U.S. Civil War, when Confederate General Stonewall Jackson was shot by his own troops when returning to camp from a nighttime mission.

[131]Pae, Peter. 'Friendly Fire' Still A Problem. *Los Angeles Times*, May 16, 2003: 1. Another press account, citing the Center for Army Lessons Learned, cited a total of 35 U.S. and coalition deaths by friendly fire, including 18 Kurdish troops killed by an Air Force F-15E aircraft, 2 British airmen killed when their Tornado fighter was shot down by a U.S. Patriot missile, 2 other British soldiers who were killed when one British Challenger tank fired on another, and one solider killed when an Air Force A-10 fired on a British Warrior armored fighting vehicle. (French, Matthew, with Dan Caterinicchia. Friendly Fire System Gets Good Grades. *Federal Computer Week*, June 2, 2003.)

Is a rate of friendly fire casualties in the Iraq war acceptable? Some argue that a certain level of fratricide is inevitable. Others argue that one friendly fire death is too many. One widely circulated rule of thumb is that fratricide typically accounts for 2% of an army's casualties. But many researchers dispute this conventional wisdom, saying that in the 20th Century, 10% to 30% of casualties have been caused by friendly fire. A 1993 study by the Office of Technology Assessment estimated that 15% to 20% of those killed or injured in World War II, the Korean War and Vietnam were due to friendly fire.[132]

**Types of Friendly Fire Incidents.** Friendly fire incidents are often categorized by the types of engagements involved: surface-to-air, air-to-air, air-to-surface, and surface-to-surface. No air-to-air friendly fire incidents were recorded in OIF and very few surface-to-surface incidents.[133] Fratricide did occur in the other engagement regimes, and examining these specific instances may help identify the issues for Congress to address.

**Surface-to-Air Incidents.** Surface-to-air incidents were among the most widely noted friendly fire incidents in the Iraq war. On March 23, 2003, a PAC-2 Patriot surface-to-air missile mistakenly shot down a British Tornado aircraft, killing its crew of two. Two days later, another fratricide incident appears to have been narrowly avoided when a U.S. Air Force F-16 fighter destroyed the radar of a Patriot battery after the Patriot system had misidentified the F-16 as a possible target. And on April 2, 3003, a PAC-3 Patriot missile shot down a U.S. Navy F/A-18C fighter, killing its pilot.[134]

As the causes of these cases are being investigated, some observers are asking why the Patriot system – which can defend against both faster-flying tactical ballistic missiles and slower-flying manned and unmanned aircraft – was engaging aircraft at all. They argue that the Tornado and F/A-18C shoot-downs could have been avoided

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[132]U.S. Congress. Office of Technology Assessment. *Who Goes There: Friend or Foe?* Washington, U.S. Govt. Print. Off., 1993. (OTA-ISC-537, June 1993) 84 p.

[133]At least one, and possibly two, Army M-1 tanks were destroyed by fire from Army M2 Bradley fighting vehicles. (Naylor, Sean D. Abrams Destroyed By Friendly, Not Iraqi, Fire. *Army Times*, June 9, 2003: 34.) Two British soldiers were killed when their Challenger II main battle tank was destroyed by another Challenger II during a fight with Iraqi forces in the battle for the southern Iraqi city of Basra. (Douglas Barrie. "Unfriendly Fire." *Aviation Week & Space Technology*. April 7, 2003.) Another article states: "According to Pentagon documents, there were at least three friendly fire fatalities between individuals." (Pae, Peter. 'Friendly Fire' Still A Problem. *Los Angeles Times*, May 16, 2003: 1.)

[134]For articles on friendly fire incidents involving the Patriot system, see Graham, Bradley. Radar Probed In Patriot Incidents. *Washington Post*, May 8, 2003: 21; Grossman, Elaine M. Patriot May Mistake Aircraft For Missile In Combat's Electronic Glut. *Inside the Pentagon*, April 24, 2003: 1; Piller, Charles. Vaunted Patriot Missile Has A 'Friendly Fire' Failing. *Los Angeles Times*, April 21, 2003: 1; Kerber, Ross. Ex-Official Says Defense Systems Flawed In Tests. *Boston Globe*, April 17, 2003: 25; Kerber, Ross. Friendly Fire Cases Draw New Scrutiny To System. *Boston Globe*, April 16, 2003: 24; Stone, Andrea. Patriot Missile: Friend Or Foe To Allied Troops? *USA Today*, April 15, 2003; Goodman, Glenn W. Jr. New Questions Surround Patriot Missile System. *DefenseNews*, April 7, 2003: 8.

by simply instructing the Patriot system to ignore slower-flying manned aircraft. Since 100% of the manned combat aircraft flying over Iraq and Kuwait during the war were U.S. or British, they argue, Patriot batteries and other air defense systems could safely have been instructed to focus solely on shooting down ballistic missiles.

Although Iraq's air force never got off the ground, Iraq did launch at least seven cruise missiles at military and civilian targets in Kuwait on March 20, March 28, and April 2, 2003.[135] Cruise missiles appear very much like manned aircraft to air defense systems because they fly at speeds and altitudes similar to manned aircraft. Did concerns for potential Iraqi cruise missile attacks deter U.S. and British air defense forces from instructing the Patriot system to ignore slower-flying aircraft? If so, does this incident suggest that additional funding should be devoted to improving the Patriot's ability to distinguish cruise missiles from aircraft?

One theory that has been advanced is that the presence on the battlefield of many Patriot systems close to one another and to other U.S. electromagnetic-emitting systems may have created a situation of electromagnetic interference that confused the Patriot system, preventing it from properly distinguishing aircraft from ballistic missiles. According to this theory, Patriot system operators in both the Tornado and F-18C/D incidents thought they were firing at enemy ballistic missiles rather than aircraft.[136] If electromagnetic interference was involved in one or more of the incidents, then reducing such interference may be elevated as a concern in designing U.S. weapon systems and developing procedures for using them.

The shot-down British Tornado reportedly failed to re-enter Kuwait from Iraq through one of the air corridors that had been cleared for allied warplanes.[137] If so, then pilot error could have contributed to this friendly fire incident. Human error in time of war is difficult to prevent entirely, but training and exercises can help reduce its frequency. Could this mistake have been avoided through better coalition training?

It was also reported that the Tornado's identification-friend-or-foe (IFF) beacon was unable to communicate with the U.S. air defense crew due to separate damage to the aircraft as it returned from its bombing mission.[138] IFF problems were also reportedly a contributing factor in the mistaken shoot-down of an Iranian airliner by a U.S. Navy cruiser in the Persian Gulf in July 1988. Do IFF technologies merit

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[135]Gormley, Dennis. North Korean Cruise Missile Tests – and Iraqi Cruise Missile Attacks – Raise Troubling Questions for Missile Defenses. *Research Story of the Week.* Monterey Institute of International Studies. Center for Nonproliferation Studies. [http://cns.miis.edu]

[136]Squeo, Anne Marie. Radiation May Impair Patriot Missile System. *Wall Street Journal*, May 23, 2003; Graham, Bradley. Radar Probed In Patriot Incidents. *Washington Post*, May 8, 2003: 21; Grossman, Elaine M. Patriot May Mistake Aircraft For Missile In Combat's Electronic Glut. *Inside the Pentagon*, April 24, 2003: 1.

[137]See, for example, Squeo, Anne Marie. Radiation May Impair Patriot Missile System. *Wall Street Journal*, May 23, 2003.

[138]Squeo, Anne Marie. Radiation May Impair Patriot Missile System. *Wall Street Journal*, May 23, 2003. See also Shanker, Thom. Risk of Being Killed By Own Side Increases. *New York Times*, April 8, 2003.

closer attention? Are IFF systems subject to too many technical glitches? Do they need to be made more user friendly?

In the F-16 incident, it was reported that the Patriot crew was taking cover from Iraqi artillery and had placed their system in automatic mode when their radar mistakenly identified the U.S. jet as a target.[139] What implications, if any, does this incident have for maintaining a "human-in-the loop" in the design and operation of sophisticated weapon systems? As military systems take increasing advantage of information technologies, there may be a temptation among weapon designers and operators to increase the level of a weapon's autonomy. Does the F-16 incident suggest that the pendulum is swinging too far away from human control of weapons?

Many digital battle-management and communications links currently being fielded by U.S. forces are designed to improve situational awareness and – as a byproduct – reduce the chances of fratricide. One such communication link, called Link-16, is touted as a high-fidelity, robust, jam-resistant link that will help reduce fratricide. What, if anything, do the Iraq war fratricide incidents imply for Link-16 funding and implementation plans? Was the F/A-18C using Link-16? Were the Patriot batteries – including the one that engaged the F/A-18C – using it?

**Air-to-Surface Incidents.** Some widely noted air-to-surface fratricide incidents also occurred in the Iraq war. On March 28, 2003, an Air Force A-10 attack plane attacked five British ground vehicles, striking two of them with 30mm cannon. The aircraft made two passes against the vehicles, killing one British solider and wounding four. U.S. aircraft flying over northern Iraq also mistakenly bombed a friendly Kurdish military convoy on April 6, 2003, killing 19 Kurds and wounding three Army Special Forces soldiers. On April 3, 2003, U.S. Central Command officials reported another possible friendly-fire incident, stating that an Air Force F-15E may have fired on U.S. Army forces, killing one soldier and injuring several others.[140]

Many believe that air-to-ground fratricide is a much tougher problem to solve than surface-to-air fratricide. Aircraft fly at hundred of miles an hour, and at altitudes high enough – normally more than 15,000 feet – to be above the effective range of enemy shoulder-fired air-defense missiles. At such heights, distinguishing friendly personnel and ground vehicles from enemy personnel and ground vehicles can be very difficult. Ground vehicles can change their positions rapidly, and friendly and enemy vehicles are often in close proximity. Some analysts argue that the only dependable safeguards against air-to-ground fratricide are procedural – having one's ground forces stay away from suspected enemy targets when friendly aircraft are attacking those targets, establishing positive identification with the forward air

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[139]Stone, Andrea. Patriot Missile: Friend or Foe to Allied Troops? *USA Today*, April 15, 2003: 6.

[140]Graham, Bradley. Patriot System Likely Downed U.S. Navy Jet. *Washington Post*, April 4, 2003: 34.

controllers on the ground who direct friendly aircraft, and knowing where friendly aircraft are going to strike before moving.[141]

The British vehicles that were fired on by the U.S. A-10 were fitted with combat identification equipment such as thermal imaging panels and strips and infrared emitters.[142] Why did these measures fail to warn U.S. aircraft? DoD and NATO allies are currently pursuing an Advanced Concept Technology Demonstration (ACTD) project for Coalition Combat Identification to develop technologies that would reduce the risk of surface-to-surface and air-to-surface fratricide. What is the status of this program? What is the balance within DoD development efforts for preventing fratricide between air-to-surface and surface-to-surface programs? DoD invested millions of dollars in the Battlefield Combat Identification System (BCIS) before canceling the project in 2001. What lessons were learned from this program?[143]

## Intelligence[144]

**Intelligence In The 1991 Persian Gulf War.** The 1991 Persian Gulf war revealed inadequacies in intelligence for support to U.S. combat troops. In particular, observers concluded that U.S. commanders in the field had insufficient access to certain time-sensitive battle-relevant intelligence due to inadequate communications links with both national-level and theater-level U.S. intelligence-collecting systems. Following the Gulf War, DoD initiated efforts to ensure that U.S. battlefield commanders could gain rapid access to relevant intelligence collected by disparate sources.[145]

**A DoD Priority.** The role of intelligence in supporting U.S. combat operations has been elevated in DoD planning by the new operational concepts (i.e., new approaches to warfighting) and associated military doctrines, especially network-centric warfare, that have been widely articulated in official DoD publications since the early 1990s. Intelligence is a key element of the administration's vision for defense transformation, which emphasizes collecting intelligence through multiple sources and sharing it rapidly between distributed U.S. forces so as to provide those forces with a complete, real-time picture of the battlefield. Reflecting this focus, the

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[141]Clark, Wesley. Technology Cannot Prevent 'Blue-On-Blue' Deaths. *London Times,* April 7, 2003.

[142]Barrie, Douglas. Unfriendly Fire. *Aviation Week & Space Technology,* April 7, 2003.

[143]See also French, Matthew, with Dan Caterinicchia. Friendly Fire System Gets Good Grades. *Federal Computer Week*, June 2, 2003; Trimble, Stephen. Iraq Combat Shows Need For New Friendly Fire Fix. *Aerospace Daily*, June 2, 2003; Eisman, Dale. Fratricide A Problem In Iraq, General Says. *Norfolk Virginian-Pilot*, May 31, 2003.

[144]This section prepared by Richard A. Best, Jr., Specialist in National Defense.

[145]See, for example, U.S. Congress. House of Representatives. Committee on Armed Services. Subcommittee on Oversight and Investigations. *Intelligence Successes and Failures in Operations Desert Shield/Desert Storm.* 103d Cong., 1st Sess. Washington, U.S. Govt. Print. Off., 1993. (Committee Print No.5, August 16, 1993)

administration states that it has accorded high-priority in DoD budget planning to intelligence, surveillance, and reconnaissance (ISR) programs.[146]

**Intelligence Successes in the Iraq War.** The Iraq war appears to have validated the central importance of detailed, accurate, and real-time intelligence in U.S. military operations. The availability of good intelligence was a major factor in the success of the war effort, enabling U.S. forces to carry out precision strikes against critical Iraqi leadership targets and military formations while bypassing other targets that were not critical to the U.S. war plan. As a result, Iraqi military command-and-control capabilities were rapidly degraded, critical Iraqi military formations were decimated before they had a chance to engage U.S. and British ground forces, civilian casualties were reduced, and (significantly for the future of Iraq) damage to the infrastructure needed for reconstruction was minimized.[147]

Intelligence in the Iraq war was collected and made available to operating forces without many of the communications problems that had existed in the 1991 Persian Gulf war, the U.S. military operation in Kosovo in 1999, and even the U.S.-led war in Afghanistan in 2001-2002. Some of the improvements resulted from the availability of new equipment; others resulted from more responsive organizational relationships that facilitated the effective use of perishable intelligence data. Press reports indicate in particular that there was closer intelligence coordination between ground and air units, enabling air strikes against enemy ground forces with fewer casualties to nearby friendly forces.[148]

A key form of intelligence was precise data on the location of important Iraqi military installations. Iraq was mapped in detail by U.S. intelligence agencies prior to the war, and regular updates were made available to battlefield commanders during the conflict. U.S. agencies obtained commercial overhead imagery and used it widely to supplement information collected by U.S. government satellites.[149]

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[146]See U.S. Department of Defense. *Transformation Planning Guidance*. Washington, 2003. (April 2003). The document states: "The new defense strategy rests on a foundation of transformed intelligence capabilities. Our ability to defend America in a new security environment requires unprecedented intelligence capabilities to anticipate where, when, and how adversaries intend to harm us. Our vision of a smaller, more lethal and nimble joint force capable of swiftly defeating an adversary throughout the depth of the global battlespace hinges in intelligence capabilities...." (Page 17)

[147]See, for example, Wall, Robert, and David A. Fulghum. The Intel Battle. *Aviation Week & Space Technology*, May 12, 2003: 62; Fulghum, David A., and Robert Wall. Baghdad Confidential. *Aviation Week & Space Technology*, April 28, 2003: 32; Chien, Philip. Satellites Aid U.S. Military In Iraq. *Washington Times*, March 28, 2003: 14; Schmitt, Eric. In The Skies Ove Iraq, Silent Observers Become Futuristic Weapons. *New York Times*, April 18, 2003: B8; Cushman, John H. Jr., and Thom Shanker. A War Like No Other Uses 21st Century Methods To Disable Enemy Forces. *New York Times*, April 10, 2003: B5.

[148]See, for example, Graham, Bradley, and Vernon Loeb. An Air War Of Might, Coordination And Risks. *Washington Post*, April 27, 2003: 1.

[149]Smith, R. Jeffrey. Secretive Agency's Maps Pave Way For Iraqi Relief; High-Tech Details That Aided Military To Be Released. *Washington Post*, April 22, 2003: 17.

U.S. intelligence agencies also made extensive use of human intelligence (humint) before and during the war.[150] Many of the principal bombing targets were reportedly identified by human agents operating in Iraq. U.S. intelligence operatives reportedly made contact with internal opposition forces that assisted the U.S.-led war effort. And some reports indicate that contacts made by U.S. intelligence elements with certain Iraqi military leaders may have led to several Iraqi divisions opting out of the conflict without formally surrendering. In addition, cooperation between U.S. special operations forces (SOF) and paramilitary forces of the CIA (many of whom reportedly are ex-SOF personnel) enabled coalition forces to secure oil fields before they could be destroyed, inhibit Iraqi ballistic missile attacks on friendly targets, and rescue U.S. prisoners of war.

**Some Questions Raised By Iraq War.** The Iraq war appears to have highlighted certain questions about the analytical effectiveness of U.S. intelligence agencies. The extent to which U.S. intelligence agencies accurately identified sites at which Iraqi nuclear, chemical, or biological weapons or materials were manufactured or stored is not yet known, though some sites at which such weapons and materials were thought likely to be located have been searched by U.S. forces and been found empty. Some observers argue that there was insufficient intelligence information about Iraqi possession of weapons of mass destruction (WMD) to have warranted military attack. Some also question whether U.S. intelligence agencies accurately estimated the reaction of Iraqi civilians, particularly Iraqi Shiites in the south, to the U.S.-led invasion, and the ability of various ethnic groups in Iraq following the war to be integrated into a democratic polity without an extended foreign military occupation.[151]

Although there were not many reports of insufficient intelligence resulting from too few collection assets, observers have noted that the war involved the use of a considerable portion of limited inventories of so-called high-demand/low-density (HD/LD) platforms such as unmanned aerial vehicles (UAVs). Some observers suggest that the Iraq war stretched available intelligence resources and that U.S. operations in a wider or longer-lasting conflict could have been constrained by limits on available surveillance capabilities.[152]

**Potential Program Implications.** The Iraq war appears to have validated the concept of centering U.S. military planning on the use of precise, real-time intelligence for supporting precision strikes on key enemy targets. In this sense, the Iraq war may reinforce the emphasis in DoD planning on programs for improving ISR capabilities. Examples of such programs include reconnaissance satellites; airborne reconnaissance platforms, including UAVs; sensors of various kinds

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[150]Kelley, Jack. Covert Troops Fight Shadow War Off-Camera. *USA Today*, April 7, 2003: 2; Peters, Ralph. The Secret War. *New York Post*, April 7, 2003: 29.

[151]Gellman, Barton. Frustrated U.S. Arms Team To Leave Iraq; Task Force Unable To Find Any Weapons. *Washington Post*, May 11, 2003. See also Hersh, Seymour M. Selective Intelligence. *New Yorker*, May 12, 2003: 44 ff.

[152]For more on U.S. UAV programs, see CRS Report RL31872, *Unmanned Aerial Vehicles: Background and Issues for Congress*, by Elizabeth Bone and (name redacted). Washington, 2003. (Updated periodically) 48 p.

(particularly miniaturized ones); and computers, datalinks, and networking software for rapidly processing and sharing intelligence data among distributed U.S. forces. Some supporters of ISR programs argue that the administration, in spite of its nominal support for improved ISR capabilities, is funding programs that are not primarily focused on intelligence (such as manned tactical aircraft) at the expense of ISR programs such as the Global Hawk and Predator UAV programs. For them, the Iraq war may serve as an opportunity to argue in favor of adjusting funding within the DoD budget for some non-ISR programs so as to finance increases for ISR programs.[153]

The Iraq war may also draw attention to the relationship between U.S. military special operations forces and CIA paramilitary forces. Have organizational and command relationships between these two types of forces been sufficiently delineated? To what extent are the capabilities of SOF units and paramilitary forces complementary, and to what extent are they redundant? To the extent that they are redundant, does this imply an opportunity to reduce planned expenditures for one group or the other?

## Psychological Operations[154]

**Psychological Operations in the Iraq War.** DoD has ceased using the term "psychological operations," often abbreviated as "psyops," believing its connotation to be too pejorative. These activities are now subsumed under the broader rubric of "information warfare."[155] The activities formerly referred to by DoD as psychological operations, which are carried by special operations forces, seek to affect the morale and behavior of an adversary's military and civilian population through print and broadcast media.

The Iraq war reportedly featured the most extensive psychological operations effort in U.S. military history:

> Since October, American and British planes have dropped 36 million leaflets on Iraqi positions across the country. They have distributed scores of solar-powered and hand-crank short-wave radios with instructions for tuning in to Arabic-language broadcasts that urge cooperation with coalition troops. Wanted posters with photographs of Baath Party and fedayeen militia leaders are being posted inside towns.
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> Iraqi opposition leaders have ridden into villages in Special Forces trucks to urge citizens to support the American-led campaign. Trucks with loudspeakers and drones have blared recordings of

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[153]See, for example, Butler, Amy. USAF Could End Production Of Original Predators, Opt For 'B' Force. *Inside the Air Force*, April 18, 2003: 1.

[154]This section prepared by (name redacted), Specialist in National Defense.

[155]The term "information operations," as used by DoD, also includes the offensive use of computers and electronic systems to confuse or disrupt the operations of enemy computers and related combat systems.

> rumbling tanks, trying to confuse Iraqi troops into thinking assaults were under way....
>
> In contrast to the first Persian Gulf war, when psychological operations were incorporated into the mission relatively late, this time the planners had been working closely with senior officers in Central Command headquarters since long before the war began. [156]

Primary objectives of the U.S. psychological operations effort in the Iraq war included the following:

- emphasize that the coalition's military campaign was against the government regime, not the people or the nation;
- persuade Iraqi military personnel to desert or to surrender upon contact with coalition forces; and
- persuade Iraqi military commanders not to use chemical or biological (CB) weapons or sabotage oilfields.

Initial assessments of the psychological operations effort have been generally positive. Though mass surrenders did not occur on the scale they did in the 1991 Persian Gulf war, some larger-scale desertions did occur. Some Iraqi units that did surrender followed the distributed leaflet instructions for procedure. Iraqi oilfield workers indicated that leaflets were also instrumental in their decisions to not carry out sabotage orders. The role of these activities in the lack of Iraqi chemical-biological (CB) weapons use remains an open question, particularly since no CB weapons have been found to date. The campaign's effect on the civilian population's attitude toward coalition forces was judged positive by U.S. officials, despite instances of popular opposition.

Some reports on the psychological operations effort have been more critical. Two noted that the part of the effort intended to encourage senior Iraqi military and civilian leaders to surrender failed to produce any significant defections, and attributed this failure to overly optimistic pre-war U.S. assessments concerning the potential for encouraging such defections through telephone and e-mail messages and cash inducements.[157] Other reports criticized the U.S. psychological operations effort for not including earlier attacks on Iraq's capability to broadcast pro-regime TV

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[156]Dao, James. Trying To Win Iraqi Hearts and Minds On The Battlefield. *New York Times*, April 6, 2003. See also Brant, Martha. The IO Options. *Newsweek (Web exclusive)*, March 26, 2003. An Air Force statistical summary of the Iraq war states that the psychological operations included 158 aircraft sorties that dropped 31.8 million leaflets, 58 sorties by EC-130E Commando Solo radio- and TV-broadcasting aircraft, and 125 sorties by EC-130H Compass Call communications-jamming aircraft. (U.S. Department of Defense. *Operation IRAQI FREEDOM – By The Numbers*. [Assessment and Analysis Division, USCENTAF, T. Michael Moseley, Lt Gen, USAF Commander, April 30, 2003, Unclassified] p. 8)

[157]Kelley, Jack. U.S. Officials Concede They 'Misjudged' Iraqi Defections. *USA Today*, March 31, 2003: 1; Drogin, Bob, and Greg Miller. Plan's Defect: No Defectors. *Los Angeles Times*, March 28, 2003: 1. For an earlier report on these efforts, see Schmitt, Eric, and Thom Shanker. U.S. Reports Talks Urging Surrender. *New York Times*, March 21, 2003: 1.

messages to its own people.[158] And one report, based on interviews with U.S. participants in the war, stated that the U.S. psychological operations effort may have been undercut by the decision to accelerate the start of the U.S. ground offensive by one day, which prevented the final pre-war elements of the effort from being implemented before the onset of combat operations.[159]

**Potential Program Implications.** On the whole, the experience with the U.S. psychological operations effort in the Iraq war suggests that such operations can be a relatively cost-effective means of positively affecting combat operations, but that the success of such operations can be affected by numerous factors. From the standpoint of planning, one potential conclusion is that psychological operations can provide an advantage for U.S. forces, but that uncertainties about the extent of that advantage might make it somewhat risky for U.S. military planners in future conflicts to count on psychological operations as a reliable substitute for a certain amount of conventional U.S. combat power.

## Chemical-Biological Warfare[160]

**Pre-War Concerns About Use of CB Weapons.** In the weeks leading up to the Iraq war, numerous observers expressed concern over the possibility that Iraq would use chemical-biological (CB) weapons to disrupt the U.S.-led invasion. By forcing U.S. and British ground forces to wear bulky CB protective suits, Iraqi use of such weapons, observers feared, could slow-down the operations of U.S. and British ground forces, particularly on hot-weather days. There were also concerns prior to the war that the U.S. military's inventory of CB protective suits might be insufficient or might include some incorrectly-manufactured suits that would not provide their wearers with proper amounts of protection.

**CB Weapons Not Used.** Despite repeated warnings to expect Iraqi use of CB weapons, and warnings from U.S. military officials early in the conflict that release authority for these weapons had been given to regional subordinate Iraqi commanders, no CB weapons use was encountered. Estimates of when CB use was to be expected underwent several revisions, ranging from pre-emptive strikes against deploying U.S. forces to "last ditch" use in defense of Baghdad. None proved accurate. No CB munitions were discovered with the Iraqi ground force units engaged by coalition forces, and through May 2003, no CB munition storage facilities had been located.

Because U.S. troops never encountered CB weapons, their protective equipment and training was not tested under combat conditions in a contaminated environment. Nevertheless, troops had to operate as though the threat was imminent, and the full

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[158]See Gordon, Michael. The Medium Is the Message. *New York Times on the Web*, March 26, 2003; Cooper, Christopher. U.S., British Force May Help Iraqi Television Jump The Shark. *Wall Street Journal*, March 28, 2003.

[159]Atkinson, Rick, and Peter Baker and Thomas E. Ricks. Confused Start, Swift Conclusion. *Washington Post*, April 13, 2003: 1.

[160]This section prepared by (name redacted), Specialist in National Defense.

array of U.S. CB defensive capabilities were brought to the campaign. Overgarments were worn routinely by U.S. troops – with accompanying hoods, gloves, masks, and boot covers close to hand. Two newly-developed chemical agent detectors were deployed, as were biodetection and CB decontamination systems. Though full analysis will have to wait for official after-action assessments, no significant problems were reported for any of this equipment.

## Airlift and Aerial Refueling[161]

**A Test of Post-1991 Enhancements.** Congress has closely tracked issues relating to U.S. airlift and aerial refueling (i.e., air mobility) capabilities in recent years because they are critical, along with U.S. sealift capabilities, for supporting U.S. expeditionary military operations. The Iraq war provided a test of enhancements for U.S. air mobility capabilities that were funded following the 1991 Persian Gulf war, when certain air mobility inadequacies were exposed. These enhancement programs included, among other things, the following:

- the procurement of new C-17 airlift aircraft to replace older C-141 airlift aircraft;
- modernizing the avionics of the Air Force's existing C-5 airlift aircraft; and
- modernizing the Air Force's existing KC-135 tanker aircraft by updating their cockpits, replacing their 1950s-era engines with more fuel efficient models, and outfitting some KC-135s with wing-tip, hose-and-drogue systems to refuel U.S. Navy and allied aircraft.

In addition to constituting a test of these enhancements, the Iraq war occurred as DoD and Congress are considering four current program issues relating to air mobility:

- how many C-17s to procure, beyond those already procured;
- how many C-5s should be modernized, re-engined, and kept in the active inventory;
- whether to implement a somewhat controversial program, authorized by Congress as part of its action on the FY2003 defense budget, to lease (rather than purchase) 100 Boeing 767 airliners for use as Air Force tanker aircraft; and
- whether to modify the contractual arrangements for the Civil Reserve Air Fleet (CRAF).

Prior to the start of the Iraq war, some observers believed that supporting the war would severely tax U.S. air mobility resources. They predicted that the long flight distances from the United States and its forward bases in Europe to the Persian Gulf, the difficulty in gaining access to air bases in countries neighboring Iraq, and

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[161]This section prepared by (name redacted), Specialist in National Defense. For more on air mobility programs, see CRS Reports RL30685, *Military Airlift: C-17 Aircraft Program;* RS20915, *Strategic Airlift Modernization: Background, Issues and Options;* and RS20941, *Air Force Aerial Refueling: Background and Issues*, all by (name redacted).

the ongoing U.S. military operations in Afghanistan and the Horn of Africa would combine to create real challenges to U.S. air mobility.

**Air Mobility In The Iraq War.** Air mobility operations, as expected, played a significant role in the Iraq war.[162] Although information on air mobility efforts in the Iraq war is still preliminary, early reports suggest that airlift operations were largely satisfactory, and that the Air Force's new C-17 airlift aircraft performed well. Early reports also suggest, however, that aerial refueling operations were less than satisfactory in some respects. While many pilots involved in the Iraq war praised aerial refueling efforts in print and electronic interviews, they also reportedly complained that refueling shortages were a significant impediment to operations, especially at the war's beginning.[163]

Aerial refueling (and airlift) operations in the Iraq theater of operations were complicated by limits on foreign basing and overflight rights,[164] the simultaneous

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[162]Air mobility missions accounted for 16,740, or 40%, of the 41,404 sorties (excluding sorties by special operations forces and Army helicopters, and "coalition sovereignty flights") in the war. (U.S. Department of Defense. *Operation IRAQI FREEDOM – By The Numbers*. [Assessment and Analysis Division, USCENTAF, T. Michael Moseley, Lt Gen, USAF Commander, April 30, 2003, Unclassified] p. 7-8) The U.S. Transportation Command reported that by April 10, 2003, it had flown 16,213 air mobility missions for the war, exceeding the total number of such missions flown in the 1991 Persian Gulf war. (Roberts, Chuck. C-130 Crews Keep The Supplies Coming. *Air Force News,* April 16, 2003.)

[163]See, for instance Dolan, Matthew. Pilots Complain of Refueling Delays. *Norfolk Virginian-Pilot,* April 16, 2003; Fulghum, David. Tanker Puzzle. *Aviation Week & Space Technology,* April 14, 2003; Selinger, Marc. Navy Chief Says F/A-18E/F Helped With Fuel Limits in Iraq. *Aerospace Daily,* April 18, 2003.

[164]In the Iraq war, military planners operated about 200 tanker aircraft out of 15 different air bases. During the 1991 Persian Gulf war, by contrast, 350 tankers were distributed among just 5 bases. (Fulghum, *op cit.)* No official rationale for distributing aerial refueling aircraft among so many bases has yet been announced. One explanation may be that a dearth of bases in general pushed tanker aircraft to secondary and tertiary bases so shorter range combat aircraft could operate from bases closest to Iraq. The more dispersed arrangement of tankers in the Iraq war appears to have complicated the task of coordinating tanker flights with combat aircraft flights, so as to make sure that the right mix of refueling booms (for Air Force aircraft) and drogues (for the Navy, Marine Corps, and coalition aircraft) were on hand at the right times. (Booms and drogues are different kinds of fixtures for connecting the tankers trailing fuel line to the combat aircraft's fuel-intake valve.)

The requirement for U.S. strike aircraft to fly around rather than through Turkish airspace increased aerial refueling requirements, because those aircraft now had to fly longer missions. And Turkey's decision not to allow the U.S. Army's 4th Infantry Division to attack northern Iraq from bases in Turkey increased airlift requirements, because establishing a U.S. ground presence in northern Iraq as a consequence had to be done primarily by air. Fifteen C-17 aircraft executed one of the largest air assaults in recent memory, airdropping 1,100 paratroopers from the Army's 173rd Airborne Brigade. To buttress this force, U.S. airlift aircraft transported an additional million pounds of equipment, several M-1 Abrams tanks, and another 1,000 soldiers. (Vogel, Steve. Airlift

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conduct of air and ground combat operations in the Iraq war (which increased the number and types of air combat missions that had to be supported), and possibly the rapid northward advance of U.S. ground forces through Iraq (which prompted combat aircraft supporting those forces to fly further into Iraq).

To improve aerial refueling coverage, Air Force tanker aircraft reportedly operated more aggressively than in past conflicts, flying closer to hostile territory than in previous conflicts such as the 1991 Persian Gulf war. While this improved tanker support for some U.S. combat aircraft, it may have reduced it for others. Navy aircraft flying from carriers in the Persian Gulf reportedly could not reach Air Force tanker aircraft operating deep inside Iraqi airspace.[165] In addition, it was reported that sorties of Navy aircraft flying into Iraq from two carriers in the Eastern Mediterranean were reduced due to limits on aerial refueling capability.[166]

**Requirements For Air Mobility Aircraft.** The experience with air mobility operations in the Iraq war will likely inform congressional debate on a number of general issues relating to requirements for air mobility aircraft, including the following:

- How much total airlift and aerial refueling capability does the United States need to support current and future U.S. military operations?
- What number of airlift and aerial refueling aircraft, with what mix of characteristics (e.g., range, payload, offload speed, number and type of fuel dispensers), will best meet this requirement?
- How will requirements for airlift aircraft change as a result of planned changes in U.S. Army forces, particularly efforts to make Army forces lighter and more mobile?
- How will requirements for airlift and aerial refueling aircraft change as a result of potential changes in the future mix of combat aircraft (long-range bombers, fighters, and unmanned air vehicles) to be supported?
- Are current Air Force aerial refueling aircraft modernization efforts sufficiently joint, particularly in terms of taking into account the aerial refueling needs of the Navy and Marine Corps?[167]

With regard to the total airlift capability required to support current and future U.S. military operations, the current requirement to have 54.5 million ton-miles per

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[164](...continued)
for Paratroops a Million-Pound Daily Deal. *Washington Post*, March 31, 2003: 17; Hoyle, Craig. C-17 Missions Prove Flexibility of US Forces. *Jane's Defence Weekly*, April 16, 2003.)

[165]Fulghum, op cit. To make up for this deficiency, F/A-18E/F Super Hornets began carrying extra fuel tanks (instead of bombs) that were used to not only extend their range, but also to provide extra fuel for other Navy aircraft – a tactic called "buddy tanking."

[166]Fulghum, David A. New Bag Of Tricks. *Aviation Week & Space Technology*, April 21, 2003: 22.

[167]For more on these issues, see CRS Reports RS20915 *Strategic Airlift Modernization: Background, Issues and Options*, and RS2094, *Air Force Aerial Refueling: Background and Issues*, both by (name redacted).

day of airlift capability[168] was conceived prior to September 11, 2001. In light of the Iraq war, the war in Afghanistan, and the global war on terrorism in general, how valid is this requirement today? Do the underlying assumptions and analyses behind this figure still hold? Will increased attention on fighting terrorism abroad lead to more numerous deployments? What kinds of forces will need to be deployed to combat terrorism and how might they differ from the force packages anticipated by defense planners pre-September 11th? Will increased attention to homeland security lead to decreased overseas deployments?

With regard to the changing mix of combat aircraft to be supported, fighter aircraft tend to be more airlift- and aerial refueling-intensive than either long-range bombers or unmanned air vehicles (UAVs). Some observers argue that airlift and aerial refueling requirements, which can be expensive to meet, can be lowered by reducing planned DoD investments in fighters and increasing funding for long-range bombers and UAVs.

**Potential Program Implications.** The Iraq war may have implications for specific air mobility program issues, including the following.

***C-17 Procurement.*** The Air Force in FY2003 completed a multi-year procurement of 120 C-17 airlift aircraft and began a follow-on multi-year procurement of 60 additional C-17s, bringing the total planned C-17 procurement to 180 aircraft. The general in charge of the U.S. Transportation Command said in 2002 that he wanted a total of 222 C-17s to meet airlift demands.[169]

In addition to citing these DoD studies, supporters of increasing C-17 procurement beyond 180 planes could argue, following the Iraq war, that the war validated the continued importance of airlift capability for supporting U.S. military operations, that it showed the effectiveness of the C-17 as an airlift aircraft (particularly in transporting larger cargo loads over long distances to airfields with shorter runways), and that it demonstrated how limits on foreign basing and overflight rights can lead to increased demands for airlift. They could also argue that the planned transformation of the Army toward lighter and more mobile forces could lead to an increased demand in the future for using airlift aircraft (rather than ships) for rapidly transporting Army forces to distant conflicts, and for transporting them directly to the combat theater, rather than to a forward staging area.

Opponents of increasing C-17 procurement beyond 180 planes could argue that the general success of the airlift effort in the Iraq war shows that the United States in the future will not necessarily need more than 180 C-17s. They could argue that the Iraq war and the war in Afghanistan suggest that the United States in the future will fight wars with fewer ground forces than in the past, and that this, combined with the Army's planned shift toward lighter forces, could lead to a reduction in airlift requirements. They could also argue that airlift requirements in the future

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[168]Ton-miles per day is a key measure of airlift capability. One ton-mile means 1 ton of cargo transported over a distance of 1 mile.

[169]Levins, Harry. Transportation Command's Chief Emphasizes The Need For More C-17 Cargo Planes. *St. Louis Post-Dispatch*, February 2, 2002: 9.

might be reduced as less airlift-intensive UAVs begin to replace manned fighters and DoD makes greater use of high-speed sealift ships. Future airlift requirements, they could argue, can be partly met by modernizing the C-5 fleet and by pursuing new types of airlift aircraft approaches, such as high-tech airships and wing-in-ground aircraft (see discussion below on future airlift technologies).

***C-5 modernization and engine replacement.*** Following the Iraq war, debate will continue on the number of C-5s to modernize and re-engine. Most observers agree that in the near term, some mix of C-17s and C-5s are required to meet DoD's 54.5-million-ton-mile-per-day airlift requirement. But how many C-5s should be modernized and re-engined?

Those who support modernizing and re-engining a majority of the C-5 fleet could argue that the Iraq war showed that the United States needs all the airlift volume that it can muster. The easiest way to maintain and build upon our current airlift volume, they could argue, is to keep in service as many C-5s as possible. The C-5's maximum payload of 281,000 lbs is 76% greater than the C-17's maximum payload of 160,000 lbs. Thus, it takes almost two new C-17s to replace the lost payload volume of every C-5 that is retired. The C-5, supporters could also argue, can carry many pieces of military equipment too bulky or too irregularly shaped for any other aircraft. They can point out that although the C-17 is capable of carrying much outsize and oversize cargo, only the C-5 can carry items such as the Mark V special operations boat or the 53-foot mobile medical hospital.[170] In addition, C-5 supporters could argue, modernizing and re-engining all the C-5's will substantially increase the C-5 fleet's readiness rate, ensuring that the maximum amount of airlift payload volume is available at any given time.

Those who support modernizing and re-engining fewer C-5s argue that the Iraq war showed that overall airlift volume is important, but being able to move large payloads directly to short or austere airfields in the combat theater is more important. Airfields near Iraq were limited in the recent war, and the C-17 was the only long-distance airlift aircraft that could use the full range of airfields available in the Iraq theater of operations. Fewer C-5s, they could argue, should be modernized so that funds are available to procure more C-17s, ensuring that the future U.S. airlift fleet will be better able to move payloads directly from the United States to the theater of combat, and not just from the United States to a forward airbase located in, for example, Europe. They could also argue that the outsize cargo that can be carried only by the C-5 is of secondary importance, and that the C-17 can carry all important outsize military equipment. What cannot be carried by C-17s, they could argue, can be delivered by ship. While the C-5's readiness rate can be improved through modernization, they could argue, it will still be lower than the C-17's readiness rate. If readiness rates of airlift aircraft are a concern, they could argue, fielding fewer C-5s and more C-17s will result in a higher overall readiness rate for the total airlift fleet.

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[170]The C-5, according to one Air Force estimate, can carry at least 87 pieces of military equipment that are too big for the C-17. (Memorandum on C-5 airlift capabilities from the Air Force office of Legislative Affairs, May 13, 2003.)

***Lease of Boeing 767s For Use as Tankers.*** DoD and Congress in recent years have considered how to address the issue of the aging of the Air Force's fleet of KC-135 tankers. Options considered have included extending the service lives of the KC-135s, procuring new tanker aircraft, and leasing Boeing 767 airliners for use by the Air Force as tankers.

The last of these options – the leasing arrangement – was authorized by Congress as part of its action on the FY2003 defense budget. DoD has since considered how to implement this arrangement. In general, supporters of the arrangement argue that it is a cost-effective way to quickly improve the Air Force's tanker capabilities, particularly at a time when the Air Force is struggling to finance the acquisition of several other kinds of aircraft. Opponents argue that the leasing arrangement will violate the spirit, if not the letter, of the full funding provision that normally governs procurement of DoD weapons and equipment,[171] and that in the long-run it will prove more expensive, and less cost effective, than the option of procuring new aircraft.

Following the Iraq war, supporters of the leasing arrangement could argue that the shortage of aerial refueling assets in the war demonstrates a need for quickly improving U.S. capabilities in this area, particularly if U.S. forces need to fight two regional conflicts in overlapping time frames (an official DoD requirement for sizing U.S. military forces). They could argue that extending the service lives of the KC-135s would provide only a short-term fix, and that procuring new tankers would provide little near-term relief to the situation and require procurement funding for several years at levels that the Air Force cannot afford.

Supporters could also argue that the Iraq war exacerbated a situation of reduced civilian air travel that began with the terrorist attacks of September 11, 2001 – a situation that has substantially reduced orders from commercial airline operators for new large commercial aircraft. This situation, they can argue, has significantly damaged the financial health of Boeing, the only U.S. maker of large commercial aircraft. The leasing arrangement, supporters could argue, will help shore up the financial health of Boeing, a major defense contractor involved in numerous defense programs important to DoD's future.

Opponents of the leasing arrangement could argue that the Iraq war does nothing to resolve the most important question facing the proposal – whether the Boeing 767 the best platform to replace the KC-135s. Several aircraft characteristics, they could argue, must be weighed in determining the most appropriate airframe for use as a tanker, including range, payload, fuel throughput, and type of fuel dispenser. Typically, a formal study called an Analysis of Alternatives (AOA) is conducted to determine the best airframe. Such an analysis can be particularly important if the aircraft to be acquired is a joint asset. Lease opponents could argue that, the Iraq war notwithstanding, no AOA has been conducted to determine that the 767 is the optimal platform. Considering the importance of aerial refueling and the long time

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[171]For more on the full funding provision, see CRS Report RL31404, *Defense Procurement: Full Funding Policy – Background, Issues, and Options for Congress*, by Ronald O'Rourke and (name redacted). Washington, 2003. (Updated periodically) 41 p.

that air mobility aircraft tend to remain in the active inventory, lease opponents could argue that the Iraq war does not obviate the need to conduct a rigorous, joint AOA before deciding how to replace today's air refuelers.

Opponents of the leasing arrangement could argue that providing indirect government financial assistance to a particular defense contractor like Boeing is questionable public policy, and that the need for providing such assistance Boeing's case is not clear, because while September 11, 2001 and the Iraq war may have reduced Boeing's civilian commercial aircraft business, they also may have increased Boeing's military business due to the resulting increase in U.S. defense spending. Opponents could also argue that even if providing financial assistance is appropriate and necessary in this case, the leasing arrangement may not be the most cost-effective way to provide it.

***Civil Reserve Air Fleet (CRAF).*** The Civil Reserve Air Fleet (CRAF), established in 1951, is an arrangement under which commercial and charter airline operators agree to provide aircraft and crews to DoD in time of war to augment military airlift capabilities. In return for making their aircraft available, these operators are allowed to bid during peacetime on DoD contracts for transporting military personnel and cargo – business that is worth billions of dollars. For the Iraq War, DoD mobilized 47 CRAF aircraft. This is only the second time that the CRAF was mobilized; the first was in 1990-1991 to support the 1991 Persian Gulf war.

While CRAF is a voluntary program and provides steady business to U.S. carriers during peacetime, some observers have expressed concern that financially troubled U.S. commercial airlines might no longer be able to afford continued participation in the CRAF program as currently structured. These observers have suggested that new deals might need to be struck between DoD and airlines to ensure the continued participation of airline operators in the CRAF program.

Supporters of making such new deals could argue that the use of CRAF aircraft in the Iraq war demonstrates DoD's continuing need for the program, that larger numbers of CRAF aircraft might be needed in future times of emergency, particularly for fighting two regional conflicts in overlapping time frames, that the participation of commercial airline operators is critical to the program's success, and that all necessary steps, including new deals between DoD and the commercial airliners, should therefore be taken to ensure that the program remains healthy.

Supporters of staying with the current CRAF arrangement could argue that although commercial airlines are financially troubled and the Iraq war demonstrated the usefulness of the CRAF program, the U.S. government has already taken steps to shore up airline finances, the airlines themselves are now restructuring their operations to further improve their financial health, and that even if some U.S. commercial airlines continue to experience weak finances, the actual number of CRAF aircraft used in the Iraq war – a military operation of significant size – suggests that sufficient numbers of civilian aircraft to meet U.S. needs for such a conflict can be secured for the CRAF from the more financially healthy commercial operators.

***Future Airlift Technologies.*** Some observers, including Arthur Cebrowski, the director of DoD's Office of Force Transformation, have stated following the Iraq war that DoD should consider developing and acquiring new kinds of airlift aircraft, such as such as high-tech, modified blimps capable of transporting 1,000 tons of cargo at speeds of up to 100 miles per hour, or "wing-in-ground effect" aircraft capable of transporting hundreds of tons of cargo at speeds of a few hundred miles per hour.[172] Developing and acquiring airlift aircraft like these, they argue, could fill in the current gap between today's airlift aircraft (which transport much smaller payloads at higher speeds) and sealift ships (which transport much larger payloads at much slower speeds).[173]

## Sealift[174]

**A Test of Post-1991 Enhancements.** Congress has closely tracked issues relating to U.S. sealift capabilities in recent years because they are critical, along with U.S. air mobility programs, for supporting U.S. expeditionary military operations. The Iraq war provided a test of enhancements for U.S. military sealift capabilities that were funded following the 1991 Persian Gulf war, when certain inadequacies in U.S. military sealift capabilities were exposed. These enhancement programs included, among other things, the following:

- the acquisition of 19 additional sealift ships called LMSRs (for Large, Medium-Speed Roll-on/Roll-off[175] ships) for use in surge sealift from U.S. ports and overseas prepositioning of Army equipment and supplies,
- the acquisition of additional ships for enhancing the three Maritime Prepositioning Ship (MPS) squadrons that are used for prepositioning of Marine Corps equipment, and
- investments to improve the mobilization readiness of the Ready Reserve Force (RRF), a group of government-owned sealift ships that are kept in reserve for potential activation in time of war.

**Sealift In The Iraq War.** At the peak of the Iraq-war sealift effort, 62% of the Military Sealift Command's prepositioning and surge sealift ships were involved in supporting the war.[176] An article on the sealift effort states:

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[172]Wing-in-ground aircraft are aircraft that fly very close to the surface so as to reduce drag, increase lift, and thereby transport heavy loads more efficiently.

[173]Sirak, Michael. US Navy Floats Lighter-Than-Air Transport Concept. *Jane's Defence Weekly*, May 7, 2003; Ma, Jason. NAVAIR Chief: Heavy Airlift Technology Could Speed Up Logistics." *Inside the Navy*, April 28, 2003; Trimble, Stephen. Cebrowski: Iraq War Offers Clues For Transformation Agenda. *Aerospace Daily*, April 23, 2003; Fulghum, David A. Fast Forward. *Aviation Week & Space Technology*, April 28, 2003: 34.

[174]This section prepared by Ronald O'Rourke, Specialist in National Defense.

[175]A roll-on/roll-off ship is equipped with ramps so that wheeled vehicles can be quickly rolled on and off the ship.

[176]Information provided to CRS by Military Sealift Command (MSC) via e-mail and telephone , May 23, 2003. This figure, which represents sealift ships in use on March 24,

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> More than 90 percent of all combat gear and supplies used in the rapid advance to Baghdad was shipped by sea in record time.... [DoD's Military Sealift Command, or MSC] moved 16.6 million square feet of equipment for the U.S. Army and Marine Corps and hauled 377 million gallons of fuel across oceans, helping deliver materiel to the fight three times faster than during the 1991 Gulf War while relying on fewer chartered foreign ships.
>
> The logistics campaign built on vast stores of equipment positioned in the region over the last decade, including 2 million square feet of equipment delivered between July and January to support exercises. That equipment remained in place when hostilities began in March. Extensive planning, a new war game and a decade-long investment in ships capable of carrying large loads facilitated the quick delivery by sea.... In January, MSC began intensive dispatches to the gulf region of equipment that U.S. forces would need. Tanks, trucks, food, power generators, ammunition and more were loaded on ships at 10 U.S. and five European ports, joining ships already filled with equipment in Diego Garcia....
>
> During the Gulf War, the Pentagon chartered 215 foreign ships to help ferry cargo. This time, thanks to MSC's "large organic fleet," few other ships were needed.... Turkey's decision to deny U.S. troops access to its ports kept 40 ships with the 4th Infantry Division's equipment treading water in the eastern Mediterranean Sea for weeks, prompting MSC to charter 43 non-U.S. ships to help keep other supplies moving.[177]

General Richard B. Myers, the Vice Chairman of the Joint Chiefs of Staff, was quoted as saying: "Without our large, medium-speed roll-on/roll-off ships (LMSR) and other strategic sealift, we would have been dead in the water. We win or lose wars based on our logistics capability and the ships were the big story in Iraq. DoD's investment and attention to that part of our infrastructure pays dividends."[178]

On the other hand, General John Handy, the commander of the U.S. transportation Command, was quoted as saying on March 12 that "in the air[lift] side of things and in some degree the sealift side, we are transportation constrained, not dramatically, but transportation constrained."[179] It was also reported that the

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[176](...continued)
2003, MSC's peak day of operations during the Iraq war, includes 29 of MSC's 38 prepositioning ships and 52 of MSC's 92 surge sealift ships. Twelve of the 38 prepositioning ships and 4 of the 92 surge sealift ships are on long-term lease to MSC; the others are government-owned. The sealift effort for the Iraq war also involved short-term charters of commercial cargo ships.

[177]Sherman, Jason. Logistics Success Built on Sealift. *DefenseNews*, May 12, 2003: 32. See also Maraoui, Andre. A New Dimension Of Strength. *Sea Power*, May 2003: 29; and Hilzenrath, David S. Supply Transfers Reflect '91 Experience. *Washington Post*, April 5, 2003: 27; Vergun, David. Outfitting The Operating Force. *Sea Power*, May 2003: 36.

[178]As quoted in ... Logistics, Logistics, Logistics. *Defense Daily*, April 28, 2003. See also Keeter, Hunter. Fast Sealift Ships, LMSRs, C-130s Keys To Success In Iraq: Army Officials. *Defense Daily*, May 21, 2003.

[179]Burger, Kim. US Build-Up Is Fast But 'Not Fast Enough.' *Jane's Defence Weekly*, (continued...)

unavailability of port facilities in Turkey and Saudi Arabia for offloading equipment and supplies from U.S. military sealift ships led to a bottleneck at the Kuwaiti ports of Shuwaikh and Shuaiba.[180]

**Potential Program Implications.** If limits on overseas port facilities are judged to be a potential feature of future U.S. conflicts, one possible option would be to invest in sealift capabilities for moving equipment and supplies from ship to shore without need for host-nation port facilities. In addition, Arthur Cebrowski, the director of DoD's Office of Force Transformation, has said that the Iraq war did not feature any major innovations in logistics or transportation, and that DoD should consider potential improvements in these areas, including very high-speed sealift ships capable of moving at speeds of 80 knots or more.[181]

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[179](...continued)
March 19, 2003.

[180]Josar, David. Transportation Groups Tackle Oversized Load. *European Stars and Stripes*, April 8, 2003; Wilkinson, Jeff. U.S. Supply Loads Are Taxing Kuwait's Ports, Airports. *Philadelphia Inquirer*, March 19, 2003.

[181]Trimble, Stephen. Cebrowski: Iraq War Offers Clues For Transformation Agenda. *Aerospace Daily*, April 23, 2003; Fulghum, David A. Fast Forward. *Aviation Week & Space Technology*, April 28, 2003: 34.