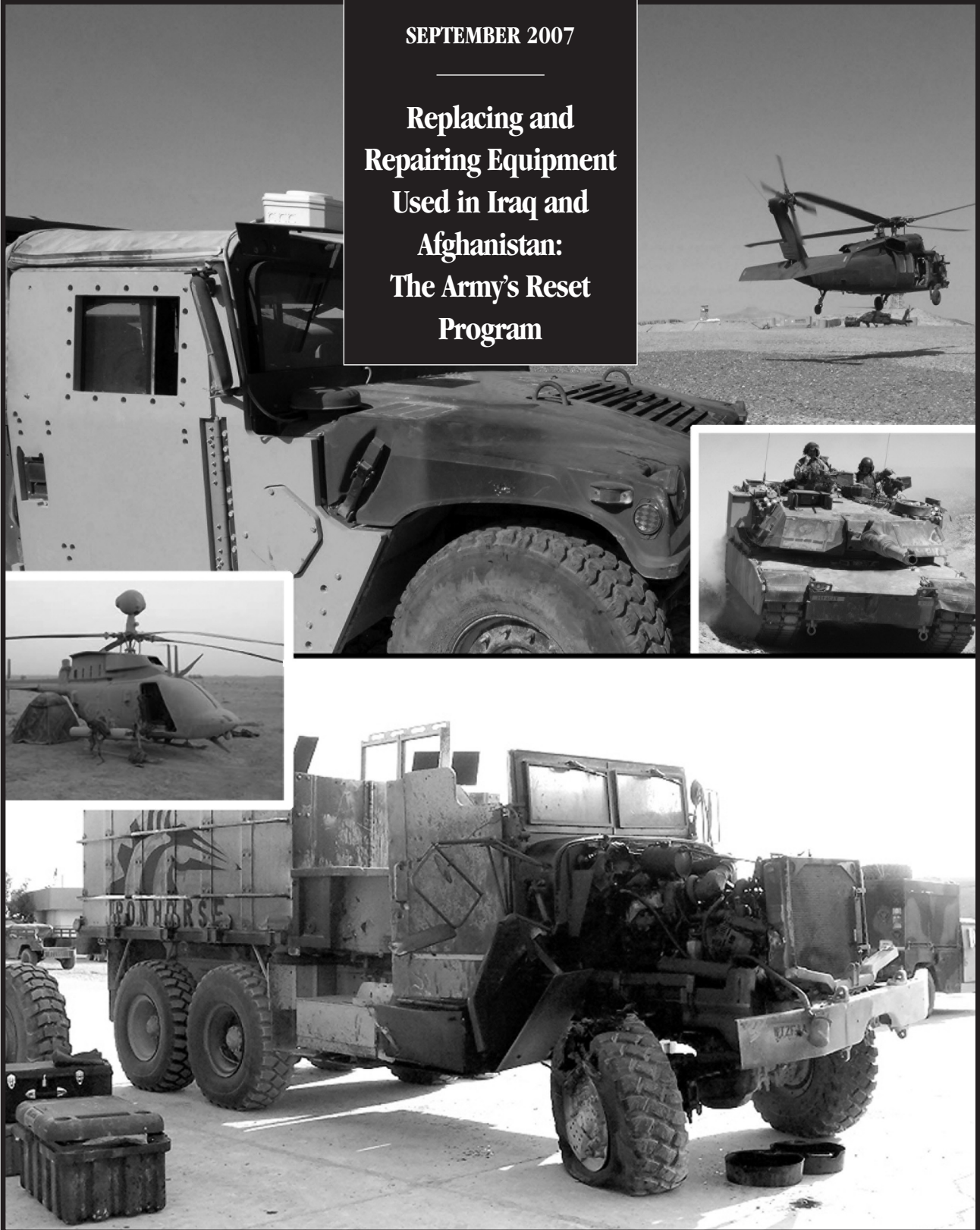


A  
**CBO**  
PAPER

SEPTEMBER 2007

Replacing and  
Repairing Equipment  
Used in Iraq and  
Afghanistan:  
The Army's Reset  
Program







# **Replacing and Repairing Equipment Used in Iraq and Afghanistan: The Army's Reset Program**

September 2007

---

## Notes

Unless otherwise indicated, all years in the report are federal fiscal years.

Numbers in the text and tables may not add up to totals because of rounding.

The photo of the HMMWV and Blackhawk helicopter on the cover was taken by Army Private First Class Leslie Angulo, and the inset photo of the tank was taken by Army Private Brandi Marshall. The photo of the truck and the inset helicopter photo were provided courtesy of the Lawrence Livermore National Laboratory and the Department of the Army, respectively.

---




## Preface

**T**o date, the Army has received \$38 billion to replace, repair, and recondition equipment that has been lost, damaged, or used extensively in conducting operations in Iraq and Afghanistan. For equipment returned from such operations, those funds are needed, the Army and Department of Defense argue, to restore items to a satisfactory working condition so that Army units that are not deployed to the theater will be ready to respond to crises that might arise. Additional money is likely to be needed in the future as well. The Administration's annual funding requests for resetting the Army's equipment have increased steadily from 2005 to 2007, and the Army has said that it will continue to need approximately \$13 billion annually for that purpose for as long as operations continue at their current pace and for at least two years after hostilities cease.

This Congressional Budget Office (CBO) paper, prepared at the request of the House Armed Services Committee, examines the Army's requirements and the Administration's funding requests for resetting equipment returning annually from Iraq and Afghanistan. In its analysis, CBO sought to identify the conditions affecting equipment being used in Southwest Asia that might prompt increases in the annual costs for resetting it. CBO also developed estimates of annual costs and compared them with the Army's estimated requirements and the Administration's funding requests, and attempted to explain any differences between its estimates and those of the Army. In keeping with CBO's mandate to provide objective, impartial analysis, the paper makes no recommendations.

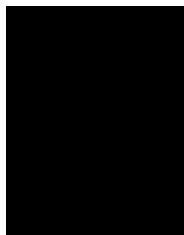
Frances M. Lussier of CBO's National Security Division prepared the paper under the general supervision of J. Michael Gilmore. The author would like to thank Michael J. Bennet of CBO for his assistance in fact-checking the document and David Sparrow of the Institute for Defense Analyses for his comments on an earlier draft. (The assistance of an external reviewer implies no responsibility for the final product, which rests solely with the author and CBO.) Donald Marron, formerly of CBO, and current staff members Arlene Holen, Sarah Jennings, Jason Wheelock, and Christopher Williams commented on earlier versions of the paper.

Leah Mazade edited the report, and Kate Kelly proofread it. Cindy Cleveland produced drafts of the text and tables, and Maureen Costantino designed the cover and prepared the report for publication. Lenny Skutnik produced the printed copies, Linda Schimmel coordinated the print distribution, and Simone Thomas prepared the electronic version for CBO's Web site ([www.cbo.gov](http://www.cbo.gov)).



Peter R. Orszag  
Director





# Contents

*Summary ix*

## 1

### **Introduction and Background 1**

Army Equipment Supporting Operations in Iraq and Afghanistan 1

How the Army's Operations in the Theater Affect the Availability of Equipment for Nondeployed Units 4

Conditions in the Theater and Their Effect on the Army's Equipment 6

## 2

### **Costs Associated with Resetting the Army's Equipment 17**

CBO's Estimates of the Army's Annual Costs to Replace and Repair Equipment 17

The Army's Estimates of Costs and the Administration's Funding Requests for the Reset Program 22

## 3

### **Issues Concerning the Army's Requests for Funds to Reset Its Equipment 33**

Questions About Activities Being Funded Under the Reset Program 33

Effects of Early Submission of Requests for Funding 34

Other Issues 34

**Tables**

S-1.	Selected Army Systems in the Theater at the End of 2006 and Equipment Available for Units at Home Stations	<i>xi</i>
S-2.	Summary of Types of Costs Included in the Army's and CBO's Estimates for Reset	<i>xvii</i>
1-1.	Inventories of Selected Army Systems at the End of 2006 Compared with Systems in the Theater	<i>3</i>
1-2.	Inventories and Lack of Availability of Selected Army Systems for Use by Units at Home Stations at the End of 2006	<i>5</i>
1-3.	Selected Army Systems Required and Available for Use by Units at Home Stations at the End of 2006	<i>7</i>
1-4.	Usage Rates for Selected Army Systems During Operations in the Theater and in Peacetime	<i>9</i>
2-1.	CBO's Estimates of the Army's Annual Costs to Replace and Repair Selected Systems	<i>18</i>
2-2.	Comparison of CBO's and the Army's Estimates of Costs for 2007 to Replace and Repair Lost and Returned Equipment	<i>24</i>
2-3.	Comparison of the Administration's Requests and CBO's Estimates of Costs for 2007 to Replace and Repair Lost and Returned Equipment	<i>25</i>
2-4.	Summary of Types of Costs Included in the Army's and CBO's Estimates for Reset	<i>27</i>
2-5.	Funding Required and Requested for the Army's Reset Program	<i>29</i>
3-1.	Shortages of Selected Army Systems for Units at Home Stations and Purchases from 2005 to 2007	<i>36</i>

**Figures**

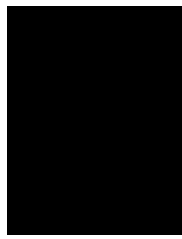
S-1.	Army Procurement Funding, 2004 to 2007	<i>xii</i>
S-2.	Sustainable, Wartime, and Peacetime Operating Tempos of Selected Systems	<i>xiv</i>
1-1.	Value of the Army's Equipment in the Theater, by Type, at the End of 2006	<i>2</i>
1-2.	Helicopter Operating Tempos in Iraq and Afghanistan and in Peacetime	<i>10</i>
1-3.	Combat Vehicle Operating Tempos in Iraq and in Peacetime	<i>11</i>
1-4.	Truck Operating Tempos in Iraq and in Peacetime	<i>12</i>
2-1.	CBO and Army Estimates and Administration Funding Requests for Annual Costs to Replace Battle Losses and Washouts	<i>23</i>



**Figures (Continued)**

2-2.	CBO and Army Estimates and Administration Funding Requests for Annual Costs of Depot-Level Maintenance for Returned Equipment	26
2-3.	CBO and Army Estimates and Administration Funding Requests for Annual Costs of Field-Level Maintenance for Returned Equipment	30
3-1.	Army Procurement Funding, 2004 to 2007	35





## Summary

**T**o support its forces in Iraq and Afghanistan, the U.S. Army has transferred hundreds of thousands of pieces of equipment to the theater (which comprises not only Iraq and Afghanistan but also surrounding areas) and in most cases has brought that equipment back to the United States after about a year. Because of the pace of operations in the theater and the harsh conditions in Southwest Asia, that returning equipment requires repair, reconditioning, and in some instances replacement. The Army refers to the process of bringing returned equipment back up to operating standards as “reset,” and each returned item undergoes that process if it is to be retained. The Army thus far has received \$38 billion to reset more than 300,000 pieces of major equipment; the service estimates that it will continue to need approximately \$13 billion annually for such purposes for as long as the war in Iraq continues at its current level and for at least two years after U.S. forces are withdrawn.

The Congressional Budget Office (CBO) examined the Army’s estimates of the funds needed to meet the requirements of its reset program and the funds that the Administration has requested and received for that purpose from 2005 through 2007. On the basis of the number of forces in the theater and the equipment being returned to Army units’ home stations each year, CBO also estimated the annual costs to replace, repair, and recondition the major types of the Army’s returning equipment—specifically, helicopters, combat vehicles, and trucks. When its calculations differed significantly from those of the Army, CBO attempted to identify the reason for the discrepancy.

As a result of its analysis, CBO observed the following about the pace and conditions under which the Army’s equipment is operating in Iraq and Afghanistan:

- For some weapon systems, operating rates in the theater (for instance, the number of hours per month that

an attack helicopter flies) are several times higher than the systems’ operating rates in peacetime.

- Such systems, most of which were intended to be used during the Cold War, are nevertheless operating at rates below those for which they were designed and, with few exceptions, should be capable of sustaining those rates for many years.
- In some cases, operating conditions in Iraq and Afghanistan, particularly the presence of sand and dust, have led the Army to conclude that once equipment is returned to home stations, it will need more-extensive repairs than the Army had originally anticipated, resulting in higher annual costs for the reset program.

CBO’s findings regarding the Administration’s requests for reset funds include the following:

- More than 40 percent of the requested funds have been designated for activities other than replacing lost equipment or repairing returned systems. Those activities include upgrading systems to make them more capable and buying new equipment to eliminate shortfalls in the Army’s inventories, some of which are long-standing.
- The Administration’s annual funding requests for the Army’s reset program have grown over the 2005–2007 period. CBO cannot determine all of the reasons for the increases on the basis of the data that the Army has provided.
- In general, CBO’s estimates of the annual funding needed to replace and repair the Army’s helicopters, combat vehicles, and trucks are lower than the Administration’s corresponding funding requests.

With respect to concerns expressed by senior military officials and Members of Congress that the current pattern of deployment and reconditioning might result in shortages of equipment, CBO found that shortfalls existed only in the inventories of certain systems and that those shortages had been evident before the start of operations in Iraq. Specifically:

- Inventories of most combat vehicles and helicopters have been sufficient to support operations overseas and to equip units at their home stations.
- Inventories of most types of the Army's modern trucks were insufficient before the war. As a result, those fleets are too small to support operations in Iraq and Afghanistan and at the same time fully equip units at their home stations.
- Equipment shortages among specific units not deployed to Iraq or Afghanistan—such as those in the Army National Guard—existed before the war but have been exacerbated by the Army's requiring units to deploy with a full set of equipment and to leave some of that equipment behind, in the theater.
- The significant investment that the Army has made to procure items that are currently in short supply—which it has done in some cases with funds requested for the reset program—will result in fewer shortages in equipment inventories once all the procured items have been delivered.

### **How Ongoing Operations Affect the Army's Equipment**

Both the Marine Corps and the Army have reset programs designed to recondition equipment used in Iraq and Afghanistan. Of the combined Army and Marine Corps equipment in the theater, that of the Army constitutes almost 85 percent, and the service required more than twice as much funding for 2006 and 2007 for its reset programs as the Marine Corps did. Furthermore, the Army estimates that to continue its program, it will need \$13 billion or more in each of the next two years, compared with the Marine Corps's estimated future requirements of less than \$1 billion annually. Because the Army's program is so much larger than that of the Marine Corps, CBO examined reset requirements and funding solely for the Army's program.

The Office of the Secretary of Defense reported to the Congress in September 2006 that roughly 20 percent of the Army's equipment was in Iraq. Some military spokesmen and Members of Congress are concerned about whether the Army can conduct operations in Iraq and Afghanistan and still equip those of its units that are not deployed there. Others have stated that the harsh operating conditions in Southwest Asia are damaging the Army's equipment. To assess whether the service can equip units not deployed to the theater, CBO examined the types and amounts of equipment that the Army is maintaining there. To assess whether that equipment is being used at unsustainable levels, CBO analyzed the pace at which systems are operating.

### **Effects on Availability of Equipment**

According to CBO's calculations, in early 2007, the Army had almost \$30 billion worth of equipment in Iraq, Afghanistan, and surrounding areas to support its operations in Southwest Asia. About one-third of that equipment remains in the theater permanently (in the pool of so-called theater provided equipment, or TPE), and the other two-thirds is redeployed with units that return home. Typically, 17 percent of the Army's inventory of helicopters, 10 percent of its combat vehicles, and 16 percent of its trucks are in the theater at any given time (see Summary Table 1). Nevertheless, the Army generally has enough helicopters and combat vehicles (which deploy and return with their associated units) to equip its forces, even if some of the items returning from the theater cannot be used because they are being repaired. (The Stryker vehicle is an exception, but recent purchases should alleviate shortages by 2009.)

In contrast, most of the Army's trucks that are supporting operations in Iraq and Afghanistan are being left in the theater for use by subsequently arriving forces. That policy has intensified long-standing shortages of the service's more modern trucks, particularly among units in the reserve component (the Army National Guard and Army Reserve) because of the Army's practice of equipping units in the active-duty Army first. Consequently, even fewer of the Army's most modern trucks are available to equip reserve-component units in the United States. At the end of 2006, according to CBO's calculations, the Army faced potential shortfalls in equipping its units in the United States and Europe of as many as 13,000 modern high-mobility multipurpose wheeled vehicles (HMMWVs); 32,000 FMTV (family of medium tactical vehicle) trucks; and 7,600 heavy trucks. Those

**Summary Table 1.**

## Selected Army Systems in the Theater at the End of 2006 and Equipment Available for Units at Home Stations

	Total Inventory <sup>a</sup>	Systems Typically in the Theater <sup>b</sup>		Number of Systems for Units at Home Stations <sup>c</sup>		
		Number	Percentage of Total Inventory	Requirement <sup>d</sup>	Available <sup>e</sup>	Surplus or Deficit (-) <sup>f</sup>
Helicopters <sup>g</sup>	3,150	530	17	2,500	2,510	10
Combat Vehicles <sup>h</sup>	30,100	2,890	10	13,880	24,200	10,320
Trucks						
Modern trucks <sup>i</sup>	181,400	35,340	19	174,360 <sup>j</sup>	132,800 <sup>j</sup>	-41,560 <sup>j</sup>
Older trucks <sup>k</sup>	53,000	3,100	6	12,300	49,400	37,100
Total, Trucks	234,400	38,440	16	186,660	182,200	-4,460

Source: Congressional Budget Office based on data from the Department of the Army's WebTAADS (the Army Authorization Document System) database and additional Army data.

- All vehicle inventories and requirements are rounded to the nearest 100 vehicles. The corresponding figures for helicopters are rounded to the nearest 10 helicopters.
- Includes equipment in Iraq, Afghanistan, and surrounding areas.
- Units in Europe and the United States that could be deployed overseas.
- Authorized level of equipment needed for units in the Army's active-duty and reserve components.
- Excludes equipment in the theater, in South Korea, or in prepositioned sets on board ships.
- Incorporates the assumption that equipment left in the United States or Europe by deploying units is redistributed to returning units.
- Includes Apache, Kiowa Warrior, Chinook, and Blackhawk helicopters.
- Includes Abrams tanks, Bradley fighting vehicles, M113-based vehicles, M88 recovery vehicles, and Stryker vehicles.
- Includes high-mobility multipurpose wheeled vehicles (HMMWVs), the family of medium tactical vehicles, heavy expanded-mobility tactical trucks, heavy equipment transporters, palletized loading systems, and line-haul trucks (which are similar to commercial tractor-trailers).
- Does not include up-armored HMMWVs (those in which the armor is integral rather than bolted on) because CBO was unable to determine requirements for those vehicles for units at home stations.
- Includes M939, M809, M35, and M44 series medium trucks.

inventory shortages were not all due to ongoing operations in Southwest Asia; some would have existed even without those operations as a result of the creation of the Army's new modular units and the service's long-standing underfunding of its truck programs.<sup>1</sup>

To alleviate some of the shortages, the Administration has included money in its supplemental budget requests—roughly \$11 billion for 2005, \$14 billion for 2006, and

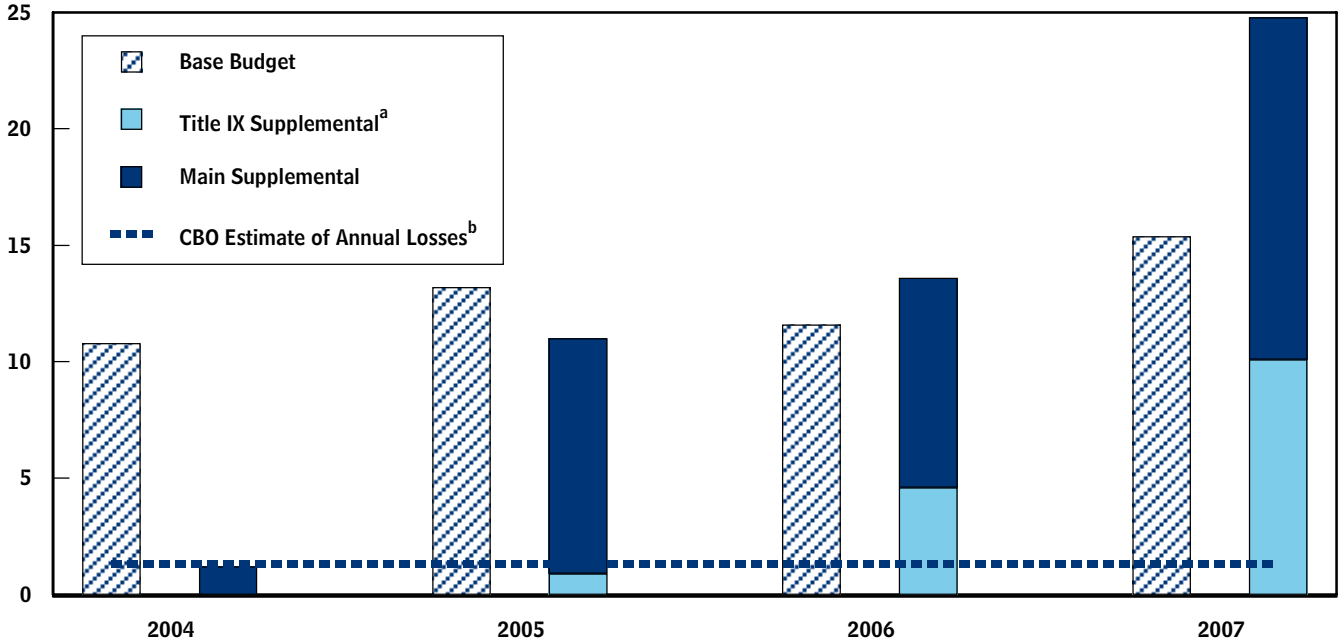
\$25 billion for 2007—to procure additional or upgraded equipment for the Army, some of which is to be purchased as part of the service's reset program. (Of the \$25 billion requested for 2007, the Army plans to use \$2.5 billion to buy equipment for its reserve-component units, in part to replace items left behind in Iraq.) The Army's supplemental procurement funding from 2005 through 2007 totals \$49 billion; in CBO's estimation, that amount is more than enough to purchase replacements for all of the service's equipment deployed at any given time to support operations in Iraq and Afghanistan (see Summary Figure 1).

1. The Army is reorganizing its units to achieve a more standard structure of its forces, an initiative that it terms "modularity." The resulting larger number of smaller units will require more equipment if they are all to be similarly outfitted.

**Summary Figure 1.**

**Army Procurement Funding, 2004 to 2007**

(Billions of dollars)



Source: Congressional Budget Office.

Note: The total value of the Army's equipment in the theater (Iraq, Afghanistan, and surrounding areas) is \$28.2 billion, in CBO's estimation.

- a. "Bridge" funding requested as a supplement after submission of the President's budget and provided in the regular defense appropriation under title IX.
- b. Includes battle losses and washouts (systems deemed irreparably damaged on their return to home stations).

**Effects of Increased Operating Tempos**

The Army maintains that increased operating tempos and harsh conditions in the theater are causing its equipment to wear out prematurely, and the Administration has accordingly requested funding for replacing, completely rebuilding, or upgrading some of the equipment being returned from Southwest Asia. To gauge the magnitude of the stress under which the Army's equipment is functioning, CBO examined recent operating rates for the Army's major systems and compared them with rates during peacetime and rates anticipated for operations during the Cold War.

In general, the Army's major systems are operating at rates that exceed—sometimes by factors of five or six—their average operating rates in peacetime. Helicopters, which have been heavily used in Afghanistan and Iraq, are flying at rates two to three times the average pace of

active-duty units' peacetime operations, and combat vehicles (such as tanks, Bradley fighting vehicles, and Stryker vehicles) are driving four to six times the typical monthly distances. Although those higher operating rates mean that for the same period, the Army's equipment will need more maintenance than it receives in peacetime, they do not necessarily mean that the equipment must be replaced when it returns from the theater. For example, the operating tempo for Bradley fighting vehicles in Iraq—as high as 290 miles per month—is much lower than the 2,500 miles per month envisioned for combat operations against the Warsaw Pact during the Cold War. The same holds true for many of the Army's trucks (with the exception of line-haul trucks, which are similar to commercial tractor-trailers): Although trucks are being driven up to twice as many miles as is typical in peacetime, they are still operating at rates below those expected of them during the Cold War.

CBO also estimated (on the basis of total miles driven or hours flown) the maximum operating rate that some of the Army's current systems could maintain in Iraq and Afghanistan before they reached the end of their useful service lives and needed to be replaced. With the exception of up-armored HMMWVs (which are characterized by armor that is integral to the vehicle rather than bolted on), the rate that could be supported for at least 10 years exceeds the current operating pace, in some cases by more than a factor of 10 (see Summary Figure 2). That finding is based on several premises:

- In general, rates of use for equipment in peacetime are not high. A tank, for example, over a 20-year service life of peacetime activity might drive at most 800 miles a year, or a total of 16,000 miles.
- Except for a few systems (the up-armored HMMWV being the best example), less than 25 percent of the inventories of most major Army systems are in Iraq or Afghanistan.
- Most pieces of equipment are in the theater for only one rotation, lasting 12 months to 15 months; the systems then return to their home stations until their unit rotates back to Southwest Asia. If the stress produced by high-tempo operations is shared equally among all helicopters or vehicles in a fleet, equipment in fleets that have only a small portion of their total inventory deployed to Iraq will experience stressful conditions only part of the time.

That last statement does not apply to the Army's up-armored HMMWVs. As of April 2007, almost 100 percent of that fleet was in the theater, and the HMMWVs were accumulating mileage at relatively high monthly rates. Nevertheless, most of those vehicles were built within the past four years—and many in the past two years—and the fleet as a whole still has the capacity to drive more than a billion miles. As a result, even those systems theoretically could maintain the pace they are currently experiencing in Iraq for at least 10 more years.

Increased operating tempos, together with environmental conditions that include sand and dust, could lead to a need for more-extensive repairs, however, and for that reason, the Administration's supplemental requests for the Army's reset program have included significant amounts of funding—\$1.1 billion for 2005, \$2.0 billion for 2006, and \$3.8 billion for 2007—for depot-level

repairs on returning equipment. (The Army has several depots that perform the more difficult and wide-ranging overhaul and repair work that cannot be carried out by soldiers who use the equipment and who typically perform less extensive field-level maintenance.) Yet the need for more-extensive repairs cannot be tied directly to higher operating rates alone, because the pace of operations, unlike the requests for funding, did not triple between 2005 and 2007. Rather, some of the explanation may be in the Army's experience in dealing with the effects of sand and dust.

By 2006, after more than two years of operations in Iraq, the Army was sending all returning pieces of some types of equipment—for example, Abrams tanks and Bradley fighting vehicles—to a depot to be reconditioned. The tanks and the Bradleys automatically go to a depot for resetting because they must be totally dismantled and thoroughly cleaned before they are returned to service. The difference in costs between reconditioning vehicles in their units—that is, bringing them up to the field-maintenance standard—and resetting them at the depot is at least \$800,000 per tank and \$500,000 per Bradley. CBO estimates that for those weapon systems alone, the annual cost of reversing the effects of sand and dust will be an increase of at least \$700 million in depot-level maintenance costs.

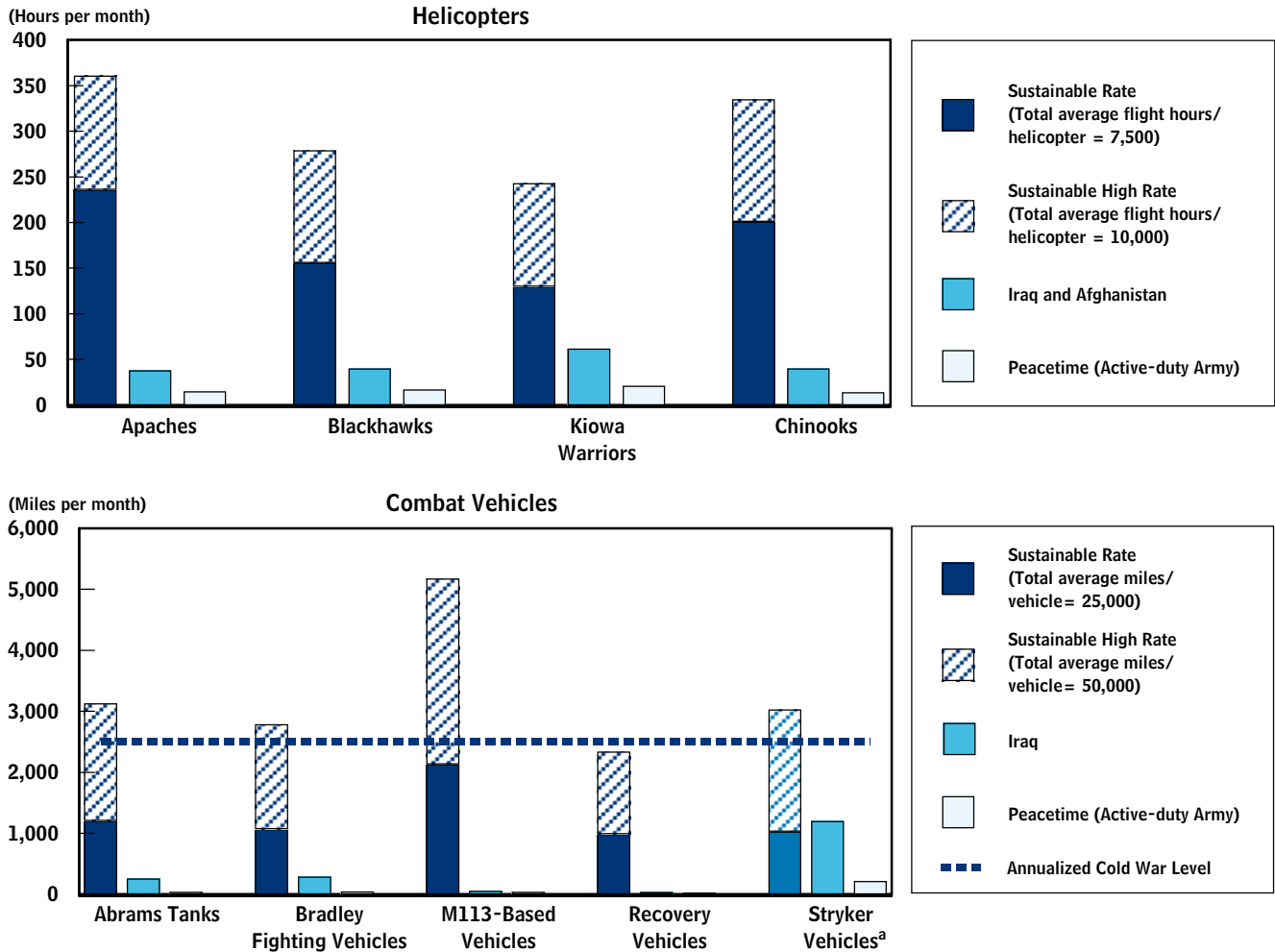
## Estimating Annual Costs for the Army's Reset Program

According to the Chief of Staff of the Army, the reset program is designed to reverse the effects of combat stress on equipment. The program encompasses several activities:

- Replacing equipment lost in the theater or deemed irreparable on its return. (The latter is known as a washout.)
- Repairing and reconditioning systems to bring them back to a satisfactory operating condition either at the field level, by soldiers in the units once they have returned to their home stations, or, in the case of more-extensive repairs, by Army personnel at depots or by contractors at their own sites. (Repairs may have been made to a piece of equipment while it was in the theater, but that activity is not part of the reset program, which comprises only repairs made after equipment has been brought home.)

**Summary Figure 2.**

**Sustainable, Wartime, and Peacetime Operating Tempos of Selected Systems**



Continued

■ Recapitalizing systems, which involves either completely overhauling and rebuilding an item (such as a tank or truck) so that it is returned to an “as-new,” zero-mile condition; or upgrading a system—a more-extensive makeover that also includes substantial improvements in the system’s capabilities.

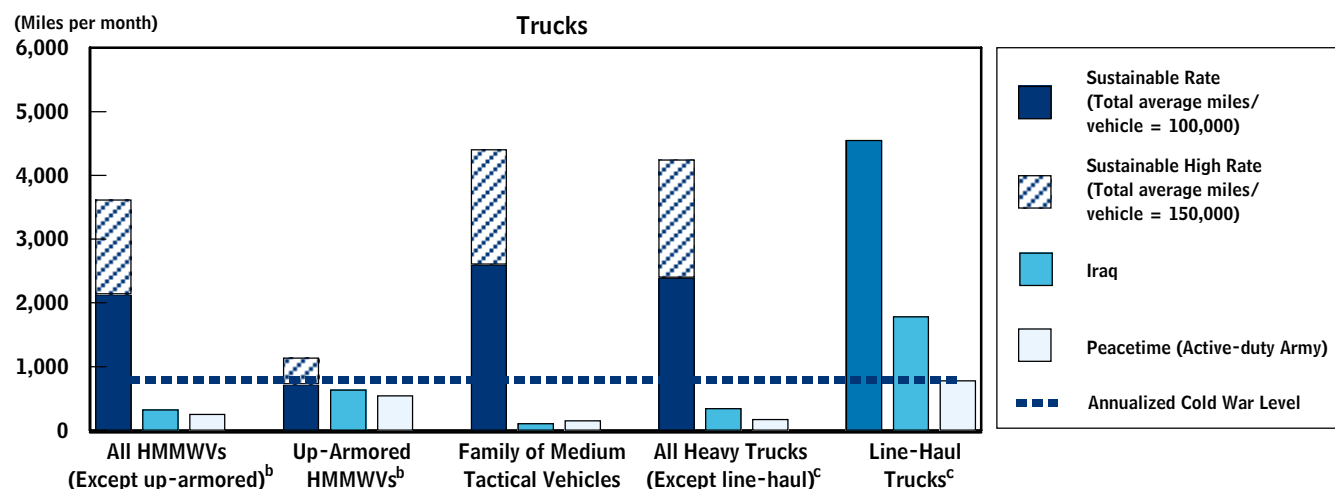
**Estimating Annual Costs for Repairing and Replacing Equipment**

The funds required to repair returning equipment and replace items that are lost in a given year depend on the amount of equipment that the Army expects will be returned and lost during that year and the associated costs for repairs and replacements. The size of the Army’s force

in Iraq and Afghanistan should be the main determinant of the number of pieces of equipment that are returned from or lost in the theater. Although the force’s size has varied, it has remained relatively stable, on average, at roughly 150,000 personnel in recent years, and the budget justification materials that accompany the Administration’s 2007 and 2008 requests for supplemental appropriations show it remaining the same for the foreseeable future. Moreover, the Army, in analyzing its reset requirements for 2007 and thereafter, has assumed that the amount of equipment in and returning from Southwest Asia will remain relatively constant in the next few years.

Most but not all of the equipment in the theater moves in and out with the units to which it is assigned. In general,



**Summary Figure 2.****Continued**

Source: Congressional Budget Office based on data from the Army's aviation community, the Army Materiel Systems Analysis Activity, and the Army's Operating and Support Management Information System.

Notes: HMMWV = high-mobility multipurpose wheeled vehicle.

Sustainable operations are those that CBO estimates can be maintained for 10 years with the current fleet.

- For Stryker vehicles, the total accumulated mileage is assumed to be twice that of tracked vehicles.
- In up-armored HMMWVs, the armor is integral to the vehicle rather than bolted on.
- For line-haul trucks (which are similar to commercial tractor-trailers), the total accumulated mileage per truck is assumed to be 450,000 miles.

until 2007, Army units rotated in and out of the theater roughly annually, and as a result, most equipment remained in the theater for about a year and was then returned to its unit's home station to be reset. The approximately one-third of the Army's equipment in the TPE pool, which stays in the theater permanently, will either be returned home as troops are withdrawn or as the pace of activity permits. Thus, although some equipment from the pool might be returned to the United States in a given year, the bulk of the Army's equipment that requires repair has been the items being returned with their units.

Once the quantity and types of equipment in and returning from the theater are determined, annual costs for repair and replacement depend on the rate of yearly losses in the theater and the level of repair needed to reset equipment that has been returned. The Army distributes returning items among three categories: those that need more extensive repair (depot-level maintenance), those that need less extensive repair (field-level maintenance),

and those that cannot be repaired at all and need to be replaced (washouts). The cost per item increases with the amount of repair needed.

**The Army's Estimating Method.** Starting in 2005 and for every year thereafter, the Army has estimated the annual costs for resetting its equipment. The basis for its estimates has changed as the Army has learned more about the effects that operations in Iraq and Afghanistan have on its weapon systems. For example, the Army originally projected, in 2005, that 15 percent of tanks and Bradley fighting vehicles returning from Iraq would need depot-level repairs, but subsequent experience has shown that all such equipment needs to be repaired at a depot. Averaging over all types of returning equipment (including items that are automatically sent to depots), the Army estimated that in 2006 and 2007, 28 percent of its returning equipment would require depot-level repair, and the remainder, field-level repair. An additional 1 percent to 2 percent of its equipment would be lost annually in the theater or deemed to be washouts.

**CBO's Estimating Method.** CBO estimated yearly costs for the Army's reset program for helicopters, combat vehicles, and trucks in two categories: for systems lost in the theater, the costs to replace them; and for equipment being returned to home stations, the costs to replace washouts and to perform either depot- or field-level repairs on the systems remaining. CBO limited its analysis to helicopters, combat vehicles, and trucks, for two reasons. First, for the three years for which the Army has estimated reset costs (2005, 2006, and 2007), those systems account for two-thirds to three-quarters of the Army's total estimated cost to replace lost equipment and to repair returning equipment. Second, they represent a manageably small number of items, compared with the hundreds of thousands of radios, generators, small arms, and other items that the Army includes in its reset estimates. The Army's reset program also includes one-time costs that CBO did not estimate—for example, costs to reset the prepositioned equipment that the Army has located in other nations and on board ships and the equipment that is part of the TPE pool and remains in the theater.

CBO used the same method that the Army did to estimate costs, multiplying the quantity of returning equipment by the cost to replace or repair it. In addition, CBO used the Army's estimates of the shares of returning equipment requiring replacement or repair and the Army's unit costs for those activities averaged over the three years (2005 to 2007) for which the service has calculated reset costs.

Because of uncertainty about the current disposition of the Army's theater provided equipment, CBO calculated a range of estimated costs for replacing and repairing returned trucks. Almost 75 percent of the Army's trucks in Iraq are in the TPE pool, so the annual rate at which they return to the United States affects the costs associated with repairing them. Originally, the Army had planned to leave all theater provided equipment in place until U.S. forces began to be drawn down, only then returning individual items to the United States for resetting. However, with hostilities continuing longer than it originally anticipated, the Army has begun to return some items—primarily trucks—from the TPE pool to be reset. CBO's estimates of annual costs were based on annual return rates for trucks in the TPE pool that ranged from zero to 50 percent.

**Comparing the Army's and CBO's Estimates.** CBO's estimate of the total annual costs to repair and replace helicopters, combat vehicles, and trucks destroyed in or returned from Iraq and Afghanistan ranges from \$3.2 billion to \$4.1 billion. The Army's estimates of comparable costs grew appreciably from 2005 to 2006, rising from \$2.6 billion to \$5.0 billion, respectively (see Summary Table 2); its estimated funding requirement for both 2006 and 2007, at \$5.0 billion, is \$0.9 billion higher than the top figure in CBO's range. There are numerous reasons for the difference, but the most important factors are the Army's higher projections of the numbers of helicopters lost and trucks returned for resetting.

**Other Costs Included in the Army's Estimates.** The Army estimated the costs of several types of activities that CBO did not address, including:

- Completely rebuilding or upgrading returned equipment and purchasing new or upgraded equipment for its modular or reserve-component units (annual costs of \$3.0 billion to \$5.2 billion);
- Replacing lost items and repairing returned equipment other than helicopters, combat vehicles, and trucks (estimated costs of roughly \$1.2 billion for 2005 and \$1.8 billion for 2006 and 2007);
- Resetting the Army's prepositioned equipment, a one-time cost that the Army argues is critical to enabling it to respond to unexpected crises in remote locations but that CBO did not estimate because of a lack of data about the state of the equipment sets before the war and the Army's desired configuration for them after troops have been withdrawn (annual costs ranging from a low of \$50 million for 2007 to \$1.4 billion for 2006); and
- Repairing equipment that remains in the theater and performing various other unspecified repairs (see Summary Table 2).

CBO excluded some costs from its estimates because they were not directly associated with the need to repair or replace worn, damaged, or destroyed equipment. That rationale applied to the Army's plan to devote \$13 billion over three years to new or upgraded equipment to reduce shortfalls in its equipment inventories and improve its capabilities in the field. In addition, CBO had no basis for independently estimating the amounts that the Army

**Summary Table 2.****Summary of Types of Costs Included in the Army's and CBO's Estimates for Reset**

(Billions of dollars)

	CBO Estimate of Annual Costs <sup>a</sup>	Army Estimate of Requirements and Administration Funding Request		
		2005	2006	2007
<b>Costs for Replacing and Repairing Equipment Used in the Theater</b>				
<i>Replacement of Losses</i>				
Helicopters, Combat Vehicles, and Trucks	0.8 to 1.3	0.7	1.6	1.6
All Other Equipment	n.a.	<u>0.1</u>	<u>0</u>	<u>0</u>
Estimated costs	n.a.	0.8	1.6	1.6
Funds requested	n.a.	0.7	1.1	2.4
<i>Repair of Returning Equipment</i>				
Depot-Level Maintenance				
Helicopters, combat vehicles, and trucks	1.5 to 1.7	0.6	1.6	1.6
All other equipment	n.a.	<u>0.5</u>	<u>0.7</u>	<u>0.7</u>
Estimated costs	n.a.	1.1	2.3	2.3
Funds requested	n.a.	1.1	2.0	3.8
Field-Level Maintenance				
Helicopters, combat vehicles, and trucks	0.9 to 1.1	1.3	1.8	1.8
All other equipment	n.a.	<u>0.6</u>	<u>1.1</u>	<u>1.1</u>
Estimated costs	n.a.	1.9	2.9	2.9
Funds requested	n.a.	1.7	2.5	3.0
<i>Total, Replacement and Repair</i>				
Helicopters, Combat Vehicles, and Trucks	3.2 to 4.1	2.6	5.0	5.0
All Other Equipment	n.a.	<u>1.2</u>	<u>1.8</u>	<u>1.8</u>
Estimated costs	n.a.	3.8	6.8	6.8
Funds requested	n.a.	3.5	5.6	9.2
<b>Other Costs for Resetting Equipment</b>				
Resetting of Army Prepositioned Sets	n.a.	0.7	1.4	*
Rebuilding and Upgrading of Returned Equipment and Purchase of New or Upgraded Equipment for Reserve-Component and Modular Units <sup>b</sup>	n.a.	3.0	5.2	5.2
Other Repair <sup>c</sup>	n.a.	<u>1.6</u>	<u>0.1</u>	<u>0.1</u>
Estimated costs	n.a.	5.3	6.7	5.3
Funds requested	n.a.	3.1	3.0	7.9
<b>All Costs for Replacing, Repairing, and Resetting Equipment</b>				
<b>Total Estimated Costs</b>	<b>n.a.</b>	<b>9.1</b>	<b>13.5</b>	<b>12.1</b>
<b>Total Funds Requested</b>	<b>n.a.</b>	<b>6.6</b>	<b>8.6</b>	<b>17.1</b>

Source: Congressional Budget Office based on data from the Department of the Army.

Note: n.a. = not applicable; \* = less than \$50 million.

- CBO estimated the costs associated with replacing and repairing helicopters, combat vehicles, and trucks only.
- The reserve component comprises the Army National Guard and Army Reserve. Under its modularity initiative, the Army is reorganizing its units into a more standard structure.
- May include establishment of repair facilities in the theater and other unspecified repair costs.

required for various other activities (ranging from \$0.1 billion to \$1.6 billion), including, for 2005, setting up repair facilities in Iraq.

**Reset Funds That Have Been Requested and Received**

Although policymakers have appropriated essentially all of the funds that the Administration has requested for the Army's reset program, those requests have not always

mirrored the service's estimated requirements. For 2005 and 2006, the Administration requested funds (\$6.6 billion and \$8.6 billion, respectively) that were less than the Army's estimated requirements by \$2.5 billion and almost \$5 billion. For 2007, the Administration requested \$17.1 billion in funding, which exceeded the Army's estimated requirements for that year by roughly \$5 billion.

# Introduction and Background

In the spring of 2003, the U.S. military introduced large numbers of ground forces into Iraq and since then has maintained a sizable amount of equipment in the theater to support their activities.<sup>1</sup> A smaller number of forces—requiring a smaller amount of equipment—have been engaged since the fall of 2001 in Operation Enduring Freedom in Afghanistan. This Congressional Budget Office (CBO) paper examines some of the costs associated with reconditioning the equipment used to conduct operations in Iraq and Afghanistan. That process, which the Army calls reset, is designed to bring the equipment that has been returned from the theater back to a satisfactory working condition.

Both the Marine Corps and the Army have large amounts of equipment in Southwest Asia, and both have reset programs that are designed to recondition equipment once it has left the theater. The Army, however, has seven times more equipment in the theater than the Marine Corps has and in the past has required more than twice the reset funding. Furthermore, the Army estimates that it will need \$13 billion or more in each of the next two years to continue its program, compared with the Marine Corps's estimated future requirements of less than \$1 billion annually. As a result, CBO's examination of reset requirements and funding focused on the Army's program alone. Specifically, CBO estimated the annual costs to replace the Army's major equipment lost in the course of operations in Iraq and Afghanistan and to repair and recondition major weapon and support systems that have returned with their units to home stations in the United States and Europe. Because the Army's helicopters, combat vehicles, and trucks constitute a manageable number of items, CBO restricted its analysis to those systems.

---

1. "The theater" refers to Iraq, Afghanistan, and surrounding areas in Southwest Asia, including Kuwait and other nearby countries.

## Army Equipment Supporting Operations in Iraq and Afghanistan

In December 2006, the value of the Army's equipment in the theater totaled almost \$30 billion, CBO estimates. Aircraft and related equipment, weapons and tracked combat vehicles (such as tanks and Bradley fighting vehicles), and tactical vehicles (mainly trucks) accounted for more than 85 percent of that amount; aviation-related equipment represented \$10 billion of the total; weapons and tracked combat vehicles, \$8 billion; and tactical wheeled vehicles, \$7 billion (see Figure 1-1).<sup>2</sup> Most of the equipment (about two-thirds, figured on the basis of value) rotates in and out of the theater with units as they deploy from and return to their home stations; the rest (about one-third) remains in the theater permanently, to be used by units once they arrive. Of the tactical wheeled vehicles used in Iraq, roughly 80 percent (by value) remain in the theater in the pool of what the Army refers to as theater provided equipment (TPE). In contrast, almost all of the Army's aircraft rotate in and out of the theater with their associated units.

The amount of equipment that the Army had in the theater at the end of 2006—almost 570,000 items—is only a fraction of its total inventories. According to the Office of the Secretary of Defense (OSD), equipment in Iraq and surrounding areas represents about 20 percent

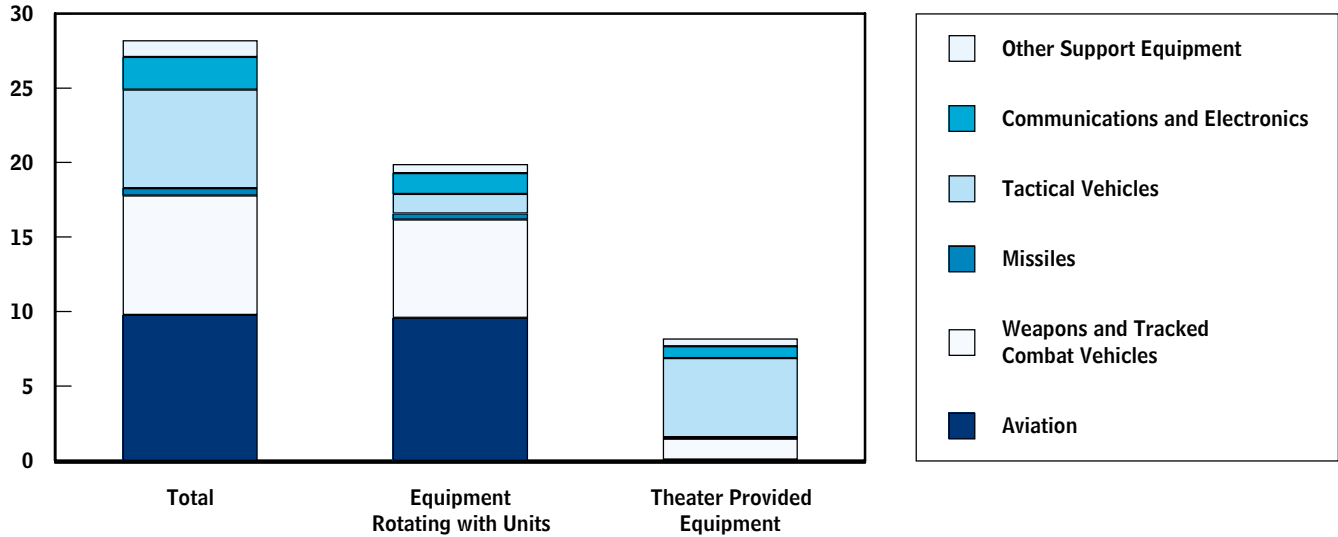
---

2. That equipment breakdown is based on the appropriated funds used to purchase the items. Aviation assets include helicopters and fixed-wing planes as well as ground-support equipment, air traffic control equipment, and aircraft survivability equipment, such as systems designed to defeat enemy missiles. Weapons and tracked combat vehicles include rifles, machine guns, and artillery pieces in addition to tanks, armored personnel carriers, and Stryker vehicles. Tactical vehicles include all of the Army's trucks and associated trailers.

**Figure 1-1.**

**Value of the Army's Equipment in the Theater, by Type, at the End of 2006**

(Billions of dollars)



Source: Congressional Budget Office based on data from the Department of the Army.

Note: "The theater" refers to Iraq, Afghanistan, and surrounding areas in Southwest Asia, including Kuwait and other nearby countries.

of the Army's total fleets.<sup>3</sup> But the portion of the Army's total inventory of a system that is in the theater varies widely by equipment type:

- Approximately 15 percent to 20 percent of the Army's helicopters have been in Iraq and Afghanistan at any given time over the past three years. (Helicopters have figured significantly in the Army's operations in Afghanistan, portions of which are relatively inaccessible to vehicles.)
- The 550 Abrams tanks that have typically been in Iraq make up just less than 9 percent of the service's total inventory of approximately 5,900 tanks, and in general, the Army has deployed similar portions of its inventories of other combat vehicles (see Table 1-1). An exception to that practice is the Army's use of its Stryker vehicles; more than 20 percent of them have typically been deployed.

- The Army has deployed about 57,400 (or less than 20 percent) of its 300,000 trucks and trailers to support operations in Iraq and Afghanistan. It has sent much larger percentages of some of its fleets—such as up-armored versions of the high-mobility multi-purpose wheeled vehicle, or HMMWV—to Iraq.<sup>4</sup> Indeed, almost 100 percent of the Army's total inventory of up-armored HMMWVs were in the theater at the end of April 2007.

Overall, the proportion of the Army's equipment that is now in Southwest Asia—about 20 percent of all types—corresponds roughly to the share of its forces deployed there. The exact numbers have varied since the start of operations; however, estimates are that at any given time in recent years, approximately 150,000 Army personnel have been deployed to Iraq, Kuwait, Afghanistan, and the surrounding areas, accounting for about 20 percent of the Army's deployable forces.<sup>5</sup>

3. That rough estimate encompasses all types of Army equipment in Iraq and surrounding areas, not just the limited number of systems that CBO examined in detail. See Office of the Secretary of Defense, *Long-Term Equipment Repair Costs: Report to Congress* (September 2006), p. 9.

4. In up-armored HMMWVs, the armor is integral to the vehicle rather than bolted on.

5. See Department of the Army, *Fiscal Year (FY) 08 Supplemental Budget Estimate: Operation and Maintenance, Army, Justification Book* (February 2007), p. 4.

**Table 1-1.**

## Inventories of Selected Army Systems at the End of 2006 Compared with Systems in the Theater

	Total Number of Army Systems <sup>a</sup>		Systems Typically in the Theater		Number of Systems Remaining Outside the Theater
	Inventory	Requirements <sup>b</sup>	Number	Percentage of Total Inventory	
<b>Helicopters</b>					
Apaches	690	680	120	17	570
Chinooks	450	450	70	16	380
Kiowa Warriors	350	350	70	20	280
Blackhawks	1,660	1,660	270	16	1,390
<b>Combat Vehicles</b>					
Abrams tanks	5,900	2,800	550	9	5,350
Bradley fighting vehicles	6,700	3,800	640	10	6,060
M113-based vehicles	13,700	7,600	1,220	9	12,480
M88 recovery vehicles	2,400	1,500	180	8	2,220
Stryker vehicles	1,400	2,300	300	21	1,100
<b>Trucks</b>					
<b>HMMWVs</b>					
Up-armored <sup>c</sup>	18,200	10,300	18,000	99	200 <sup>d</sup>
All other models	107,700	116,000	5,800	5	101,900
Total, HMMWVs	125,900	126,300	23,800	19	102,100
<b>Medium trucks</b>					
FMTVs	25,500	53,900	5,200	20	20,300
M939 and M809 series	35,000	9,900	2,700	8	32,300
M35/44 series	18,000	5,900	400	2	17,600
Total, Medium trucks	78,500	69,700	8,300	11	70,200
<b>Heavy trucks</b>					
HEMTTs	14,400	17,200	2,800	19	11,600
HETs	2,700	2,000	640	24	2,060
PLSs	4,000	4,100	1,100	28	2,900
Line-haul <sup>e</sup>	8,900	8,800	1,800	20	7,100
Total, Heavy trucks	30,000	32,100	6,340	21	23,660

Source: Congressional Budget Office based on the Department of the Army's WebTAADS (the Army Authorization Document System) database and additional Army data.

Notes: "The theater" refers to Iraq, Afghanistan, and surrounding areas in Southwest Asia, including Kuwait and other nearby countries.

HMMWV = high-mobility multipurpose wheeled vehicle; FMTV = family of medium tactical vehicles; HEMTT = heavy expanded-mobility tactical truck; HET = heavy equipment transporter; PLS = palletized loading system.

- All vehicle inventories and requirements are rounded to the nearest 100 vehicles. The corresponding figures for helicopters are rounded to the nearest 10 helicopters.
- Requirements are based on authorized levels of equipment as of February 2007 for all units in the Army's active-duty and reserve (National Guard and Army Reserve) components.
- In up-armored HMMWVs, the armor is integral to the vehicle rather than bolted on. Inventories are as of April 2007.
- Some of those vehicles were en route to the theater as of April 2007.
- Similar to commercial tractor-trailers.

## How the Army's Operations in the Theater Affect the Availability of Equipment for Nondeployed Units

The Army's support of its forces in Iraq and Afghanistan limits the equipment available to units that are not deployed there. Among the systems that CBO examined, the Army's fleets of trucks, and especially the most modern models, may be in short supply for nondeployed units as a result of operations in the theater. But other factors affect such availability as well, including the need to equip forces dedicated to the defense of South Korea, the storage of equipment in various places around the world for use in emergencies, and the removal of equipment from service while it is being repaired or upgraded.

### Forces and Equipment Stationed Overseas

The demands made on the Army's fleets in equipping its units and the prepositioned sets that are permanently stationed overseas in some cases limit the equipment available to Army units in the United States and Europe that might be called on to respond to crises requiring military intervention. At the end of 2006, the Army had almost 20,000 soldiers and significant amounts of associated equipment permanently stationed in South Korea. It has positioned additional equipment in South Korea and on board ships, to be used if a crisis arises on the Korean peninsula or (in the case of the sea-based equipment) anywhere in the world. Although the amount of equipment fielded at those locations does not make up a large share of the Army's overall inventories, those prepositioned stocks further reduce what is available for use by units not in Iraq or Afghanistan. For instance, more than 10 percent of the trucks that constitute the Army's family of medium tactical vehicles (FMTVs) are in South Korea or prepositioned on board ships (see Table 1-2).

### Equipment Being Repaired or Upgraded

At any time, some portion of the Army's equipment is unavailable for use because it is being repaired, overhauled, or upgraded. All equipment, if used, requires periodic servicing, and much of that field-level maintenance is provided by the soldiers who use the equipment. More-extensive overhauls and repairs that soldiers cannot perform are carried out at one of the Army's depots (so-called depot-level maintenance). In addition, some of the Army's equipment is undergoing upgrades to replace existing electronic or other components with newer, more sophisticated versions—work that is performed at the depots by Army personnel or by contractors, or by both

together.<sup>6</sup> In some cases, upgrading a complicated vehicle or helicopter (that is, replacing older components with newer, more capable ones) can take as long as two years. In part because of the need to overhaul equipment returning from Iraq and Afghanistan, in early 2007, significant backlogs of vehicles were awaiting overhauling or upgrading at the Army's depots. Those backlogs included hundreds of Abrams tanks and Bradley fighting vehicles and more than 2,000 HMMWVs (see Table 1-2).

### Potential Shortages of Equipment

When the equipment that is overseas or at depots is combined with the equipment that is permanently deployed in Iraq, Afghanistan, and their environs, the total amount of equipment that is unavailable to units at their home stations may represent as much as one-third of an entire fleet. In one instance, that of up-armored HMMWVs, hardly any of those vehicles are available to units in the United States and Europe (see Table 1-2). Consequently, soldiers who are preparing to deploy to Iraq cannot train on the vehicles that they will be driving in the theater, a troubling matter for those troops, according to the Government Accountability Office (GAO), because, for example, HMMWVs that are not armored have different handling characteristics and designs than the HMMWVs used in Iraq.<sup>7</sup>

Among the equipment inventories that CBO examined, truck fleets could experience the most shortages as a result of the demands associated with operations in Iraq. Those potential shortfalls primarily stem from the Army's policy that most of the trucks used in the theater remain there and do not return home with their units. The share of some truck fleets that remains permanently in Iraq is less than 10 percent, but the proportion of heavy trucks and FMTVs is larger—from 13 percent to 23 percent. As for up-armored HMMWVs, almost all of them remain in Iraq.

6. For example, when an Abrams tank undergoes a major upgrade, personnel at a depot dismantle it and ship the reusable parts to a contractor for upgrading and reassembling.

7. Statement of William M. Solis, Director, Defense Capabilities and Management, Government Accountability Office, before the Subcommittees on Readiness and Air and Land Forces of the House Committee on Armed Services, published as Government Accountability Office, *Defense Logistics: Preliminary Observations on the Army's Implementation of Its Equipment Reset Strategies*, GAO-07-439T (January 31, 2007).



**Table 1-2.**

## Inventories and Lack of Availability of Selected Army Systems for Use by Units at Home Stations at the End of 2006

	Total Inventory <sup>a</sup>	Location of Unavailable Systems			Unavailable Systems as a Percentage of Total Inventory
		In South Korea or Prepositioned <sup>b</sup>	Permanently in Iraq and Afghanistan	At Depots <sup>c</sup>	
<b>Helicopters</b>					
Apaches	690	50	0	1	7
Chinooks	450	10	5	0	3
Kiowa Warriors	350	0	0	0	0
Blackhawks	1,660	50	0	1	3
<b>Combat Vehicles</b>					
Abrams tanks	5,900	220	50	620	15
Bradley fighting vehicles	6,700	360	10	730	16
M113-based vehicles	13,700	540	220	450	9
M88 recovery vehicles	2,400	110	30	0	6
Stryker vehicles	1,400	0	0	0 <sup>d</sup>	0
<b>Trucks</b>					
<b>HMMWVs</b>					
Up-armored <sup>e</sup>	18,200	500	18,000	0	100
All other models	107,700	5,000	2,300	2,300	9
Total, HMMWVs	125,900	5,500	20,300	2,300	22
<b>Medium trucks</b>					
FMTVs	25,500	3,400	3,200	180	27
M939 and M809 series	35,000	300	2,200	90	7
M35/44 series	18,000	100	100	10	1
Total, Medium trucks	78,500	3,800	5,500	280	12
<b>Heavy trucks</b>					
HEMTTs	14,400	1,000	2,000	100	22
HETs	2,700	300	600	20	34
PLSs	4,000	400	900	40	34
Line-haul <sup>f</sup>	8,900	200	1,700	60	22
Total, Heavy trucks	30,000	1,900	5,200	220	24

Source: Congressional Budget Office based on the Department of the Army's WebTAADS (the Army Authorization Document System) database and additional Army data.

Note: HMMWV = high-mobility multipurpose wheeled vehicle; FMTV = family of medium tactical vehicles; HEMTT = heavy expanded-mobility tactical truck; HET = heavy equipment transporter; PLS = palletized loading system.

- All vehicle inventories are rounded to the nearest 100 vehicles. The corresponding figures for helicopters are rounded to the nearest 10 helicopters.
- Numbers are based on authorized requirements and may not represent the actual equipment assigned to South Korea or to prepositioned sets at the end of 2006.
- Backlogs at depots as of November 2006.
- Stryker vehicles are repaired by soldiers in units and by contractors at special facilities at a unit's home station.
- In up-armored HMMWVs, the armor is integral to the vehicle rather than bolted on. Inventories and numbers of vehicles in Iraq and Afghanistan are as of April 2007.
- Similar to commercial tractor-trailers.

With so many trucks being left in the theater, returning units must rely on equipment supplied from excess stocks or left behind by deploying units. In some cases, as with HMMWVs, FMTVs, and heavy expanded-mobility tactical trucks (HEMTTs), there is no surplus—indeed, the Army does not have enough of those types of trucks to equip all of its units.<sup>8</sup> And even when the service has sufficient trucks for its forces, the Army's permanent stationing of a significant portion—almost 20 percent, in the case of the line-haul fleet—of its total inventory in Iraq means that, without the redistribution to returning units of the equipment left behind in the United States and Europe by deploying troops, insufficient trucks remain to equip forces that are not in Iraq.<sup>9</sup>

CBO's analysis demonstrates that this is the case across the board with respect to the Army's most modern trucks (such as HMMWVs, FMTVs, and many heavy trucks; see Table 1-3).<sup>10</sup> Even under a perfect redistribution of the trucks left behind at units' home stations, shortages of several thousand HMMWVs and heavy trucks and of more than 28,000 FMTVs would result. And if trucks were not redistributed among units remaining at or returning home, much larger shortages might ensue.<sup>11</sup> The extent of the overall shortfall in the heavy-truck fleet could more than double, and the shortage of HMMWVs that are not up-armored could approach 13,000 (see Table 1-3). Although the Army might be able to fill some

8. Even in the absence of constraints arising from operations in Iraq, the Army would need almost 30,000 additional FMTVs and almost 3,000 more HEMTTs to fully equip its forces.

9. Line-haul trucks are similar to commercial trucks that haul 18-foot trailers.

10. CBO's definition of modern trucks includes the most recent model series in each of the Army's three truck families. For light trucks—typically those with a payload of 1½ ton or less—HMMWVs are the most recent model. In the medium-truck category—those with a 2½ ton or 5 ton capacity—the FMTVs, which were introduced in 1996, are the most modern. (In comparison, the M35/M44 series trucks were first fielded in 1965, the M939s and M809s in 1983.) Most of the Army's heavy trucks—those with a capacity greater than 5 tons—date from 1982 or later. The exception is the Army's fleet of line-haul trucks, some of which were first fielded in 1977.

11. For instance, transferring equipment from units stationed in Europe to units stationed in the United States, or from units in Maine to units in California, might prove difficult. Furthermore, the redistribution of Army National Guard equipment across state lines could raise some obstacles because of the differing needs of individual states.

of the gaps with older versions of trucks of similar capacity—substituting M939 and M35 series trucks for FMTVs, for example—those older trucks are not as sophisticated and capable as the more modern ones they would be replacing. And in some cases, such as that of HMMWVs, the Army does not have large numbers of suitable substitute vehicles in its inventory.

The lack of suitable equipment for units not deployed to operations in Southwest Asia has prompted concern among military officials, such as the Army's Chief of Staff and the Chairman of the Joint Chiefs, and some Members of Congress. With so many of the service's most advanced weapon systems either in Iraq or being repaired or overhauled, some defense policymakers argue that units not involved in Iraq will be inadequately equipped and ill prepared to respond quickly to a crisis. In the case of major systems, such as Abrams tanks and Bradley fighting vehicles, the Army has sufficient equipment in its inventories for all of its units; but should the need arise for thousands of specialized pieces of equipment, such as specially armored HMMWVs, the Army could come up short. Yet the demand for up-armored HMMWVs and armored trucks in other operations might be small—such vehicles would not be useful, for example, if the Army had to respond to a natural disaster in the United States or to a major theater war, such as one on the Korean peninsula in which trucks would be constrained primarily to rear areas. (Up-armored trucks have been produced in large numbers specifically in response to conditions in Iraq.)

A further point is that the Army received funds for 2005, 2006, and 2007 to purchase large numbers of several types of vehicles that are now in high demand (see the later discussion). Although it may take one or two years for all equipment purchased with those funds to be delivered, that investment should go a long way toward alleviating some of the currently perceived shortfalls in equipment.

## Conditions in the Theater and Their Effect on the Army's Equipment

Many Army officials have spoken about the difficult conditions in which the service's equipment must operate in Iraq and Afghanistan and the deleterious effects those conditions have on the Army's equipment. Although systems are, indeed, operating in a much more grueling environment than the ones in which they typically

**Table 1-3.**

### Selected Army Systems Required and Available for Use by Units at Home Stations at the End of 2006

	Total Inventory <sup>a</sup>	Requirement <sup>b</sup>	Systems for Units at Home Stations			
			Perfect Redistribution <sup>c</sup>		Imperfect Redistribution <sup>d</sup>	
			Number Available	Surplus or Deficit (-)	Number Available	Surplus or Deficit (-)
<b>Helicopters</b>						
Apaches	690	510	520	10	520	10
Chinooks	450	370	370	0	365	-5
Kiowa Warriors	350	280	280	0	280	0
Blackhawks	1,660	1,340	1,340	0	1,340	0
<b>Combat Vehicles</b>						
Abrams tanks	5,900	2,030	4,500	2,470	4,450	2,420
Bradley fighting vehicles	6,700	2,800	5,000	2,200	4,990	2,190
M113-based vehicles	13,700	5,840	11,500	5,660	11,280	5,440
M88 recovery vehicles	2,400	1,210	2,100	890	2,070	860
Stryker vehicles	1,400	2,000	1,100	-900	1,100	-900
<b>Trucks</b>						
HMMWV models except up-armored vehicles <sup>e</sup>	107,700	105,200	94,600	-10,600	92,300	-12,900
<b>Medium trucks</b>						
FMTVs	25,500	45,300	16,700	-28,600	13,500	-31,800
M939 and M809 series	35,000	6,900	31,900	25,000	29,700	22,800
M35/44 series	18,000	5,400	17,500	12,100	17,400	12,000
Total, Medium trucks	78,500	57,600	66,100	8,500	60,600	3,000
<b>Heavy trucks</b>						
HEMTTs	14,400	13,400	10,500	-2,900	8,500	-4,900
HETs	2,700	1,060	1,700	640	1,100	40
PLSs	4,000	2,600	2,500	-100	1,600	-1,000
Line-haul <sup>f</sup>	8,900	6,800	6,800	0	5,100	-1,700
Total, Heavy trucks	30,000	23,860	21,500	-2,360	16,300	-7,560

Source: Congressional Budget Office based on the Department of the Army's WebTAADS (the Army Authorization Document System) database and additional Army data.

Note: HMMWV = high-mobility multipurpose wheeled vehicle; FMTV = family of medium tactical vehicles; HEMTT = heavy expanded-mobility tactical truck; HET = heavy equipment transporter; PLS = palletized loading system.

- All vehicle inventories are rounded to the nearest 100 vehicles. The corresponding figures for helicopters are rounded to the nearest 10 helicopters.
- Systems required for units in the United States and Europe that are not deployed to Southwest Asia.
- Incorporates the assumption that equipment left in the United States or Europe by deploying units is redistributed to returning units.
- Incorporates the assumption that equipment left in the United States or Europe by deploying units is not redistributed to returning units.
- CBO was unable to estimate requirements for up-armored HMMWVs (those in which the armor is integral to the vehicle rather than bolted on) for units at their home stations.
- Similar to commercial tractor-trailers.

function during peacetime, the conditions in Southwest Asia—with some exceptions—are within the bounds of what the equipment was originally designed to endure. Factors that have been cited by representatives of the Army and the Department of Defense as hastening the deterioration of equipment in Iraq and ultimately contributing to higher reset costs include high rates of operation, harsh climatic and environmental conditions, and the requirement for protective armor for trucks.

### Operating Tempos in Iraq and Afghanistan

Since the beginning of operations in Iraq, the Army has at times reported that its systems are operating at rates as much as 10 times higher than those experienced in peacetime.<sup>12</sup> Although that kind of increased pace may be the case for short periods and for some specific types of equipment, it does not apply to all of the Army's systems and in the past has not been maintained for long periods.

**Helicopters.** The Army's helicopters have seen heavy use in operations in Iraq and Afghanistan (see Table 1-4). Data collected by the Army's aviation community yield monthly operating tempos for the service's helicopters in the theater that are 2.4 to 3 times the average peacetime rates of helicopters in the Army's active-duty units (see Figure 1-2).

**Combat Vehicles.** These systems (examples are Abrams tanks and Bradley fighting vehicles) have also been operating at rates higher than those typical of peacetime operations, according to data collected by the Army Materiel Systems Analysis Activity, or AMSAA (see Table 1-4 and Figure 1-3).<sup>13</sup> Rates of use in the theater for some combat systems, though, such as the M88 recovery vehicles, do not differ significantly from those typical of peacetime. Furthermore, more-modern versions of some systems—the M1A2 Abrams tanks and the A3 versions of the M2 and M3 Bradley fighting vehicles—exhibit higher operating rates than do older, less sophisticated versions of the same system.<sup>14</sup> That discrepancy may be due to a preference of commanders in the theater to use more-capable versions of weapon systems more intensively, or it

may be an anomaly arising from the small samples that AMSAA used in its study, which typically included 30 percent or less of a particular type of vehicle fleet.<sup>15</sup> Rates of use for tanks, Bradley fighting vehicles, and Stryker vehicles have been approximately four to six times those typical of peacetime (see Table 1-4). In contrast, rates of use for the older M113-based vehicles and M88 recovery vehicles have been much closer to those experienced in peacetime.

**Trucks.** Heavy trucks have been operating in Iraq at rates that are roughly twice their operating rates in active-duty units in peacetime (see Table 1-4 and Figure 1-4 on page 12). Although those rates are not particularly high when compared with those at which civilian trucks normally operate, they could be especially wearing because some trucks remain in the theater for several years.<sup>16</sup> In contrast, trucks that rotate back with their units to home stations—about a quarter of all trucks in the theater—will be subject to those higher rates for at most 15 months, while a unit is deployed to the theater.<sup>17</sup> Other types of trucks are operating at rates closer to those they experience in peacetime—for example, HMMWVs are operating at rates that are somewhat higher than their peacetime tempos and FMTVs at rates that are somewhat lower.

### Putting Operating Tempos in Context

Although the Army's equipment is being operated in Iraq and Afghanistan at rates that are higher than those typical

12. See Congressional Budget Office, *The Potential Costs Resulting from Increased Usage of Military Equipment in Ongoing Operations* (March 18, 2005), p. 10.

13. Henry Simberg, *AMSAA Sample Data Collection: Ground System Usage and Parts Replacement Analysis, Operation Iraqi Freedom* (Army Materiel Systems Analysis Activity, May 2007); and additional data provided by AMSAA to the Congressional Budget Office.

14. According to AMSAA's data, which cover October 2003 through April 2007, operating tempos for M1A2s were almost twice those of M1A1s—258 miles per month versus 134 miles per month. Comparable data for the A3 and A2 versions of the Bradley fighting vehicle were 480 miles per month and 220 miles per month, respectively. The operating rate for M88A2 recovery vehicles was 43 miles per month, compared with 32 miles monthly for the M88A1, according to AMSAA's data.

15. An exception is the Stryker vehicles: AMSAA has been monitoring the activity of almost all of the Stryker vehicles in the theater.

16. How long a truck that is part of the TPE pool will remain in the theater is unclear. Although those vehicles were originally intended to remain there for the duration of operations, a significant number have been returned to the United States for resetting.

17. The Chief of Staff of the Army has announced that starting in mid-2007, all active-duty units sent to Iraq or Afghanistan will spend 15 months in the theater (rather than 12 months, as previously). Given that the policy does not apply to units in the reserve component of the Army, it is unclear what effect it will have on the condition of equipment returned for resetting.

**Table 1-4.**

## Usage Rates for Selected Army Systems During Operations in the Theater and in Peacetime

	Operations in the Theater <sup>a</sup>		Peacetime Operating Tempo <sup>c</sup>
	Number of Systems Typically Deployed	Operating Tempo <sup>b</sup>	
<b>Helicopters (Tempo = hours flown per month)</b>			
Apaches	120	38	15
Chinooks	70	40	14
Kiowa Warriors	70	62	21
Blackhawks	270	40	17
<b>Combat Vehicles (Tempo = miles driven per month)</b>			
Abrams Tanks	550	200	45
Bradley Fighting Vehicles	640	290	50
M113-Based Vehicles	1,220	60	45
M88 Recovery Vehicles	180	40	30
Stryker Vehicles	300	1,200	220
<b>Trucks (Tempo = miles driven per month)</b>			
HMMWVs			
Up-armored <sup>d</sup>	18,000	640	550
All other models	5,800	330	260
Family of Medium Tactical Vehicles	5,200	110	160
Heavy Trucks			
Line-haul <sup>e</sup>	1,800	1,790	780
All other models	4,540	350	180

Source: Congressional Budget Office based on data from the Army's aviation community, the Army Materiel Systems Analysis Activity, and the Army's Operating and Support Management Information System.

Note: HMMWV = high-mobility multipurpose wheeled vehicle.

- a. Includes Iraq, Afghanistan, and surrounding areas.
- b. Operating tempos for helicopters are based on cumulative hours flown from February 1, 2003, through January 15, 2006. Tempos for combat vehicles and trucks are based on data from the Army Materiel Systems Analysis Activity covering periods of varying duration and different sample sizes. Equipment that is listed in the agency's database and that rotates in and out of the theater with units is typically deployed for about 12 months.
- c. Average monthly operating tempo for a system in an active-duty unit from 1995 through 2005, excluding contingency operations.
- d. In up-armored HMMWVs, the armor is integral to the vehicle rather than bolted on.
- e. Similar to commercial tractor-trailers.

of peacetime, the equipment was designed for operating tempos that are even more intense. The rates that Army planners envisioned for major combat operations during the Cold War—specifically, a confrontation with the Warsaw Pact, which almost all of the Army's current equipment was designed for—are many times higher than current peacetime rates and, for most types of equipment, higher than those currently being experienced in Iraq and Afghanistan. Specifically, planners expected that

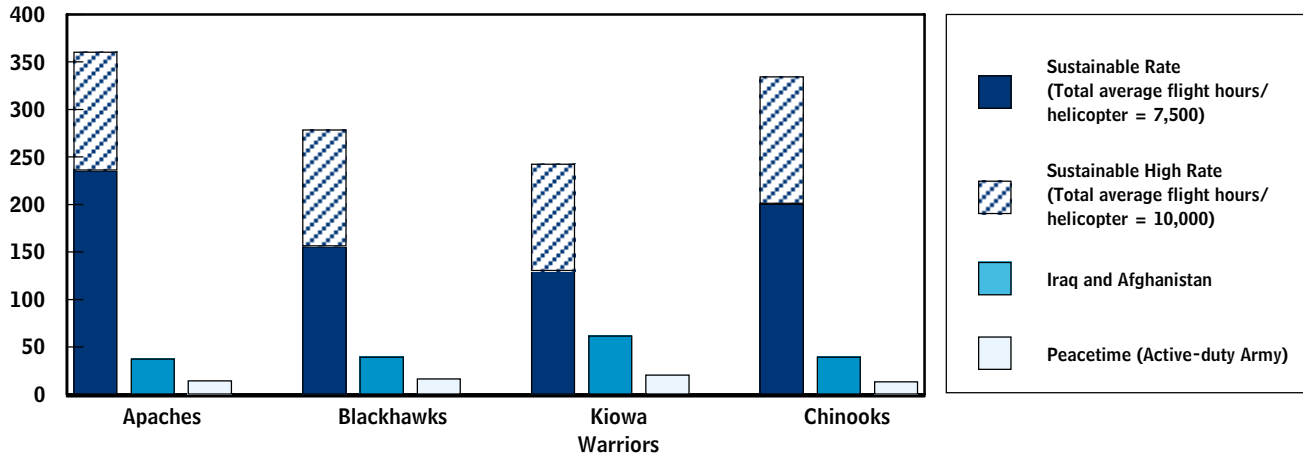
for several months, helicopters would be flying for 4 hours per day and combat vehicles and trucks would be driving 250 miles and 80 miles per day, respectively.<sup>18</sup> Those daily operating tempos translate into monthly

18. John C.F. Tillson and others, *Review of the Army Process for Determining Force Structure Requirements*, IDA Paper P-3189 (Alexandria, Va.: Institute for Defense Analyses, May 1996).

**Figure 1-2.**

## Helicopter Operating Tempos in Iraq and Afghanistan and in Peacetime

(Hours per month)



Source: Congressional Budget Office based on data from the Army’s aviation community and the Army’s Operating and Support Management Information System.

Note: Sustainable operations are those that CBO estimates can be maintained for 10 years with the current fleet.

rates of 120 hours for helicopters, 7,500 miles for combat vehicles, and 2,400 miles for trucks.

Equipment usage rates such as those envisioned during the Cold War and currently being experienced in Iraq could result in increased costs because of the demand for more maintenance and spare parts. But, as the Secretary of Defense reported to the Congress, they are not “necessarily an indicator that equipment is being pushed beyond what it can accomplish.”<sup>19</sup> The very high levels of activity that current systems were expected to sustain for several months during the Cold War can be used to establish annual benchmarks. If the vehicular activity that would have taken place in four months during a Cold War-era confrontation were spread over a year, the monthly operating pace would be lower and more sustainable. Annualized versions of the rates anticipated for combat during the Cold War—2,500 miles a month for combat vehicles and 800 miles a month for trucks—are much higher than those experienced today in Iraq and Afghanistan by all but the Army’s line-haul trucks (see Figures 1-3 and 1-4).

Helicopters present a slightly different case but are still operating well within their design limits. Indications of those limits can be gleaned from the fact that attack-helicopter units in the Army provide enough support personnel to enable such aircraft to fly 780 hours per year, or 65 hours per month. Those rates—although less than the levels anticipated during the Cold War—are nevertheless higher than the current operating rates of most helicopters in Iraq and Afghanistan.

### Can the Army’s Equipment Sustain Today’s Operating Tempos?

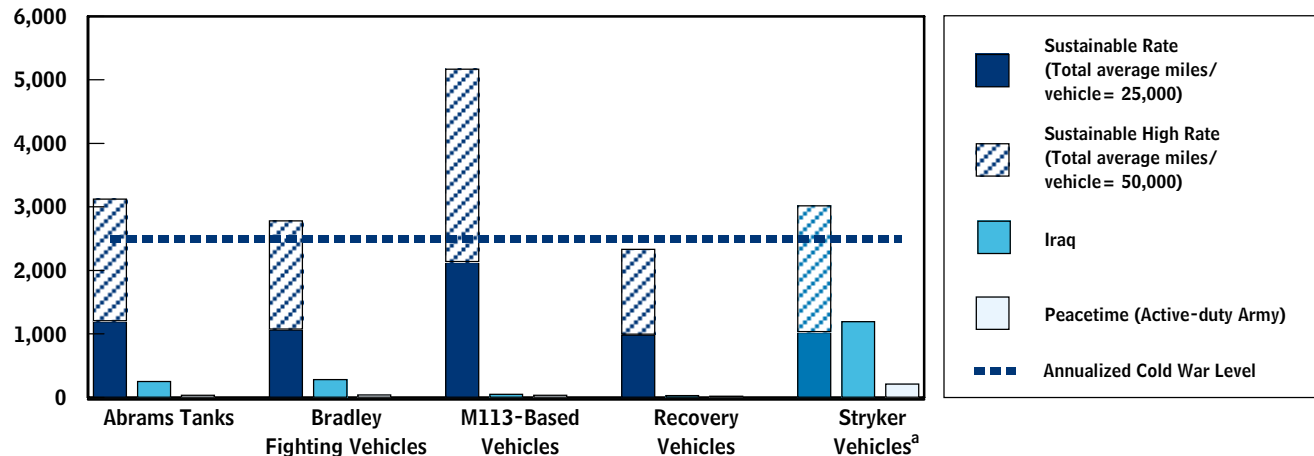
Even though it appears that most types of Army equipment were designed to sustain the present operating tempo in Iraq over the short term, how long can the Army’s current inventory of equipment continue operations at today’s pace? A consideration of the tank fleet suggests an answer to that question.

Whether the Army’s total tank fleet can keep operating in Iraq at the current pace depends on the portion of the fleet that is deployed there for each rotation, the total number of miles that a tank can reasonably accumulate before it is no longer considered usable, and the mileage that an average tank had accumulated by the end of 2006. As is the case for almost all of the Army’s helicopters and most of its combat vehicles, under the Army’s current policy, an individual tank will sustain high rates

19. Office of the Secretary of Defense, *Ground Force Equipment Repair, Replacement, and Recapitalization Requirements Resulting from Sustained Combat Operations: Report to the Congress* (April 2005), p. 3.

**Figure 1-3.****Combat Vehicle Operating Tempos in Iraq and in Peacetime**

(Miles per month)



Source: Congressional Budget Office based on data from the Army Materiel Systems Analysis Activity and the Army's Operating and Support Management Information System.

Note: Sustainable operations are those that CBO estimates can be maintained for 10 years with the current fleet.

a. For Stryker vehicles, the total accumulated mileage is assumed to be twice that of tracked vehicles.

of operation for at most 15 months before it is shipped back to its home station for maintenance and overhauling. Thus, if the Army rotates tanks from the entire fleet through units deploying to Iraq, a tank might be in the theater for 15 months, drive as much as 3,000 miles there, rotate home, and not be deployed back to Iraq for several years. In the meantime, the average annual peacetime operating tempo—the Army has typically budgeted for 800 miles per tank per year—will contribute to the tank's overall mileage at a much slower pace.<sup>20</sup>

The current deployment of roughly 11 percent of the total tank inventory of M1A1 and M1A2 tanks means that if the Army spread the burden out over the entire fleet, each tank would be sent to Iraq once every 9 rotations—or every 11 years, if rotations lasted 15 months.<sup>21</sup> The average tank in the current fleet of

M1A1 and M1A2 tanks was about 15 years old at the end of 2006, and had accumulated an average of almost 5,000 miles (based on a sample that included roughly half of the Army's M1A1s and M1A2s).<sup>22</sup> If a tank can accumulate 50,000 miles before it is retired, no matter how old it is, then at the end of 2006, an average tank could be used for almost 45,000 more miles.<sup>23</sup> Under the assumption of a rotation rate of 10 years of peacetime operations for every 15 months in Iraq, an average tank could be sent to 9 rotations spread over more than 100 years (based solely on total mileage used) before it

20. Actual average operating rates have been significantly lower during peacetime—540 miles over the past 10 years—even for tanks in active-duty units. Tanks in the National Guard are driven many fewer miles per year.

21. The Army's total M1 tank inventory includes almost 680 older M1 and M1 Improvement Program models, which are not being deployed to Iraq. A typical deployment of 550 tanks represents 11 percent of the Army's total inventory of almost 5,240 M1A1 and M1A2 tanks.

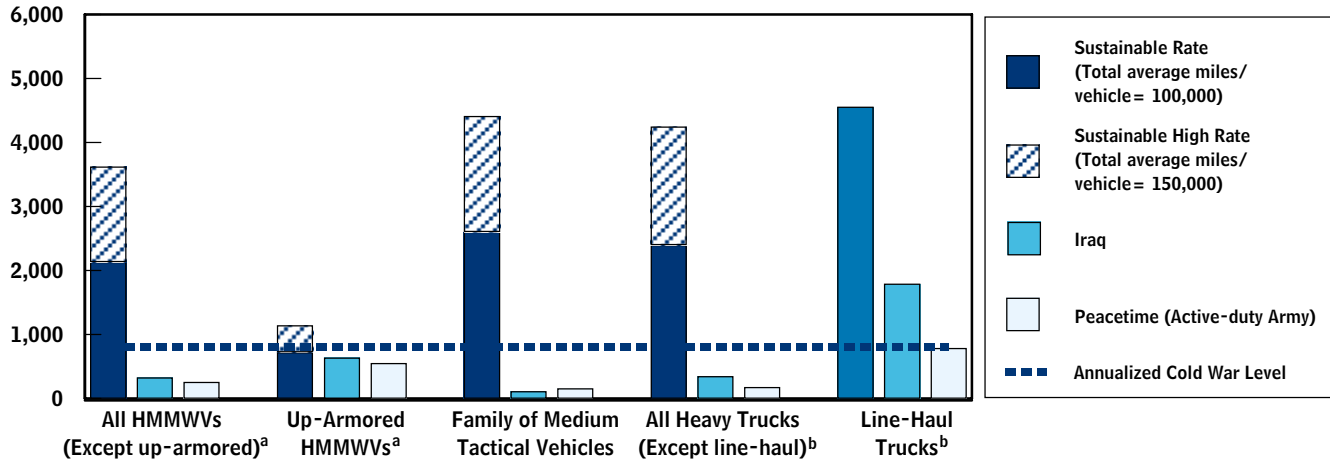
22. That figure is the average mileage accumulated by all M1A1 and M1A2 tanks currently assigned to units—active duty, National Guard, and administrative—in the Army. The annual mileage per tank averaged over the entire fleet (which includes tanks that accumulate no mileage in a given year, such as those in prepositioned sets) has been 360 miles over the past 10 years.

23. CBO could not document the Army's or the manufacturer's maximum mileage limits for tanks. A minimum limit could be constructed on the basis of 19 years at peacetime rates of 800 miles per year and one rotation to Iraq, for a total of roughly 20,000 miles. However, individual tanks are obviously capable of driving more than 20,000 miles because 24 tanks within the sample of roughly half of the total M1A1 and M1A2 tanks in the inventory have accumulated more than that number. Indeed, 11 tanks from the same sample have accumulated more than 50,000 miles, and 7 tanks, more than 100,000 miles.

**Figure 1-4.**

## Truck Operating Tempos in Iraq and in Peacetime

(Miles per month)



Source: Congressional Budget Office based on data from the Army Materiel Systems Analysis Activity and the Army's Operating and Support Management Information System.

Notes: Sustainable operations are those that CBO estimates can be maintained for 10 years with the current fleet.

HMMWV = high-mobility multipurpose wheeled vehicle.

- a. In up-armored HMMWVs, the armor is integral to the vehicle rather than bolted on.
- b. For line-haul trucks (which are similar to commercial tractor-trailers), the total accumulated mileage per truck is assumed to be 450,000 miles.

accumulated its limit of 50,000 miles. The corresponding value for a 100,000-mile lifetime limit would be 18 rotations.

Alternatively, the Army's current equipment could support a much higher pace of operations in Iraq for a much shorter period. CBO calculated the operating level for helicopters, combat vehicles, and trucks that could be supported in Iraq—or in the case of helicopters, in Iraq and Afghanistan—for the next 10 years (from the end of 2006 through the end of 2016). CBO assumed for its analysis that all equipment in each fleet would share equally in the burden of operations in Southwest Asia; that is, in general, a piece of equipment would stay in the theater for 15 months and then be replaced by a new piece of equipment that had been at a unit's home station and operating at peacetime rates for a number of years.<sup>24</sup> (That assumption is valid only for some of the trucks now in Iraq, as discussed later.)

**Helicopters.** Under the above assumptions, most of the Army's helicopters should be able to operate for the next 10 years at tempos much higher than those experienced

during recent operations, in CBO's estimation (see Figure 1-2 on page 10). CBO's analysis also incorporated the assumption of a total lifetime limit of 10,000 flight hours for each of the Army's helicopters. (That limit corresponds to the number of hours at which the Navy tests its helicopters to see if they remain flightworthy.) Under that assumption, all of the service's helicopters could operate for 10 more years at tempos four to nine times higher than those currently being experienced—but if they did so, all helicopters in the fleet would have accumulated 10,000 flight hours by 2016 and be at the end of their useful lives.

24. In conversations with CBO staff, representatives of the Army indicated that the service was bringing some tanks back from Iraq, overhauling them at a depot, and reassigning them to units being sent back to the theater. Although that practice would cause individual tanks to accumulate mileage faster than the above discussion indicates, other tanks in the fleet would be accumulating mileage solely at the peacetime rate and could be called into service later. An additional factor is that Army documents describe tanks that have been overhauled at the depot as having returned to a "zero-mile" condition.



Limiting total average flying time to 7,500 hours for each helicopter over the next 10 years would leave the Army's helicopter fleet with enough residual capacity after 2016 to fly 10 more years at peacetime rates. And even that lower level would allow the Army's helicopters through 2016 to fly at rates two to six times those currently being flown in Iraq and Afghanistan (see Figure 1-2 on page 10). Moreover, according to the OSD's April 2005 report to the Congress, the Army can gauge and mitigate the increased wear resulting from operations in Iraq and Afghanistan by using existing maintenance procedures—because managing the effects of operating tempos is an integral part of helicopter units' regular maintenance activities.<sup>25</sup>

**Combat Vehicles.** According to CBO's analysis, the Army's combat vehicles in Iraq are operating at sustainable rates.<sup>26</sup> On the basis of its assumption of a 50,000-mile limit per vehicle, CBO estimates that the Army's tanks and Bradley fighting vehicles can operate for the next 10 years at levels 10 to 16 times those of current operations and M113-based vehicles and M88 recovery vehicles can operate at even higher multiples of current rates (see Figure 1-3 on page 11). And even if the Army's tracked combat vehicles could be driven only for a maximum of 25,000 miles, the resulting levels of operation that could be sustained for 10 years would still exceed those currently being experienced in Iraq.

Stryker vehicles are relatively new to the Army—they were first fielded in 2002—and they differ from the rest of the service's combat vehicles in that they have wheels rather than tracks. They also differ in their peacetime usage rates, which are four times higher than those of the Army's tanks and Bradley fighting vehicles. (Although their average age at the end of 2006 was only two years, a significant number of Strykers had already accumulated more than 25,000 miles.) For that reason, CBO used 50,000- and 100,000-mile lifetime limits in its analysis of Stryker vehicles.<sup>27</sup> Under an assumed limit of 100,000 miles, Stryker vehicles could sustain operating tempos for 10 more years that were two and a half times greater than those they are currently experiencing in Iraq. If the life-

time mileage of a Stryker was limited to 50,000 miles, however, the Stryker fleet would be able to sustain an operating tempo that was 10 percent less than the rate at which those vehicles are now operating.

**Trucks.** Like the Army's combat vehicles, the service's current fleet of trucks should be capable of sustaining operations at higher rates for many years, according to CBO's analysis. For the Army's trucks—except for line-haul vehicles—CBO used the assumption that a truck's maximum lifetime mileage is 100,000 or 150,000 miles.<sup>28</sup> Because line-haul trucks are used to transport cargo over long distances, they are expected to drive much longer distances than other types of trucks during their service lives; CBO thus used a commercial standard for them of a maximum of 450,000 miles accumulated after 10 years of operations and limited the pool of useful trucks to those that were less than 10 years old at the end of 2006.<sup>29</sup> With lifetime limits of 150,000 miles for most other trucks and 450,000 miles for line-haul trucks, the Army's current fleet, with the exception of its up-armored HMMWVs, could maintain operating tempos for the next 10 years that were at least 2.5 times as high—and in some cases almost 40 times as high—as those experienced in Iraq for the past several years (see Figure 1-4).

The Army's fleet of up-armored HMMWVs constitutes an exception to that finding because the operating tempos it could sustain in Iraq do not match those of the Army's other truck fleets. Nevertheless, the fleet of up-armored HMMWVs that the Army owned at the end of April 2007 could sustain its current operating tempos—and ones almost twice as high—for 10 years. In fact, those vehicles, most of which are supporting operations in Iraq and Afghanistan and are being driven an average of almost 7,700 miles per year, could continue to operate at current levels for 17 more years before they reached the assumed maximum mileage of 150,000 miles per vehicle. Even if each HMMWV's total mileage was limited to

25. Office of the Secretary of Defense, *Ground Force Equipment Repair, Replacement, and Recapitalization Requirements*, p. 15.

26. CBO used maximum per-vehicle limits of 25,000 miles and 50,000 miles in its analysis of tracked combat vehicles and limits of 50,000 miles and 100,000 miles in its analysis of Stryker vehicles.

27. At the end of 2006, 11 percent of the Army's Stryker vehicles had been driven more than 50,000 miles, and four of them had been driven more than 100,000 miles.

28. The Army, to CBO's knowledge, does not have mileage standards for retiring its trucks. However, several hundred of the HMMWVs in its inventory have driven more than 150,000 miles, as have many of its larger trucks.

29. Based on practices of New Penn Motor Express, a commercial firm that uses its fleet of trucks for line-haul service until they reach 450,000 miles or 10 years of service.

100,000 miles, operations at current rates could be maintained for 10 more years.

In some cases, the high operating tempos that CBO estimates could be sustained by the Army's trucks might not apply. CBO's calculations incorporate the assumption that the trucks receive appropriate maintenance while deployed to the theater. However, its calculations do not take into account adverse conditions there that could affect the trucks' ability to continue to operate at high rates over the long periods that they might remain in the theater before being shipped back to their home stations for more-extensive repairs.

### Desert Conditions in Iraq and Afghanistan

The dry, dusty conditions typical of Southwest Asia, although not unprecedented in the Army's history of operations, exact a toll from its equipment. Sand and dust may degrade both helicopters and vehicles by abrading rotor blades in the former and clogging air filters in the latter. Sand is also harmful to the turbine blades in tank engines, causing them to thin and eventually break if they are not replaced in a timely manner.

On the basis of its experience in 1991 in Operation Desert Storm, the Army instituted several procedures for its ground equipment at the start of the Iraq war to address the damage it expected from operating in a desert environment. The procedures, which are intended to reduce future maintenance costs by identifying and repairing equipment wear and damage that might not otherwise be visible, call for disassembling major components (such as brake systems, cooling systems, alternators, and engines) and inspecting them for contamination by sand and dirt. An example of the cost of that type of maintenance—known as delayed desert damage (3D)—for heavy trucks in 2005 was \$39,000 per HEMTT, according to the OSD.<sup>30</sup> In comparison, by CBO's calculations based on the Army's cost models, routine maintenance to bring the same type of truck up to standards would cost roughly \$3,000.<sup>31</sup>

The corresponding package of procedures for the Army's helicopters that was developed after Desert Storm is known as special technical inspection and repair (STIR). In addition to performing such routine maintenance tasks as inspecting parts to determine whether they need replacing, testing and adjusting controls, and repairing damage, maintenance personnel in the units remove all electronic boxes and instrument control panels to inspect them for sand. The cost of a complete STIR for an Apache AH-64 helicopter in 2005 was roughly \$1 million, compared with \$270,000 for routine maintenance (again, a calculation based on the Army's cost factors).

Although the Army has been applying the 3D procedures to its combat vehicles as they are returned from the theater, it has recently determined that for some types of equipment, the procedures alone are insufficient. In general, a piece of equipment is sent to a depot only if it is so severely damaged that soldiers in the unit cannot repair it. As units have returned from Iraq, however, the Army has found that the tanks that were sent to a depot and broken down for repair showed extensive infiltration of sand in components that soldiers in units would generally not have access to.<sup>32</sup> That discovery prompted the Army in 2006 to determine that on their return from Iraq, all Abrams tanks and Bradley fighting vehicles would be sent to a depot to be disassembled and thoroughly cleaned. The difference in cost between reconditioning the vehicles in their units and doing so at a depot is at least \$800,000 per tank and \$500,000 per Bradley fighting vehicle. CBO estimates that for those systems alone, the annual cost of reversing the effects of sand and dust on all returning tanks and Bradleys will be between \$700 million and \$1.2 billion.

Another factor that contributes to the degradation of the Army's equipment in Iraq is the need for armor on trucks to protect their occupants from roadside bombs. Many of the trucks initially deployed to Iraq were not designed to accommodate the additional weight of the armor that was bolted on to them, and their suspensions and transmissions suffered from carrying loads heavier than they

30. Office of the Secretary of Defense, *Ground Force Equipment Repair, Replacement, and Recapitalization Requirements*, p. 10.

31. Based on the estimated cost—equal to 1 percent of the replacement value—to bring a piece of equipment up to the 10/20 technical manual standard, which is used in the Army Cost and Economic Analysis Center's *FORCES Cost Model*, version 2003.0513.

32. Institute of Land Warfare, *Resetting the Force: The Equipment Challenge* (Arlington, Va.: Association of the United States Army, October 2005).

were designed to support.<sup>33</sup> The costs incurred as a result of that additional stress are hard to ascertain, but in the early years of the Iraq war, trucks returning to their home stations from the theater had a much higher rate of “washout” (a determination that they were irreparably damaged or too costly to repair) than had been true for the Army’s trucks in the past. Trucks returning from Iraq had a 12 percent washout rate compared with the significantly lower historical rates of 4 percent to 8 percent. (The Army treats trucks destroyed in the theater as a result of combat or accident separately—it considers them battle losses.) The higher washout rates have meant more trucks lost as a result of operations in Iraq, leading to potential annual replacement costs of \$100 million.<sup>34</sup>

As operations have continued, the Army has introduced trucks that have integrated armor or a redesigned chassis that allows them to carry the additional weight. Nevertheless, the service’s early attempts to protect its personnel and vehicles initially resulted in an unanticipated level of repair and overhaul to compensate for the combination of added armor, dusty conditions, and high rates of use.

### Conclusion

From its analysis, CBO has concluded that, in general, the pace of operations in Iraq and Afghanistan by itself should not stress the Army’s weapon systems beyond their capacity. In other words, if the Army increased maintenance to match the level of operations, the pace of operations alone should not be sufficient to degrade equipment after one rotation in the theater, or even after several rotations, to the point that equipment needed to be replaced—a position reinforced in the OSD’s 2005 report to the Congress. That conclusion is most applicable to systems

that are deployed to the theater for limited periods and, once redeployed, not expected to return there for several years. That is, it applies mainly to fleets of equipment (helicopters, combat vehicles, and some trucks) 20 percent or less of which are in the theater, under the assumption that the Army rotates all of its equipment through the theater in turn.

Yet CBO’s conclusion about operating tempos may also apply to other categories of equipment. Even if the Army is rotating only a small subset of its total inventory through Iraq and Afghanistan, that equipment should be able to sustain operations for many more years if it is receiving extensive overhauling on its return to its home station. Systems that are permanently stationed in Iraq, such as up-armored HMMWVs, could constitute exceptions to that premise if they do not receive adequate maintenance in the theater. But CBO’s analysis shows that, in general, most of the Army’s systems should be able to sustain the current operating tempo for at least 10 more years.

That said, CBO’s conclusion rests on certain assumptions—that the Army’s systems are being properly maintained while operating at their current high rates and that unexpected conditions are not degrading their performance—that may not be valid for all categories of equipment. Helicopters and combat vehicles for the most part are receiving extensive maintenance after 12 months to 15 months in the theater. Trucks and other types of equipment that remain in the theater permanently could present a different case because initially, those vehicles might not have received adequate maintenance in Iraq. Since 2005, however, the Army has worked hard to establish facilities in the theater to keep its trucks in good condition. It has also, as operations have allowed, started to return some of its heavier trucks and lighter HMMWVs to the United States for resetting. With continued maintenance and the fielding of systems adapted to the environment, the Army should be able to maintain high operating rates for its equipment for several years, even in the difficult conditions prevailing in Southwest Asia.

33. For HMMWVs, the additional armor added as much as a ton to each vehicle’s weight. For larger trucks (those in the family of medium tactical vehicles and line-haul trucks, for example), armor added between one and a half and two tons.

34. That figure is an upper-bound estimate because the Army has chosen not to replace older trucks that were deemed irreparable on their return.



## Costs Associated with Resetting the Army's Equipment

**D**uring the course of operations in Iraq and Afghanistan, the Army's equipment has been lost, damaged, and exposed to sand, dust, and heat. Once Army units have left Southwest Asia and returned with their equipment to their home stations, systems that were lost in the theater must be replaced (generally through the procurement process) and equipment that has returned with the units must be brought back up to standards by repairing what is damaged and by cleaning and inspecting items that do not require refurbishing.<sup>1</sup> Equipment deemed irreparably damaged on its return—that is, a washout—is also replaced through the procurement process. All of those activities, in the Army's view, are part of reset (as are the upgrading and rebuilding of equipment).

As long as troop levels in the theater remain relatively constant, the equipment that requires resetting should consist, for the most part, of items that are rotating home with units and not items from the pool of theater provided equipment, which remain in the theater permanently. The Army originally planned to reset those TPE items as troop levels fell and the equipment was permanently redeployed to home stations. However, because operations in Iraq have continued longer than the Army originally anticipated, the service has started to return some equipment from the TPE pool for resetting as conditions allow.

The Army's aircraft and its combat and wheeled vehicles, which represent more than 85 percent of the equipment in the theater based on value, have also accounted for 50 percent of the procurement funds provided in supplemental appropriations for 2006 and 2007 and 60 percent of the reset-associated maintenance costs that the Army has identified. In its analysis, the Congressional Budget

Office estimated the annual costs associated with bringing that equipment back up to standards. Where possible, it compared its findings with the Army's estimated requirements and with the Administration's requests for funds for the reset program. In general, CBO's estimates of costs for 2006 and 2007 were lower than the Army's corresponding estimates and lower than the Administration's requests for funding. However, because of the lack of detailed data underlying the Army's estimates and the funding requests, CBO cannot fully explain the discrepancies.

### CBO's Estimates of the Army's Annual Costs to Replace and Repair Equipment

Several assumptions governed CBO's analysis of the Army's costs for resetting the equipment it had lost in or was bringing back from the theater. The number of forces and the amount of equipment in the theater, which have varied but, on average, have been relatively constant over the past three years, were assumed to remain at their current levels. (Those assumptions are consistent with the Army's, which underlie the service's February 2007 request for supplemental funding for 2008 to support operations in Iraq and Afghanistan.) In addition, unit rotations were assumed to last one year.<sup>2</sup>

---

1. Those standards, which are specified in technical manuals, are known as TM 10/20 standards.

---

2. The amount of equipment returning to home stations for resetting could be affected by the "surge" in forces in Iraq in 2007 and by the increased length of units' rotations announced this year. The surge brought a roughly 20 percent boost in forces, which could lead to a proportionate increase in the amount of equipment returning home annually; at the same time, though, the increase in the length of units' deployments will reduce the amount of equipment returned each year—again, by about 20 percent. The two changes should effectively cancel each other out.

**Table 2-1.**

**CBO's Estimates of the Army's Annual Costs to Replace and Repair Selected Systems**

	Percentage of Systems Deployed or Returned		CBO Estimate of Annual Costs	
		Number of Systems	Per Item as a Percentage of the Replacement Cost	In Millions of Dollars
<b>Helicopters</b>				
Systems in the Theater				
Total deployed	100	530	n.a.	n.a.
Annual losses	4.5	24	100	500
Systems Returned from the Theater Annually				
Total returned	100	501	n.a.	n.a.
Requiring depot-level maintenance	3	15	35 to 50	125
Requiring field-level maintenance	97	486	3 to 9	575
<b>Total costs, losses and maintenance</b>	<b>n.a.</b>	<b>n.a.</b>	<b>n.a.</b>	<b>1,200</b>
<b>Combat Vehicles<sup>a</sup></b>				
Systems in the Theater				
Total deployed	100	3,000	n.a.	n.a.
Annual losses	1	30	100	75
Systems Returned from the Theater Annually				
Total returned	100	2,700	n.a.	n.a.
Deemed irreparable on inspection	1	25	100	75
Requiring depot-level maintenance	49 <sup>b</sup>	1,325	20 to 90	1,300
Requiring field-level maintenance	50 <sup>c</sup>	1,350	3 to 30	200
<b>Total costs, losses and maintenance</b>	<b>n.a.</b>	<b>n.a.</b>	<b>n.a.</b>	<b>1,650</b>

Continued

Another factor shaping CBO's analysis was its relatively limited scope. The study addressed only the annually recurring costs associated with the portions of the Army's reset program designed to replace lost items and return equipment to good working order through depot- and field-level maintenance; it did not attempt to estimate the one-time costs of resetting equipment from the TPE pool once it had been removed from the theater nor the reset costs for equipment that had once been assigned to the Army's prepositioned stocks and had been used for operations in Iraq. Moreover, CBO's analysis estimated the costs of replacing and repairing only helicopters, combat vehicles, and trucks—the three categories of equipment that account for the majority of reset costs and that for the most part comprise a relatively small number of expensive items. (In contrast, the Army's communications and electronics equipment in the theater includes more than 100,000 items of many different types.)

**Costs to Replace and Repair Helicopters**

Helicopters account for almost all of the total value—roughly \$10 billion—of aircraft and associated equipment (such as air traffic control and ground-support equipment) taking part in operations in Iraq and Afghanistan. The Army projected in December 2004 that 6 percent of its helicopters and other aviation equipment in the theater would have to be replaced annually as a result of battle losses and crash damage. It also estimated that the only aircraft that would need depot-level maintenance would be those that had been the most severely damaged, or roughly 3 percent of those returning.

The historical record shows that, on average, the Army has experienced annual losses of helicopters in the theater at close to the rate it projected. All told, between September 2003 and September 2006, 73 helicopters were lost or so badly damaged that they needed to be replaced—representing an annual rate of loss of slightly more than

**Table 2-1.****Continued**

	Percentage of Systems Deployed or Returned	Number of Systems	CBO Estimate of Annual Costs	
			Per Item as a Percentage of the Replacement Cost	In Millions of Dollars
Trucks <sup>d</sup>				
Systems in the Theater				
Total deployed	100	39,000	n.a.	n.a.
Annual losses	1	390	100	75
Systems Returned from the Theater Annually				
Units' equipment only				
Total returned	100	7,200	n.a.	n.a.
Deemed irreparable on inspection	7 or 12	500 or 850	100	100 or 150
Requiring depot-level maintenance	13	900	20 to 100	75
Requiring field-level maintenance	80 or 75	5,800 or 5,450	2 to 15	110 or 100
Units' equipment plus 50 percent of TPE				
Total returned	100	23,000	n.a.	n.a.
Deemed irreparable on inspection	7 or 12	1,600 or 2,700	100	300 or 525
Requiring depot-level maintenance	13	3,000	20 to 100	300
Requiring field-level maintenance	80 or 75	18,400 or 17,300	2 to 15	300 or 280
<b>Total costs, losses and maintenance</b>				
<b>Units' equipment only</b>	<b>n.a.</b>	<b>n.a.</b>	<b>n.a.</b>	<b>360 or 400</b>
<b>Units' equipment plus 50 percent of TPE</b>	<b>n.a.</b>	<b>n.a.</b>	<b>n.a.</b>	<b>975 or 1,180</b>

Source: Congressional Budget Office based on data from the Department of the Army.

Note: n.a. = not applicable; TPE = theater provided equipment.

- Includes Abrams tanks, Bradley fighting vehicles, M113-based vehicles, self-propelled howitzers, Stryker vehicles, recovery vehicles, and field artillery ammunition supply vehicles. Stryker vehicles are maintained in the theater and at units' home stations by soldiers and contractors.
- All returning Abrams tanks and Bradley fighting vehicles undergo depot-level maintenance.
- All maintenance of Stryker vehicles is included in field maintenance.
- Includes high-mobility multipurpose wheeled vehicles, the family of medium tactical vehicles, heavy expanded-mobility tactical trucks, heavy equipment transporters, palletized loading systems, and line-haul trucks (which are similar to commercial tractor-trailers). Roughly 25 percent of trucks return with their units. The remaining 75 percent of trucks are in the TPE pool; some of them may return to the United States for resetting while the rest remain in the theater.

4.5 percent. Attack and scout helicopters experienced slightly higher loss rates (8 percent) and utility and cargo helicopters slightly lower rates (3 percent). CBO estimates that the annual costs for replacing helicopters will be \$500 million (see Table 2-1). Those funds would cover annual losses of 15 attack and scout helicopters and 9 utility and cargo helicopters.

CBO estimated the maintenance costs for helicopters returning from the theater on the basis of the Army's experiences in 2005 through 2007. In those years, a small percentage—2 percent to 4 percent—of the Army's returning helicopters required extensive repairs that could be performed only at a depot. The cost of such repairs, per helicopter, has been as much as half of the aircraft's

replacement cost, according to the Army's estimates. Using those factors, CBO estimated that annual costs for depot-level maintenance for the helicopters being returned from Iraq and Afghanistan would be on the order of \$125 million (see Table 2-1).

Annual costs for field-level maintenance—\$575 million, in CBO's estimation—are higher than those for depot-level repairs. Mechanics assigned to aviation units perform most of the cleaning and overhauling of helicopters that are returned from the theater, and the per-aircraft cost—typically less than 10 percent of the replacement cost—of that maintenance is lower than the cost of repairs performed at the depot. But because so many more helicopters are refurbished in the field, the total annual costs for field-level maintenance will be higher, CBO estimates, than those for depot-level maintenance.

### Costs to Replace and Repair Combat Vehicles

When combat vehicles return from the theater, the Army performs much the same kind of maintenance on them that it carries out for helicopters, replacing equipment lost in the theater or judged to be a washout, and repairing and overhauling all other returning items.<sup>3</sup> Compared with the annual loss rates for helicopters, rates for the Army's combat vehicles are slightly lower, and the proportion of vehicles that undergo depot-level repairs is larger.

In general, by mid-2006, the Army had lost relatively few combat vehicles as a result of operations in Iraq: 20 tanks, 50 to 75 Bradley fighting vehicles, 20 M113-based vehicles, and 20 to 40 Strykers, according to various sources.<sup>4</sup> In December 2004, the Army projected annual losses of 2 percent, and those projections have proven reliable. In CBO's estimation, the cost of replacing washouts (\$75 million) and vehicles lost in the theater (\$75 million) could total \$150 million annually (see Table 2-1).

The Army's helicopter inventories contain few surplus aircraft, but at least two of the service's combat vehicle fleets—tanks and M113-based vehicles—have consider-

able surplus equipment. If the Army did not replace the vehicles lost from those two fleets, its annual replacement costs for lost vehicles would drop to about \$60 million. However, many of the Army's surplus tanks and M113-based vehicles are not the newest and most capable models. If the vehicles lost in Iraq from those two fleets were the latest models, then even though the Army could replace them from its excess stocks, it might need to convert those replacement vehicles to the newer version—upgrades that in many cases would cost almost as much as purchasing a new vehicle. Consequently, CBO's estimate of the cost to replace all lost combat vehicles (\$150 million) might be a more comprehensive measure of the Army's total costs.

The repair and overhaul of returned combat vehicles can be performed at either the depot or field level, depending on the extent of the required maintenance. The Army projected in December 2004 that 15 percent of returning combat vehicles would need depot-level repairs and the remainder could be brought back up to standards through field-level maintenance. By 2006, however, the Army's experience with returning equipment had grown, and it instituted a new policy: To ensure that all equipment received the maintenance required to mitigate the effects of sand and dust and restore it to a satisfactory operating condition, some items being returned from Iraq would be repaired and overhauled only at a depot.

In the case of combat vehicles, that policy applies to Abrams tanks and Bradley fighting vehicles, which are equipped with sophisticated electronic gear and optical sensors that are particularly sensitive to degradation by sand and dust. As a result, the Army will perform extensive and relatively expensive repairs on all returning tanks and Bradley fighting vehicles at a depot, costing, in CBO's estimation, roughly \$1 billion annually. Of the remaining types of combat vehicles, the Army estimates that 15 percent will still need to go to a depot for repairs.

CBO estimates that in total, 49 percent of all returning combat vehicles will undergo depot-level maintenance at a cost per vehicle of 20 percent to 90 percent of their replacement value. Based on the Army's current force levels and policies, the total cost for depot-level maintenance for returning combat vehicles will be roughly \$1.3 billion annually, in CBO's estimation.

The Army plans to use soldiers in their units to repair and recondition the rest (50 percent) of its returning combat

3. The Army accounts for losses of combat vehicles as direct battle losses, which applies to all vehicles in the theater, or as washouts, which refers to vehicles returned from the theater.

4. Greg Grant, "U.S. Army 'Reset' Bills Hit \$9B," *Defense News*, February 13, 2006, p. 1; and Office of the Secretary of Defense, *Long-Term Equipment Repair Costs: Report to the Congress* (September 2006).



vehicles.<sup>5</sup> (The remaining 1 percent of vehicles are assumed to be washouts.) Field-level maintenance is less expensive than depot-level maintenance, representing 3 percent to 30 percent of a vehicle's replacement value. Annual costs for field-level maintenance for returning combat vehicles will be about \$200 million, CBO estimates.

### Costs to Replace and Repair Trucks

Trucks, which account for roughly \$6 billion worth of equipment in Iraq and Afghanistan, are the last category of the Army's equipment for which CBO estimated replacement and repair costs in detail. Unlike helicopters and combat vehicles, most (about three-quarters) of the Army's trucks remain in the theater as part of the TPE pool and do not rotate with units—although in recent months, the Army has been changing its position on how and when equipment assigned to the pool will be repaired and reconditioned.

Early in calendar year 2006, Army personnel briefed the House Armed Services Committee and CBO staff and indicated that theater provided equipment would be returned to the United States only when force levels began to decline; at that point but not before, the equipment would undergo depot- or field-level maintenance. Yet in a report issued nine months later, the Office of the Secretary of Defense stated that such equipment would be "reset as needed or when the pace of operations allows."<sup>6</sup> The report went on to say that once equipment came back to the United States, it would be repaired through existing reset processes—which could imply that the Army will bring some items in the TPE pool back for repair and overhaul before force levels in Iraq decline. Because of that ambiguity (which makes estimating annual reset costs for the Army's trucks more difficult than estimating costs for its helicopters and combat vehicles), CBO used a range to indicate a varying share of trucks in the TPE pool being returned annually to their home stations while operations in the theater continue at their current pace.

5. That statement includes most Stryker vehicles, which are repaired at their home stations by soldiers assisted by contractors. The exception is Stryker vehicles that are severely damaged; like helicopters that require extensive overhauling, such vehicles are repaired at a depot.

6. Office of the Secretary of Defense, *Long-Term Equipment Repair Costs*, p. 3.

As it did for helicopters and combat vehicles, CBO estimated the annual costs to replace trucks lost in the course of operations in Iraq and to repair and overhaul trucks that were returned to the United States, assuming that the number of each type of truck and their operating rates remain roughly constant. Of the almost 39,000 trucks in the theater that CBO considered, high-mobility multipurpose wheeled vehicles make up more than a half (almost 24,000); they account for \$3.0 billion of the total value of all of the Army's trucks in Southwest Asia. Press reports and OSD documents indicate that since 2003, the Army has lost 750 to 1,300 trucks in the theater, yielding average annual loss rates of about 1 percent. At that rate, annual costs for replacements would be \$75 million, in CBO's estimation (see Table 2-1 on page 19).

An additional source of losses are washouts, which in past operations have averaged 7 percent for all types of trucks. In December 2004, the Army projected a higher annual truck washout rate—12 percent—because of the harsh conditions under which the trucks operate in the theater. Uncertain about which rate should pertain, CBO used both of them (as it did for estimating the number of trucks in the TPE pool that the Army would bring back to home stations each year) to estimate annual costs for replacing washouts: a lower bound incorporating the assumption that no TPE trucks are returned and an upper bound incorporating the assumption that 50 percent are brought back (see Table 2-1 on page 19). The resulting range of costs to replace washouts is \$100 million to \$525 million.

Estimates of the annual costs for repairing and overhauling returned trucks also depend on what portion of the TPE pool the Army brings back. If the Army brings back a sizable share of those trucks each year, its requirements for repairs will be much greater than the amount it is now projecting. As with its estimates of the costs to replace lost vehicles, CBO calculated two sets of annual depot- and field-level repair costs for the Army's trucks: one incorporating the assumption that no vehicles from the TPE pool are returned for resetting and the other, that half of the trucks in the pool are returned each year.

Like the Army's helicopters and combat vehicles, a portion of the service's returning trucks will require extensive maintenance at a depot, but the bulk of them will undergo repairs in the units to which they are assigned. The Army projected in December 2004 that 13 percent of its

returning trucks would need depot-level maintenance, and CBO used that value in its estimates. The Army's estimates of the per-vehicle costs of depot-level repairs for its trucks (like its estimates of such repairs for its combat vehicles) vary widely—from 20 percent to 100 percent of a truck's replacement cost. CBO's estimate of the annual cost for depot-level truck repair ranges from \$75 million to \$300 million. The cost per vehicle for field-level repairs is much lower (2 percent to 15 percent of the replacement cost), but because so many vehicles would require that lower level of maintenance, the total cost would be about the same, at \$100 million to \$300 million.

Combining all types of reset costs for trucks—replacement and depot- and field-level maintenance—yields a total annual cost ranging from \$360 million to almost \$1.2 billion, in CBO's estimation.

### **Costs to Replace and Repair Other Equipment**

Although helicopters, combat vehicles, and trucks represent more than 80 percent of the value of the Army's equipment in Southwest Asia, they account for less than 1 percent of the individual items in the theater. Some portion of the hundreds of thousands of small arms and of the stocks of communications and electronics gear, support equipment, and missiles will also require replacement or repair each year. CBO did not attempt to estimate either the numbers of such items that would require resetting nor the costs to carry out the work. However, because of the large quantity of equipment involved, the Army estimates that the annual costs will be substantial.

## **The Army's Estimates of Costs and the Administration's Funding Requests for the Reset Program**

For the three years from 2005 to 2007, the Administration requested a total of \$32.3 billion for the Army's reset program, slightly less than the \$34.7 billion that the Army had estimated was required. This section examines the Army's estimates of the total funds needed for reset; enumerates, where possible, the funding that has been requested and appropriated for the program; and compares annual funding with CBO's corresponding estimates of costs. For some portions of CBO's analysis, the lack of detailed information accompanying both the Administration's early requests for reset funding and the appropriation bills that were subsequently enacted pre-

cluded examining and comparing the funding requests and later appropriations.

### **Cost Estimates and Funding Requests for Replacing and Repairing Returned Equipment**

As part of its analysis, CBO attempted to identify the Army's estimates of the costs to replace and repair its equipment and the funding for those activities, and to compare such estimates with its (CBO's) calculations. In some cases, direct comparisons could not be made because the Army's estimates included costs (such as those for replacing expended missiles or for repairing communications and electronics gear) that CBO chose not to calculate. CBO was able to compare the funds that the Administration has requested to repair and replace equipment with the amounts that the Army estimates it requires for those activities. (For most categories of equipment, requirements are identical for 2006 and 2007.)

**Replacing Lost Equipment.** The Army's estimates of the money it requires to replace its lost equipment (both battle losses and washouts) doubled between 2005 and 2006 but then held steady for 2007. In contrast, the funding that the Administration requested for those replacements was less than the Army's estimated requirements for 2005 and 2006 but more than its estimated requirements for 2007—with the result that funding more than doubled between 2006 and 2007 (see Figure 2-1). Funds for replacing lost helicopters, combat vehicles, and trucks accounted for at least 90 percent of both the estimated requirements and the requests, with more than half of each attributable to the cost of replacing lost helicopters.

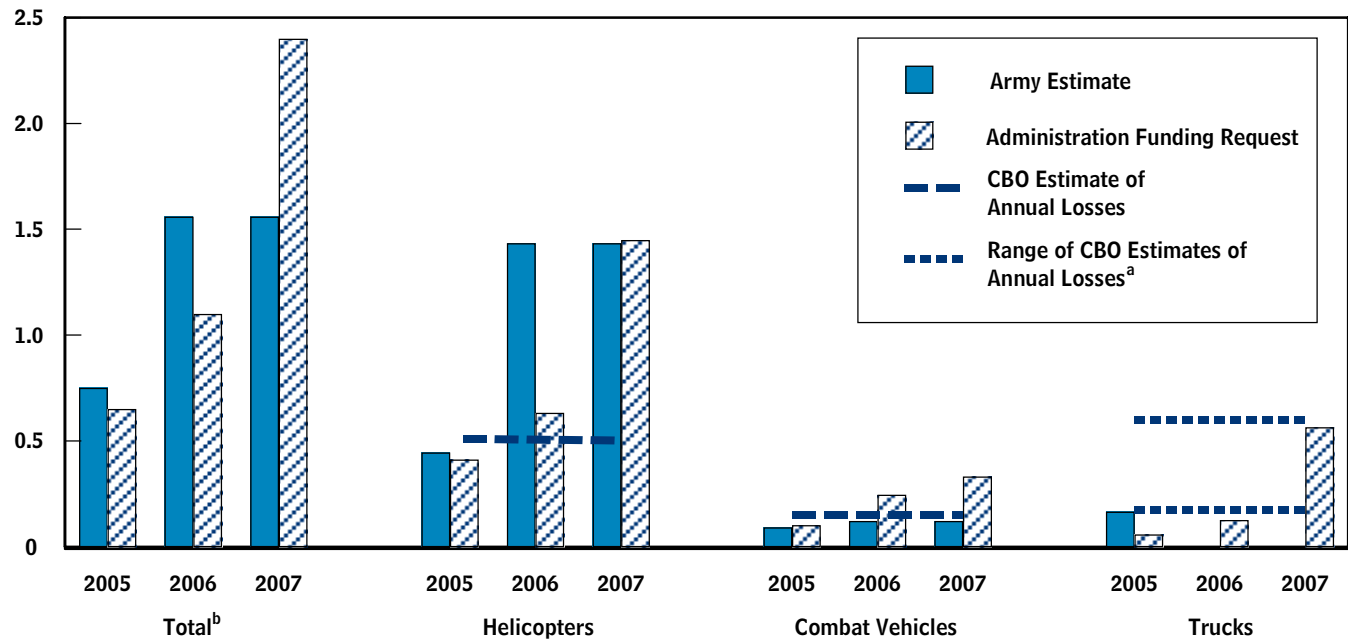
For 2005, CBO's estimates of the funding needed to replace helicopters, combat vehicles, and trucks are comparable with or exceed the Army's estimates and the requests for funding (see Tables 2-2 and 2-3). For 2007, however, CBO's estimates of the costs to replace lost helicopters and combat vehicles are much lower than the Administration's request—specifically, less than 50 percent of the request for that year for those items. The differences between CBO's estimate and the funding requested for 2007 for replacements stem primarily from the request for funds to replace more than three times as many helicopters and twice as many combat vehicles in 2007 as the Army did in 2006.

According to Department of Defense policy, the funds that the Administration requests to replace equipment

**Figure 2-1.**

## CBO and Army Estimates and Administration Funding Requests for Annual Costs to Replace Battle Losses and Washouts

(Billions of dollars)



Source: Congressional Budget Office based on data from the Department of the Army.

Note: Washouts are items deemed irreparably damaged on their return to home stations.

- The range represents estimates that include the annual cost of returning from zero to 50 percent of the trucks in the theater provided equipment pool.
- Includes replacement of all types of equipment.

lost in battle may not be based on projections but must reflect actual losses from previous years. Consequently, the funds requested for 2006 to replace helicopters were less than the Army's estimated requirements and much closer to CBO's estimate. However, the 2007 request seems to include not only helicopters lost in Iraq and Afghanistan but also some of the 40 helicopters that the Army's data show were lost between October 2001 and the end of 2006 in other operations. (The data do not specifically indicate how the helicopters were lost, only that they were not lost in the theater.) Replacements for at least some of those other losses may explain the Administration's larger request for 2007, which sought replacements for more than 60 helicopters (even though only 16 such aircraft had been lost in the theater during the previous 12 months).

In the case of losses among its truck fleets, the Army's estimated costs and the Administration's requested funds

for replacements are generally lower than CBO's figures—except for the 2007 request, which is much larger than the requests for the two previous years. Nevertheless, the Administration's funding request for 2007 for replacing lost trucks—roughly \$600 million—falls within the range of CBO's calculations (see Figure 2-1).

**Performing Depot-Level Maintenance on Returned Equipment.** Estimated costs and requested funding for depot-level maintenance for returned equipment exhibit trends similar to those for the costs and requested funding for replacing battle losses and washouts—that is, the Army's estimates of costs doubled from 2005 to 2006, and the funding that the Administration requested more than tripled between 2005 and 2007 (see Figure 2-2). The Administration's requests for funds for 2007 were higher than CBO's estimates of the Army's requirements for depot-level repair. For helicopters, the Army's estimates of costs for such maintenance were relatively low

**Table 2-2.**

**Comparison of CBO's and the Army's Estimates of Costs for 2007 to Replace and Repair Lost and Returned Equipment**

(Millions of dollars)

Type of Cost	CBO Estimate	Army Estimate	Army Estimate Minus CBO Estimate	Reason for Difference
<b>Replacement of Losses<sup>a</sup></b>				
Helicopters	500	1,400	900	The Army projects more losses of helicopters
Combat vehicles	200	100	-100	The Army's estimate included fewer vehicles
Trucks	400 <sup>b</sup>	*	-400	The Army's estimate did not include any trucks
<b>Total</b>	<b>1,100</b>	<b>1,500</b>	<b>400</b>	
<b>Repair of Returned Units' Equipment</b>				
<b>Depot-level repair</b>				
Helicopters	100	100	0	n.a.
Combat vehicles	1,300	1,200	-100	Insufficient data to determine the reason
Trucks	200 <sup>b</sup>	300	100	Insufficient data to determine the reason
Other equipment	n.a.	700	700	CBO did not estimate costs for other types of equipment
<b>Total</b>	<b>1,600</b>	<b>2,300</b>	<b>700</b>	
<b>Field-level repair</b>				
Helicopters	600	700	100	Insufficient data to determine the reason
Combat vehicles	200	300	100	Insufficient data to determine the reason
Trucks	200 <sup>b</sup>	800	600	Insufficient data to determine the reason
Other equipment	n.a.	1,100	1,100	CBO did not estimate costs for other types of equipment
<b>Total</b>	<b>1,000</b>	<b>2,900</b>	<b>1,900</b>	

Source: Congressional Budget Office based on data from the Department of the Army.

Notes: All costs are rounded to the nearest \$100 million.

\* = less than \$50 million; n.a. = not applicable.

- a. Includes battle losses and washouts (systems deemed irreparably damaged on their return to home stations).
- b. The middle value of a range of estimates.

for all three years, compared with those for combat vehicles and trucks, and are generally comparable with CBO's estimates.<sup>7</sup> The request for 2007 for depot-level maintenance for combat vehicles was higher than the Army's estimate, which had itself grown fivefold since 2005.

One reason for the increase in costs for depot-level maintenance for combat vehicles was the policy change in 2006 that required all Bradley fighting vehicles and

Abrams tanks to be overhauled at a depot after returning from Iraq. Before that change, the Army had planned to send 15 percent of its returning vehicles to a depot; after it, the Army expected that roughly 800 more vehicles would be repaired and overhauled at a depot in 2006 and 2007 than was the case in 2005. CBO's annual estimate takes that policy change into account, which explains in part why it is higher than the Army's estimate for 2005.

However, that change alone cannot explain why CBO's estimate of costs for 2007 for depot-level repair of combat vehicles is lower than the Administration's funding request for that purpose. The difference is attributable to

7. The request for funds for 2007 may be higher than that for 2006 because repairs to helicopters that were scheduled to be completed in 2006 required additional time and money as a result of unexpectedly extensive damage.

**Table 2-3.**

### Comparison of the Administration's Requests and CBO's Estimates of Costs for 2007 to Replace and Repair Lost and Returned Equipment

(Millions of dollars)

Type of Cost	CBO Estimate	Administration Request	Administration Request Minus CBO Estimate	Reason for Difference
Replacement of Losses <sup>a</sup>				
Aviation-related items	500 <sup>b</sup>	1,500	1,000	The request included replacement of losses not resulting from operations in Iraq and Afghanistan
Combat vehicles	200	300	100	The request was based on greater losses for Strykers, Bradley fighting vehicles, and tanks
Trucks	400 <sup>c</sup>	600	200	Costs fall within CBO's range
Other equipment	n.a.	*	*	CBO did not estimate costs for other types of equipment
<b>Total</b>	<b>1,100</b>	<b>2,400</b>	<b>1,300</b>	
Repair of Returned Units' Equipment				
Depot-level repair				
Aviation-related items	100 <sup>b</sup>	200	100	The request includes carryover from previous years
Combat vehicles	1,300	1,900	600	The request is based on higher unit costs for tanks and Bradley fighting vehicles
Trucks	200 <sup>c</sup>	400	200	The request is based on a larger proportion of heavy trucks returning from the theater
Other equipment	n.a.	1,300	1,300	CBO did not estimate costs for other types of equipment
<b>Total</b>	<b>1,600</b>	<b>3,800</b>	<b>2,200</b>	
Field-level repair				
Aviation-related items	600 <sup>b</sup>	600	0	n.a.
Combat vehicles	200	500	300	CBO received insufficient data from the Army to explain the discrepancy
Trucks	200 <sup>c</sup>	1,200	1,000	CBO received insufficient data from the Army to explain the discrepancy
Other equipment	n.a.	700	700	CBO did not estimate costs for other types of equipment
<b>Total</b>	<b>1,000</b>	<b>3,000</b>	<b>2,000</b>	

Source: Congressional Budget Office based on data from the Department of the Army.

Notes: Figures are rounded to the nearest \$100 million.

n.a. = not applicable; \* = less than \$50 million.

- a. Includes battle losses and washouts (systems deemed irreparably damaged on their return to home stations).
- b. Helicopters only.
- c. CBO's estimate is the middle value of a range.

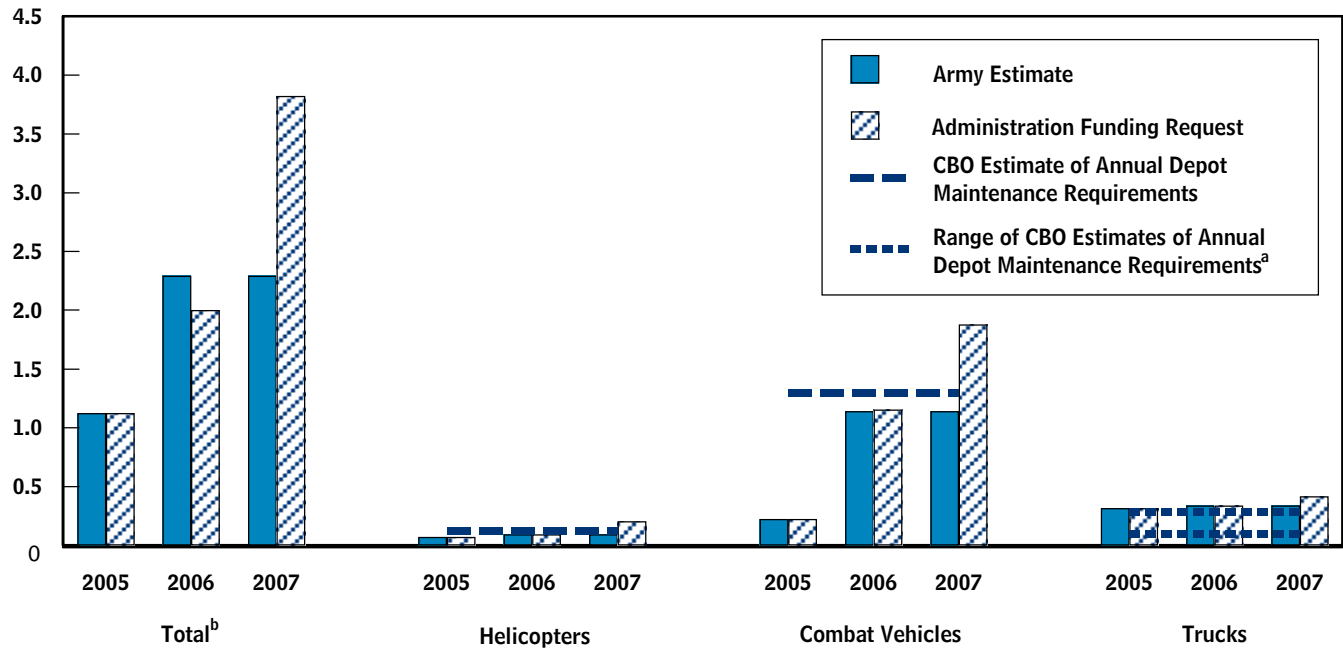
two increases that CBO's estimates do not incorporate: first, a large uptick in unit costs between 2005 and 2007 to repair and recondition a tank or a Bradley fighting vehicle at a depot; and second, a boost in the number of howitzers, recovery vehicles, and ammunition supply vehicles requiring depot-level maintenance. Some of the

increased costs for tanks and Bradley fighting vehicles could stem from the Army's discovery that reversing the effects of sand and urban operations in Iraq required additional maintenance. Similarly, experience with returned vehicles could have led the Army to conclude that a greater percentage than originally planned of

**Figure 2-2.**

**CBO and Army Estimates and Administration Funding Requests for Annual Costs of Depot-Level Maintenance for Returned Equipment**

(Billions of dollars)



Source: Congressional Budget Office based on data from the Department of the Army.

- a. The range represents estimates that include the annual cost of returning from zero to 50 percent of the trucks in the theater provided equipment pool.
- b. Includes depot-level maintenance for all types of equipment.

howitzers and other vehicles could benefit from depot-level refurbishment.

The Army’s estimates of costs and requested funding for depot-level maintenance for its trucks, unlike similar values for helicopters and combat vehicles, have remained relatively constant from 2005 to 2007. Nevertheless, they remain slightly above the top of CBO’s cost range (see Figure 2-2). Part of the reason may be differences in what the Army and CBO include in the “wheeled vehicle” category of depot maintenance that is associated with the Army’s estimates and the funding requests. (For the Army, the category includes trailers, dollies, and other such items that CBO’s estimate does not cover.) Also contributing to the discrepancy are differing estimates of the number of heavy trucks that will require depot-level maintenance; the Administration’s request for 2007 uses a larger number than CBO’s estimate does, which is based

on the service’s planning factors and projections from December 2004.

In total, the Administration’s requests for funds to pay for depot-level maintenance for equipment returning from Iraq have more than tripled over the 2005–2007 period, rising from \$1.1 billion to \$3.8 billion (see Figure 2-2 and Table 2-4). Some of that growth stems from the large increase in funding for depot-level maintenance for combat vehicles; funding rose from \$200 million for 2005 to almost \$1.9 billion for 2007. Funding for items other than helicopters, combat vehicles, and trucks also grew, climbing from \$500 million for 2005 to \$1.3 billion for 2007. The largest claimant of those funds for that latter year was communications equipment (\$700 million), followed by missile systems (\$313 million), support equipment (\$253 million), and small arms (\$38 million). The first two of those categories in particular had required

**Table 2-4.****Summary of Types of Costs Included in the Army's and CBO's Estimates for Reset**

(Billions of dollars)

	CBO Estimate of Annual Costs <sup>a</sup>	Army Estimates of Requirements and Administration Funding Requests		
		2005	2006	2007
<b>Costs for Replacing and Repairing Equipment Used in the Theater</b>				
<i>Replacement of Losses</i>				
Helicopters, Combat Vehicles, and Trucks	0.8 to 1.3	0.7	1.6	1.6
All Other Equipment	n.a.	0.1	0	0
Estimated costs	n.a.	0.8	1.6	1.6
Funds requested	n.a.	0.7	1.1	2.4
<i>Repair of Returned Equipment</i>				
Depot-Level Maintenance				
Helicopters, combat vehicles, and trucks	1.5 to 1.7	0.6	1.6	1.6
All other equipment	n.a.	0.5	0.7	0.7
Estimated costs	n.a.	1.1	2.3	2.3
Funds requested	n.a.	1.1	2.0	3.8
Field-Level Maintenance				
Helicopters, combat vehicles, and trucks	0.9 to 1.1	1.3	1.8	1.8
All other equipment	n.a.	0.6	1.1	1.1
Estimated costs	n.a.	1.9	2.9	2.9
Funds requested	n.a.	1.7	2.5	3.0
<i>Total, Replacement and Repair</i>				
Helicopters, Combat Vehicles, and Trucks	3.2 to 4.1	2.6	5.0	5.0
All Other Equipment	n.a.	1.2	1.8	1.8
Estimated costs	n.a.	3.8	6.8	6.8
Funds requested	n.a.	3.5	5.6	9.2
<b>Other Costs for Resetting Equipment</b>				
Resetting of Army Prepositioned Sets	n.a.	0.7	1.4	*
Rebuilding Returned Equipment	n.a.	0.8	0.3	0.3
Upgrading of Returned Equipment and Purchase of New or Upgraded Equipment for Reserve-Component and Modular Units <sup>b</sup>	n.a.	2.2	4.9	4.9
Other Repair <sup>c</sup>	n.a.	1.6	0.1	0.1
Estimated costs	n.a.	5.3	6.7	5.3
Funds requested	n.a.	3.1	3.0	7.9
<b>All Costs for Replacing, Repairing, and Resetting Equipment</b>				
<b>Total Estimated Costs</b>	<b>n.a.</b>	<b>9.1</b>	<b>13.5</b>	<b>12.1</b>
<b>Total Funds Requested</b>	<b>n.a.</b>	<b>6.6</b>	<b>8.6</b>	<b>17.1</b>

Source: Congressional Budget Office based on data from the Department of the Army.

Note: n.a. = not applicable; \* = less than \$50 million.

- a. CBO estimated the costs associated with replacing and repairing helicopters, combat vehicles, and trucks only.
- b. The reserve component comprises the Army National Guard and Army Reserve. Under its modularity initiative, the Army is reorganizing its units into a more standard structure.
- c. May include establishment of repair facilities in the theater and other unspecified repair costs.

much less funding for depot-level repairs in previous years.

**Performing Field-Level Maintenance on Returned Equipment.** The Army's estimated costs and the Administration's requested funding for field-level maintenance for equipment returned from Iraq and Afghanistan grew between 2005 and 2006, climbing from \$1.9 billion to \$2.9 billion for estimated costs and \$1.7 billion to \$2.5 billion for requested funds. For 2007, the Army's estimated costs remained at roughly \$2.9 billion, but the funds requested for such maintenance continued to grow, increasing to \$3.0 billion (see Tables 2-4 and 2-5). As with the rise in costs for depot-level repair, some of the reasons for the growth in that requested funding are unclear, especially in the face of CBO's significantly lower estimates of costs for field-level repairs to trucks (see Figure 2-3). Moreover, like the corresponding request for 2007 for depot-level maintenance funds, the Administration's request for field-level maintenance funds for combat vehicles was higher than CBO's estimate.

The Army's and CBO's estimates of costs for field-level repairs for helicopters are essentially the same. But analysis indicates a growing disparity between CBO's estimates of field-level maintenance costs for combat vehicles and trucks and the corresponding estimates by the Army and requests for funding for 2005 through 2007. Indeed, the funding requested for field-level repairs to combat vehicles doubled between 2005 and 2007, a jump that CBO finds difficult to explain. After 2005, all tanks and Bradley fighting vehicles were being repaired at a depot, not at the field level. Moreover, the number of combat vehicles returned from the theater each year between 2005 and 2007 should have been appreciably the same. CBO asked the Army for details of its estimates for field-level maintenance costs, but its requests yielded little useful information.<sup>8</sup>

In the case of field-level maintenance for trucks, differences between CBO's estimates of costs and those of the Army (as requirements) and the Administration (as requested funding) are evident in all three years and are much larger than the corresponding differences for other systems. CBO's estimates, even at the high end of the

range, are about half those of the Army for 2006 and 2007; its estimate for 2007 is roughly a quarter of the Administration's request for that year. Again, CBO did not receive sufficient data from the Army to allow it to determine the reason for the large discrepancies.

Testimony by the Government Accountability Office in January 2007 indicated that the Army determines its annual requirements for reset funding by aggregating costs for all equipment that it expects to bring back from the theater in that year.<sup>9</sup> For each piece of equipment, the Army estimates a unit cost for the planned resetting and multiplies that cost by the number of items it expects to be returned and available for repairs and overhauling. CBO used the same method—relying on the Army's own unit-cost calculations—to estimate costs for field-level maintenance for returning combat vehicles and trucks. As a result, CBO cannot fully explain why its estimates are so much lower than the Army's.

An Army representative explained that the service's definition of what is included in its reset program has become broader. For that reason, the Administration's 2007 funding request included the repair of some equipment that remained in the theater. Such repair, although necessary, is not part of the reset program as originally defined but instead part of the cost of ongoing operations.

**Replacing and Repairing Equipment in the Army's Prepositioned Sets.** In the early stages of operations in Iraq, the Army drew equipment from its prepositioned sets in various locations around the world and on board ships to equip units arriving in Kuwait and surrounding areas. By doing so, the Army could bring units to Southwest Asia much more quickly than if those forces traveled by sea, which would be necessary if they were bringing their equipment with them. According to an OSD report dated April 2005, before the beginning of the Iraq war, the Army had maintained two brigades' worth of equipment in Kuwait (enough to equip 6,000 to 10,000 soldiers); one brigade's worth in South Korea; one brigade's worth on board ships stationed at Diego Garcia, in the

8. CBO received detailed data concerning the resetting of 627 combat vehicles at a cost of \$23 million—out of a total of 3,655 returned vehicles (excluding Stryker vehicles) and costs of \$430 million.

9. Statement of William M. Solis, Director, Defense Capabilities and Management, Government Accountability Office, before the Subcommittees on Readiness and Air and Land Forces of the House Armed Services Committee, published as *Defense Logistics: Preliminary Observations on the Army's Implementation of Its Equipment Reset Strategies*, GAO-07-439T (January 31, 2007).



**Table 2-5.****Funding Required and Requested for the Army's Reset Program**

(Billions of dollars)

	2005		2006		2007	
	Requirement	Request	Requirement	Request	Requirement	Request
<b>Replacing and Repairing Equipment Used in the Theater</b>						
Procurement Funds						
Replacement of losses	0.8	0.7	1.6	1.1	1.6	2.4
Operations and Maintenance Funds						
Depot-level maintenance of returned equipment	1.1	1.1	2.3	2.0	2.3	3.8
Field-level maintenance of returned equipment	1.9	1.7	2.9	2.5	2.9	3.0
Subtotal, Operations and maintenance	3.0	2.8	5.2	4.5	5.2	6.8
<b>Total, Replacement and Repair</b>	<b>3.8</b>	<b>3.5</b>	<b>6.8</b>	<b>5.6</b>	<b>6.8</b>	<b>9.2</b>
<b>Other Reset Activities</b>						
Procurement Funds						
Upgrading of returned equipment and purchase of new or upgraded equipment for the Army's reserve-component and modular units <sup>a</sup>	2.2	2.4	4.9	2.1	4.9	5.9
Purchase of equipment for the Army's prepositioned sets	0	0	1.0	0.6	*	0.2
Subtotal, Procurement	2.2	2.4	5.9	2.7	4.9	6.1
Operations and Maintenance Funds						
Rebuilding of returned equipment	0.8	0	0.3	0	0.3	0.7
Resetting of the Army's prepositioned sets	0.7	0.5	0.4	0.3	*	0.3
Other <sup>b</sup>	1.6	0.2	0.1	0	0.1	0.8
Subtotal, Operations and maintenance	3.1	0.7	0.8	0.3	0.4	1.8
<b>Total, Other Reset Activities</b>	<b>5.3</b>	<b>3.1</b>	<b>6.7</b>	<b>3.0</b>	<b>5.3</b>	<b>7.9</b>
<b>All Reset Activities</b>						
Procurement	3.0	3.1	7.5	3.8	6.5	8.5
Operations and Maintenance	6.1	3.5	6.0	4.8	5.6	8.6
<b>Total, All Activities</b>	<b>9.1</b>	<b>6.6</b>	<b>13.5</b>	<b>8.6</b>	<b>12.1</b>	<b>17.1</b>

Source: Congressional Budget Office based on data from the Department of the Army.

Notes: The funding required and requested comprises the Army's estimated requirements and the Administration's supplemental budget requests.

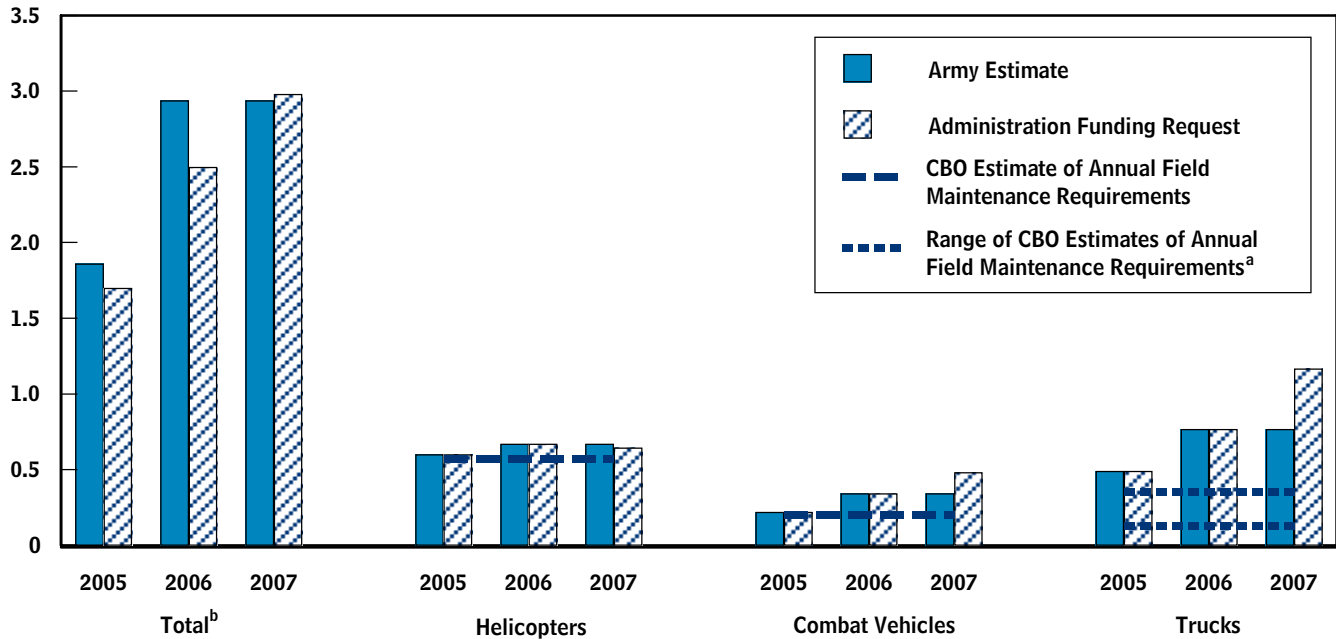
\* = less than \$50 million.

- a. The reserve component comprises the Army National Guard and Army Reserve. Under its modularity initiative, the Army is reorganizing its units into a more standard structure.
- b. May include repairs not funded in the previous year, repair and maintenance of equipment left at home stations by deploying units, and other miscellaneous repair costs.

**Figure 2-3.**

**CBO and Army Estimates and Administration Funding Requests for Annual Costs of Field-Level Maintenance for Returned Equipment**

(Billions of dollars)



Source: Congressional Budget Office based on data from the Department of the Army.

- a. The range represents estimates that include the annual cost of returning from zero to 50 percent of the trucks in the theater provided equipment pool.
- b. Includes field-level maintenance for all types of equipment.

Indian Ocean; and three brigades' worth in Europe.<sup>10</sup> To support operations in Iraq, the Army reportedly has drawn equipment from the sets located in Kuwait, Europe, and at sea and is striving to replace the items as part of its reset program.

CBO did not attempt to estimate the costs for reconstituting the Army's prepositioned sets, for two reasons. First, establishing the sets' condition before they began to be used for operations in Iraq—that is, the types and quantities of equipment that were in them—would be difficult if not impossible, and without that information, the costs to return them to their prewar state could not be estimated. Second, the Army is reconfiguring its prepositioned equipment sets, so it may not plan to return

them to the condition they were in before the war began. In fact, a GAO report noted that the Army had decided to reduce by half the amount of equipment it stores afloat.<sup>11</sup> Discussions between CBO staff and Army personnel and subsequent GAO reports indicate that the Army's plans for its prepositioned sets are in flux.<sup>12</sup> Thus, without firm plans for what should ultimately be included in them, any estimate by CBO of the costs for their reconstitution could be misleading.

10. Office of the Secretary of Defense, *Ground Force Equipment Repair, Replacement, and Recapitalization Requirements Resulting from Sustained Combat Operations: Report to the Congress* (April 2005).

11. Statement of William M. Solis, Director, Defense Capabilities and Management, Government Accountability Office, before the Subcommittees on Readiness and Tactical Air and Land Forces of the House Armed Services Committee, published as Government Accountability Office, *Defense Logistics: Preliminary Observations on Equipment Reset Challenges and Issues for the Army and Marine Corps*, GAO-06-604T (March 30, 2006).

12. Government Accountability Office, *Defense Logistics: Improved Oversight and Increased Coordination Needed to Ensure Viability of the Army's Prepositioning Strategy*, GAO-07-144 (February 2007).

The Army estimates that it will need almost \$3.0 billion to repair, replace, and reconfigure equipment for its prepositioned sets, activities that it considers part of its reset program. The Administration has requested a total of \$1.9 billion through 2007 to buy some new equipment for the sets and also to repair existing equipment and upgrade some systems. An additional \$1.1 billion may be needed after 2007 to reconstitute all of the service's prepositioned equipment, a process that could take until 2012 to complete.

### **Cost Estimates and Funding Requests for Activities Other Than Replacing and Repairing Lost and Returned Equipment**

The Army's estimates of its requirements for its reset program and the funds requested by the Administration include costs associated with activities other than replacing lost equipment or repairing equipment returned from the theater—specifically, costs to upgrade equipment that has been returned from Iraq, procure equipment for the Army's new modular units or for units in the service's reserve component, and maintain the equipment permanently stationed in the theater (see Table 2-5 on page 29).<sup>13</sup> For 2005, costs for those other kinds of reset activities exceeded the Army's requirements for replacement of lost equipment and for depot- and field-level maintenance for equipment returned from the theater; for 2006, the costs for other activities were almost as large. CBO did not estimate the costs associated with those additional reset activities primarily because such efforts are not directly related to reversing the effects of combat stress on equipment returned from Iraq and because it did not have sufficient data for those calculations.

**Upgrading Existing Equipment and Purchasing New Equipment.** The Army's estimated requirements and the Administration's budget requests included significant amounts for 2005, 2006, and 2007 to modernize and upgrade equipment being returned from Iraq and to purchase new or upgrade existing equipment for the Army's modular brigades and for units in its reserve component. The Army argues that to include those activities under its reset program makes economic sense because the upgrades can be carried out while the equipment is being

disassembled at a depot for inspection, cleaning, and reconditioning. Estimated costs for rebuilding (or recapitalizing, as the Army refers to it) or upgrading equipment and for purchasing new equipment totaled \$3.0 billion for 2005 and \$5.2 billion for 2006 and 2007 (see Table 2-5 on page 29); those amounts combine operation and maintenance (O&M) funds allotted to the Army's depots and contractors to disassemble the equipment and procurement funds to purchase and install new components. The Administration's funding requests for the same purposes totaled \$2.4 billion for 2005, \$2.1 billion for 2006, and \$6.6 billion for 2007.

The Army has used the bulk of those funds to rebuild and upgrade its tracked combat vehicles, with trucks receiving the next largest share. The request for reset funds for 2007 (which were provided as so-called bridge funding in title IX of the regular defense appropriation) included about \$2.5 billion to purchase additional equipment—primarily trucks—for reserve-component units. Trucks in particular are in short supply, advocates for the Army Reserve and National Guard argue, because a large number of vehicles have been left behind in Iraq and the surrounding areas. CBO did not estimate costs for rebuilding or upgrading equipment being returned from Iraq or for purchasing new equipment because such costs are associated with activities that go beyond repairing systems and bringing them back to good working order.

**Maintaining Equipment That Remains in the Theater.** A final category of costs that the Army has included in its reset requirements but that are not directly related to the replacement of lost items and the repair of returned equipment is that of maintaining systems that remain in the theater. The Army estimated that in 2005, it would need a one-time amount of \$1.6 billion to establish maintenance facilities in the theater. For 2007, as part of its estimated requirements and the related request for field-maintenance funds, the Army included a total of \$845 million to repair equipment remaining in the theater in the TPE pool.

### **Total Funds Required, Requested, and Appropriated for Reset**

In total, the Army's estimates of costs and the Administration's funding requests for resetting equipment have increased since 2005, with the requests experiencing much greater growth than the Army's estimates of its requirements. Total estimated requirements for the Army's reset program were \$9.1 billion for 2005,

13. The Army is reorganizing its units into a more standard structure, an initiative that it terms "modularity." The resulting larger number of smaller units will require more equipment if they are all to be similarly outfitted.

\$13.5 billion for 2006, and \$12.1 billion for 2007, or a total of \$34.7 billion. The overall figure for 2007, which was developed in the spring of 2006, was lower than the estimated requirement for 2006, primarily because the Army assumed that it would need fewer funds to reset equipment in its prepositioned sets than it had required the previous year. Otherwise, the Army's estimated requirements for 2006 and 2007 were essentially the same and about one-third higher than those for 2005.

The largest percentage increases in requirements from 2005 to 2007 were in the costs for replacing lost equipment, performing depot-level maintenance on returned items, and upgrading and purchasing equipment, all of which roughly doubled. Of the total funds that the Army estimated it needed for reset over the three years, half—\$17.4 billion—was for activities to replace lost equipment or to repair and reset equipment that had been returned from the theater, with an additional \$2.1 billion to reset and refill prepositioned equipment sets (see Table 2-4 on page 27). The remaining \$15.2 billion was for upgrading existing equipment or returning it to an as-new condition, purchasing new equipment, and establishing repair facilities in the theater.

The rise in the funding requested for the Army's reset activities has been more dramatic than the increase in the service's estimated requirements. The Administration's requests for funds climbed from \$6.6 billion for 2005 to \$17.1 billion for 2007 (see Table 2-5 on page 29). The funds requested for 2005 and 2006 did not cover the Army's estimated requirements; they were short by \$2.5 billion for 2005 and \$4.9 billion for 2006—gaps that could explain some of the boost in requirements from 2005 to 2006. The \$4.9 billion that was not requested in 2006 was instead included in the 2007

request and added to the Army's estimated requirements for that year, yielding a total request for 2007 of \$17.1 billion. The funding requested over the three-year period—a total of more than \$32 billion—was more heavily concentrated in activities to replace lost equipment or to repair and recondition returned equipment. All told, \$18.3 billion (57 percent) of the requested funds were for those activities. An additional \$1.9 billion was requested for equipment to refill and reconfigure the Army's prepositioned sets.

The Army has generally received all of the funds requested for its reset program, an amount totaling more than \$38 billion from 2002 through 2007. The bulk of that funding has been appropriated in the past three years, with annual funding increasing from \$6.6 billion for 2005 to \$8.6 billion for 2006 and then almost doubling, to \$17.1 billion, for 2007. Although the Army's rationale has been that those funds are needed to repair and recondition equipment returned from the theater, only 52 percent of the more than \$32 billion that the Army received in those three years has been O&M funding associated with repairs and maintenance. A small portion of the O&M funds has been requested and provided for activities other than repairing returned equipment—in particular, about \$700 million was requested for 2007 to rebuild some systems to an as-new condition without improving their capabilities.

The remainder (\$15.4 billion) of the requested funds has gone toward procurement. Roughly a quarter (\$4.2 billion) of that amount was requested to replace lost equipment. The remaining money has been provided to upgrade returned equipment and equip new modular and reserve-component units (\$10.4 billion), and to buy new equipment for the Army's prepositioned sets (\$0.8 billion).

## Issues Concerning the Army's Requests for Funds to Reset Its Equipment

**T**he Congressional Budget Office's analysis of the Army's reset program identified several issues regarding the funds requested by the Administration for replacing and repairing equipment returned from operations in Iraq and Afghanistan. Such issues included the observation that more than 40 percent of the reset funds that have been requested and received have been allocated to activities other than replacement and repair. In addition, some of the Army's estimates of projected equipment losses are inconsistent with recent experience. A further question involves timing, given that some of the activities associated with resetting equipment are not time critical.

### Questions About Activities Being Funded Under the Reset Program

A significant portion of the funds that the Army says it requires for its reset program supports activities that, although beneficial to the Army, do not directly relate to replacing lost equipment or repairing worn or damaged systems—the tasks that were originally seen as making up the reset process. Also a question is whether some other activities are of such urgency that they must be undertaken while hostilities are still under way.

### Some Activities May Not Qualify as Countering the Effects of Operations in the Theater

A significant portion of the funds that the Army has estimated it needs or that the Administration has requested for reset would not be used to replace lost or washed-out systems or to repair and recondition equipment returned from the theater. Rather, the funds are required, according to the Army, to rebuild to an “as-new” condition equipment that was not new when it was deployed, to

upgrade the capabilities of returned equipment, to purchase new or upgraded equipment for the service's new modular units, and to refill and reconfigure prepositioned sets.

The Army's estimates of the funds it requires for those purposes totaled \$5.3 billion for 2005, \$6.7 billion for 2006, and \$5.3 billion for 2007—or 58 percent, 50 percent, and 44 percent, respectively, of the total funds that the Army estimated it required for its reset program for those years (see Table 2-4 on page 27). Of the more than \$17 billion that the Army estimated it needed for those activities over that period, \$12 billion was required to upgrade returned equipment and to buy new or upgraded equipment for the service's modular and reserve-component units.

Although the Administration did not request—and thus the Army did not receive—all of the funds that the service said it needed for reset (supplemental requests submitted by the Administration included 73 percent and 64 percent of the Army's estimated requirements for 2005 and 2006, respectively), the Army nevertheless received significant amounts of funding for the 2005–2007 period to purchase and upgrade equipment in addition to funds to replace lost equipment. In total, \$10 billion has been appropriated for those purposes in the past three years as part of the reset program, allowing the Army to upgrade hundreds of combat vehicles and purchase tens of thousands of trucks, among other items. In particular, the Government Accountability Office has noted that the Army's request for reset funds for 2007 included “plans to accelerate modernization of Abrams tanks and Bradley fighting vehicles to accelerate achieving

long-term strategic goals under the Army's modularity initiative."<sup>1</sup>

### **Some Reset Activities May Not Be Time Critical**

The Administration has requested funds as part of the Army's reset effort for activities that could be delayed until after U.S. forces have been withdrawn from Iraq. An example is money to reset and reconfigure the Army's prepositioned sets, including those on land in Southwest Asia. According to GAO, the Army in April 2006 reported that with the exception of the set in Kuwait, it had replaced the equipment that had been removed from its prepositioned sets and brought all of the items back up to standards. Subsequent statements by the Army, however, indicate that it has been using equipment from the set in Kuwait to support ongoing operations. Furthermore, equipment requirements associated with the recent troop surge have forced the service to use equipment from the afloat sets as well.

Although maintaining prepositioned sets at sea and in South Korea is necessary to enable the Army to respond rapidly to unexpected crises, that rationale does not apply to prepositioned sets in Kuwait because large amounts of equipment and significant numbers of U.S. forces are already in the area. Thus, a time-critical need to reestablish and maintain sets of equipment in Kuwait and the surrounding area, to be held in reserve for an unexpected crisis, does not appear to exist. Moreover, the Army's plans for the future configuration and location of its other prepositioned sets are in flux. Once those plans are finalized, they could affect the composition of the prepositioned sets in Southwest Asia.

## **Effects of Early Submission of Requests for Funding**

In the past, the Administration has submitted funding requests for resetting the Army's equipment before the government's fiscal year ends—in the case of the 2007 request, the request was submitted before the fiscal year began. To determine the funds needed in the current or upcoming fiscal year, the Army must estimate the type

and quantity of equipment that will be returned to be repaired during that year. In some cases, the Army's projections have not been realized. For example, in preparing its estimate for fiscal year 2007 in the spring of 2006, the Army assumed that the number of its forces in Iraq would begin to decline and that units would start to return to their home stations during the last quarter of 2006, a process that it estimated would take roughly one year. The Army also projected that as its forces redeployed to their home stations, the pool of theater provided equipment would be returned to the United States and require repair and reconditioning. As a result, the Army's estimated requirements for reset funding for 2007 included \$845 million for reconditioning the portion of the TPE pool that the Army assumed would return to the United States in 2007.

But the Army's forces are not likely to be substantially drawn down in 2007; they were increased in the spring and summer of this year and may remain at a higher level through the end of 2007 and into 2008. Therefore, the TPE pool will not be shrinking and may instead be expanding, and the \$845 million that was requested and appropriated to reset equipment from the pool on its return to units' home stations in 2007 will probably not be used for that purpose.

That example was the clearest inconsistency between the Army's estimated and actual requirements that CBO identified, but there may be others. The Administration's request for funds for the upcoming year—that is, for 2008—depends on the amount of returned equipment and the types of maintenance that the equipment requires. If actual quantities do not match projections, the funds requested, appropriated, and used will also indicate inconsistencies.

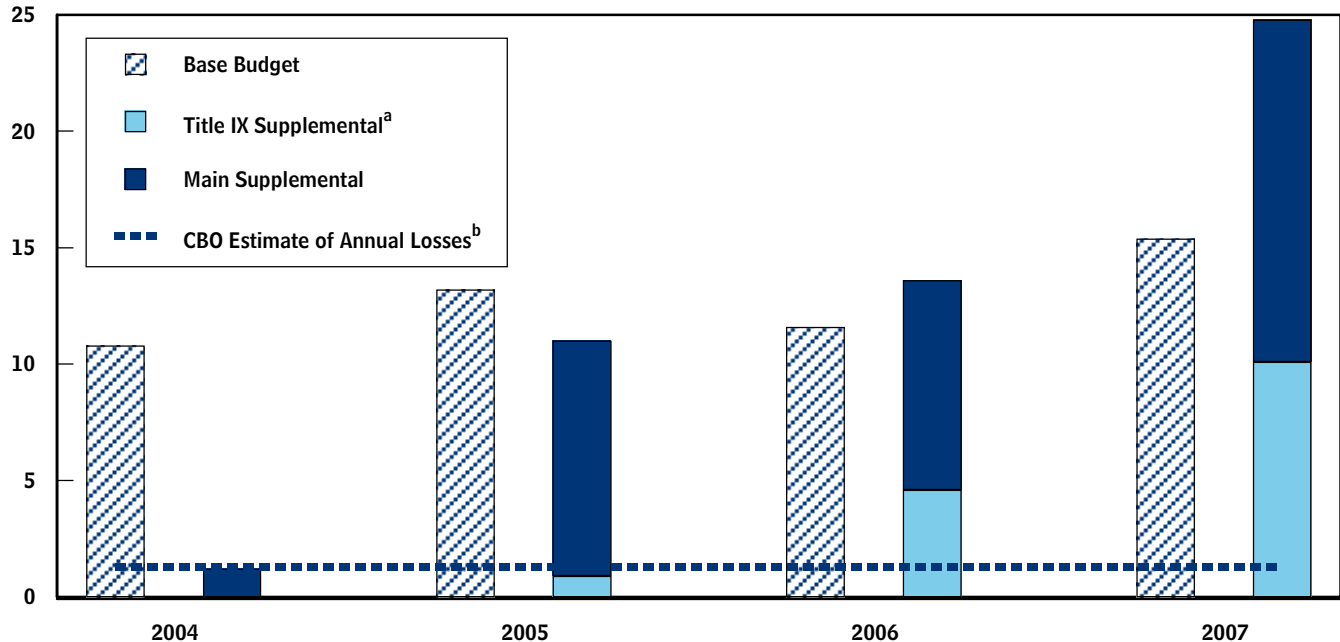
## **Other Issues**

During the course of its analysis, CBO identified two other items of interest regarding the Army's reset efforts. The first concerns the amount of procurement funding that the Army has requested in supplemental appropriations, both as part of its reset program and for other purposes, since the beginning of the war on terrorism. The second concerns the practice of sending returned equipment into lengthy programs for upgrading and reworking and the effect of that practice on the availability of equipment for units deploying or preparing to deploy to Iraq or Afghanistan.

1. Statement of William M. Solis, Director, Defense Capabilities and Management, Government Accountability Office, before the Subcommittees on Readiness and Air and Land Forces of the House Armed Services Committee, published as *Defense Logistics: Preliminary Observations on the Army's Implementation of Its Equipment Reset Strategies*, GAO-07-439T (January 31, 2007), p. 5.

**Figure 3-1.****Army Procurement Funding, 2004 to 2007**

(Billions of dollars)



Source: Congressional Budget Office.

Note: The total value of the Army's equipment in the theater (Iraq, Afghanistan, and surrounding areas) is \$28.2 billion, in CBO's estimation.

- a. "Bridge" funding requested as a supplement after submission of the President's budget and provided in the regular defense appropriation under title IX.
- b. Includes battle losses and washouts (systems deemed irreparably damaged on their return to home stations).

**Total Procurement Funding Provided in Supplemental Appropriations**

By June 2007, the Congress had appropriated a total of \$49 billion in supplemental procurement funding for the Army for 2005 through 2007—\$9 billion more than the amount received for procurement in the service's base budgets for those years (see Figure 3-1). That supplemental procurement funding was not all designated for the reset program. Of the \$49 billion appropriated, policymakers allocated \$15 billion specifically to reset—\$5 billion for replacement of lost equipment and replenishment of prepositioned sets and \$10 billion for activities that the Army considers part of that effort (such as upgrading existing vehicles to equip its new modular units and providing equipment for reserve-component units). As GAO has noted, however, it is almost impossible to determine whether the requested funding is being used to reset equipment or to meet the Army's goal of modernizing its forces. The remaining \$34 billion was

allocated to similar activities that the Army conducts outside of the reset program.

Overall, the procurement funds provided to the Army through supplemental appropriations are sufficient to replace all of the equipment that the service has typically had in the theater at any given time. CBO calculated that the overall cost to replace all deployed equipment would be roughly \$28 billion; the Congress has appropriated significantly more than that amount.<sup>2</sup>

Some of the funds provided through supplemental appropriations—at least \$1 billion—have been designated for force protection modifications, but a significant amount of the funding has been allocated to the purchase of new

2. That statement is based on replacement costs in the Army's February 2006 SB700 database, which includes prices for each item in the Army's inventory.

**Table 3-1.**

**Shortages of Selected Army Systems for Units at Home Stations and Purchases from 2005 to 2007**

(Number of vehicles)

	Total Inventory <sup>a</sup>	Shortage		Purchases, 2005 to 2007
		Perfect Redistribution <sup>b</sup>	Imperfect Redistribution <sup>c</sup>	
Stryker Vehicles	1,400	900	900	1,300
HMMWVs <sup>d</sup>	107,700	10,600	12,900	27,300 <sup>e</sup>
Family of Medium Tactical Vehicles	25,500	28,600	31,800	21,300
Heavy Expanded-Mobility Tactical Trucks	14,400	2,900	4,900	3,100
Palletized Loading Systems	4,000	100	1,000	1,000
Line-Haul Trucks <sup>f</sup>	8,900	0	1,700	1,500

Source: Congressional Budget Office based on data from the Department of the Army.

Notes: All numbers are rounded to the nearest 100 vehicles.

HMMWV = high-mobility multipurpose wheeled vehicle.

- a. As of the end of 2006.
- b. Incorporates the assumption that equipment left in the United States or Europe by deploying units will be redistributed to returning units.
- c. Incorporates the assumption that equipment left in the United States or Europe by deploying units will not be redistributed to returning units.
- d. Excludes up-armored HMMWVs (those in which the armor is integral to the vehicle rather than bolted on).
- e. Purchases were of up-armored HMMWVs, which could replace HMMWVs without integral armor in the theater, thus freeing those latter vehicles to fill shortages in units back at their home stations.
- f. Similar to commercial tractor-trailers.

equipment. Systems for which supplemental funding was appropriated for 2005 through June 2007 include roughly 100 helicopters and 48,000 new trucks of all kinds; in addition, funds to upgrade more than 3,000 tanks, Bradley fighting vehicles, and M113-based vehicles were provided. Such purchases exceed those needed to replace items lost in battle—which represent a small share of the items purchased with supplemental funds. In fact, in some cases, supplemental appropriations provided more funds for procurement than the base defense budget did. One example is funding to upgrade M1A2 tanks; the Administration requested no funding in the 2006 base budget, but policymakers included \$300 million for that purpose in the 2006 supplemental appropriation.

As a result, the combined procurement funds appropriated in base budgets and supplemental appropriations for 2005 through 2007 should help erase the shortages in the Army's equipment inventories that CBO's analysis identified. In fact, appropriations during that period were sufficient to purchase enough Stryker vehicles, high-mobility multipurpose wheeled vehicles, and heavy trucks to elim-

inate many of those shortfalls (see Table 3-1). The Army could still have a shortage of more than 10,000 trucks in its family of medium tactical vehicles after the more than 21,000 new trucks it has purchased are all delivered in 2009, but that shortage will be smaller than the one it had at the end of 2006.

**How Upgrading of Returned Systems Affects Equipment Availability**

The practice of upgrading some equipment on its return from Iraq, a practice that the Army includes as part of its reset program, may contribute to the shortages being experienced in some equipment fleets. The Army considers it economical to upgrade a piece of equipment after it has been broken down as part of the inspection and refurbishment it receives on its return from Iraq. In that way, according to the service, a system such as a tank may not only have the adverse effects of its time in Iraq erased but also have its capabilities significantly increased.

Some people might interpret the Army's use of the term "economical" to imply that the difference in what it costs



to upgrade a system and what it costs to recondition one is not very large. CBO found, however, that upgrading costs substantially more and takes much longer than reconditioning. Tanks and one type of heavy truck that falls under the Army's reset program illustrate that point. The funds requested for reset for 2007 included money to upgrade 293 M1A1 tanks to the M1A1 Abrams Integrated Management (AIM) configuration and 120 M1A2s to the M1A2 System Enhancement Program (SEP) configuration. The difference between reconditioning an M1A1 tank (\$0.9 million) and upgrading it to the AIM configuration (\$1.8 million, comprising operations and maintenance as well as procurement costs) is roughly \$0.9 million—meaning that an upgrade is roughly twice as expensive as an overhaul.<sup>3</sup> Upgrading a tank to the A2 SEP configuration costs \$5.4 million—or, again, roughly twice what it costs to overhaul the tank (\$2.8 million).

The time required to upgrade a tank is also greater than the time required to recondition it. According to Army documents, it takes roughly 4 months to disassemble, inspect, clean, and recondition a tank. It takes about 12 months to upgrade a tank to the AIM configuration and even longer (roughly two years) to upgrade one to the M1A2 SEP configuration. As a result, a tank that is undergoing either of those upgrades is unavailable to a

unit for a minimum of one year and for as long as two years—compared with the 6 months required for overhauling the tank at a depot.

The Army's practice of upgrading or reworking trucks that have returned from the theater also raises some questions. The Army's heavy expanded-mobility tactical trucks are large vehicles that are in great demand in Iraq for hauling fuel and cargo. The funding request for 2007 for the service's reset program, in addition to funds for rebuilding or extending the service life of 84 trucks, included money to repair 764 HEMTTs at a depot. Although only a small number of HEMTTs would be rebuilt under the Army's plans, those 84 trucks would be unavailable to units for about a year—much longer than the two to three months required to overhaul the same trucks at a depot. Rebuilding rather than overhauling the trucks would also exacerbate the shortage of at least 2,900 HEMTTs needed to equip units at their home stations in the United States and Europe (see Table 3-1).

Although the Army may be paying a higher price to rebuild rather than recondition its returning equipment, the practice does yield some benefits. If a system will eventually be rebuilt or upgraded, performing that job while the equipment is disassembled for reconditioning avoids the costs and time required to take it apart again later. In addition, upgrading systems now rather than waiting increases the capability of the Army's equipment and in some cases may also contribute to the standardization of weapon models across units.

---

3. The total cost of \$1.8 million for converting an M1A1 to an M1A1 AIM includes \$1.3 million in procurement costs and \$0.5 million in O&M costs.

