

# CBO

## The Cost of Supporting Military Bases



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## At a Glance

The Department of Defense operates hundreds of military bases and similar installations that host military units and support their daily operations, providing services such as housing, utilities, and grounds maintenance. This report analyzes the relationship between the cost of those services—also referred to as base operations support (BOS)—and specific characteristics of a base, such as its population and physical size. The key findings of the Congressional Budget Office include the following:

- BOS costs are strongly related to the number of a base's employees and its square footage of building space.
- With other base characteristics unchanged, BOS costs associated with an increase in population were lower at larger bases than at smaller bases. For example, in 2016 BOS costs increased by \$1,000 for each employee added to bases with 25,000 or more employees, but they increased by \$14,000 at bases with 5,000 or fewer employees. That finding implies that it would be more cost-effective to expand the population at larger bases than at smaller ones, everything else being equal.
- Other characteristics that affect BOS costs at a base are the branch of service that operates it, the mission of the units that it hosts, its location (inside or outside the United States), and its climate, although the effects of those characteristics are not as significant.



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## Notes

The years referred to in this report are federal fiscal years, which run from October 1 to September 30 and are designated by the calendar year in which they end.

All costs are expressed in 2019 dollars and are adjusted for inflation using the Bureau of Economic Analysis's gross domestic product price index.

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

On the cover:

Upper left: Base honor guard airmen stand in front of a B-52 Stratofortress at Andersen Air Force Base, Guam. U.S. Air Force photo by Staff Sergeant Bennie J. Davis III.

Upper right: The Los Angeles-class fast-attack submarine USS *Springfield* makes its homecoming arrival at Joint Base Pearl Harbor-Hickam, Hawaii. U.S. Navy photo by Mass Communication Specialist 1st Class Michael Zingaro.

Lower right: Marines from Fox Company, 2nd Recruit Training Battalion, march across the parade deck during a graduation ceremony at Marine Corps Recruit Depot San Diego. Marine Corps photo by Lance Corporal Angelica I. Annastas.

Bottom: Fort Bragg, North Carolina. Army Corps of Engineers photo by Jonas N. Jordan. Photo courtesy of the U.S. Army.

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# The Cost of Supporting Military Bases

## Summary

The Department of Defense (DoD) operates hundreds of bases that support the daily operations of units in the Air Force, Army, Marine Corps, and Navy, providing services such as housing, utilities, and grounds maintenance, much as might be found in a town or city (see Box 1 for a more detailed description of those services). In 2016, \$25 billion—about 4 percent of DoD’s budget—was allocated to the costs of such services, called base operations support (BOS). The costs of providing such support vary between bases, and the factors that affect those costs are not clearly understood. In this report, the Congressional Budget Office explores certain characteristics of bases, such as their size, geographic location, and the mission of the units they serve, and uses statistical methods to assess the relationship between those characteristics and BOS costs.

## What Data Did CBO Use to Analyze the Cost of Base Operations Support?

CBO assembled 2016 data on more than 200 bases (about 90 percent of active-duty bases) in all four services. The characteristics CBO measured include the number of full-time DoD employees at a base, its building space, and its land area. Other characteristics CBO considered include the base’s location (in the United States or overseas), the branch of service running it, the primary mission of the units it hosts, whether it hosts a significant number of transient personnel, the local climate, and the local cost of living.

## What Did CBO Find?

After analyzing all of the characteristics it identified, CBO found five that were clearly connected to a base’s BOS costs: its size, primary mission, branch of service, location, and the climate extremes that it experiences (including precipitation and temperature). Of the five characteristics, the one most strongly related to BOS costs is size, in terms of both the number of employees and the amount of building space a base has.

CBO found that, with other characteristics unchanged, the increase in BOS costs associated with an increase in population was smaller at larger bases than at smaller bases. For example, the average BOS costs associated with adding an employee at extremely large bases (25,000 or more employees) were \$1,000; the corresponding increase in BOS costs at very small bases (5,000 or fewer employees) was \$14,000. CBO also found that adding 1,000 square feet of building space was, on average, associated with an increase of about \$4,000 in annual BOS costs, regardless of a base’s size.

CBO’s results could be used to anticipate how BOS costs would change if units were relocated between bases, new units were added, or existing units were disbanded. Because CBO’s analysis suggests that BOS costs would increase less if units were added to large bases rather than to smaller ones, relocating units from smaller bases to larger ones would reduce overall BOS costs in many cases. Conversely, relocating units from larger bases to smaller ones would generally increase those costs, all other things being equal. (Creating a new unit and adding it to any base would, of course, increase overall BOS costs.)

## What Are Some Limitations of CBO’s Analysis?

CBO’s analysis did not account for all base characteristics that were potentially relevant because sufficient data for some characteristics were not available or were difficult to measure. The omitted characteristics include the number of family members on the base; the age of buildings and other infrastructure; the number and type of BOS services; the intensity of operations (intensity is higher, for example, when units are mobilizing for deployment); the portion of building space used for family housing (the cost to operate and maintain family housing is funded through a separate appropriation); and the quality or standard of BOS services (higher standards are expected to cost more).

## Box 1.

**What Is Base Operations Support?**

Military bases and similar installations are an important part of the support infrastructure that enables combat and noncombat units to prepare for their missions. Although their physical size depends on the needs of the units they host, most bases provide similar basic services, referred to as base operations support (BOS). BOS services are funded through the Department of Defense's operation and maintenance appropriation.

BOS services support troops in a number of ways:

- **Facility Services.** Services include those a city might provide to its citizens, such as operations and maintenance of utility and sanitation systems, equipment maintenance, fire protection, crash rescue, custodial services, refuse collection and disposal, snow removal, street sweeping, grounds maintenance, and insect control. BOS services in this category also include engineering services, leases of real property, security such as physical barriers and police services, environmental conservation, and pollution prevention programs.
- **Personnel Support.** These services support the daily life of service members and their families. They include dining facilities, housing, religious services, education, counseling, child and youth development, and morale, welfare, and recreational services.
- **Mission Support.** To support the operations of military units they host, bases operate airfields, ports, and training ranges and provide other support to transient military aircraft and air crews.
- **Administrative Services.** This category of services supports the staff and personnel management of the hosted military units and other organizations on the base. Such services include public affairs, financial management, legal, contracting, and other administrative services.
- **Other Support.** Other services support workforce productivity, the distribution of goods and personnel, and security. Such services include information technology, communications (such as telephone service), and logistics (supply operations and shuttle buses, for example).

Long-term capital expenditures to sustain, restore, and modernize facilities at bases are not included in BOS costs and are funded through a separate budget account. In addition, units' direct costs, such as the pay of military personnel and the operation and maintenance of their weapon systems, are not included in BOS costs.

CBO's analysis is based on the level of BOS services that bases provide today. CBO did not address whether the current level of services is optimal for ensuring readiness (the ability of service members to perform their mission) or retention (their continuation in military service). It is possible that BOS services enhance readiness by contributing to unit training or retention of personnel. A base with higher BOS costs may thus make a greater contribution to a unit's readiness than a base with lower BOS costs. However, to CBO's knowledge the link between the level of BOS services offered and the readiness of a unit has not been measured.

**Background**

DoD operates bases and other installations in all 50 states and all U.S. territories, as well as in many foreign countries.<sup>1</sup> This section describes those bases,

the amount spent on their support services, and the data CBO collected and analyzed.

**Military Bases**

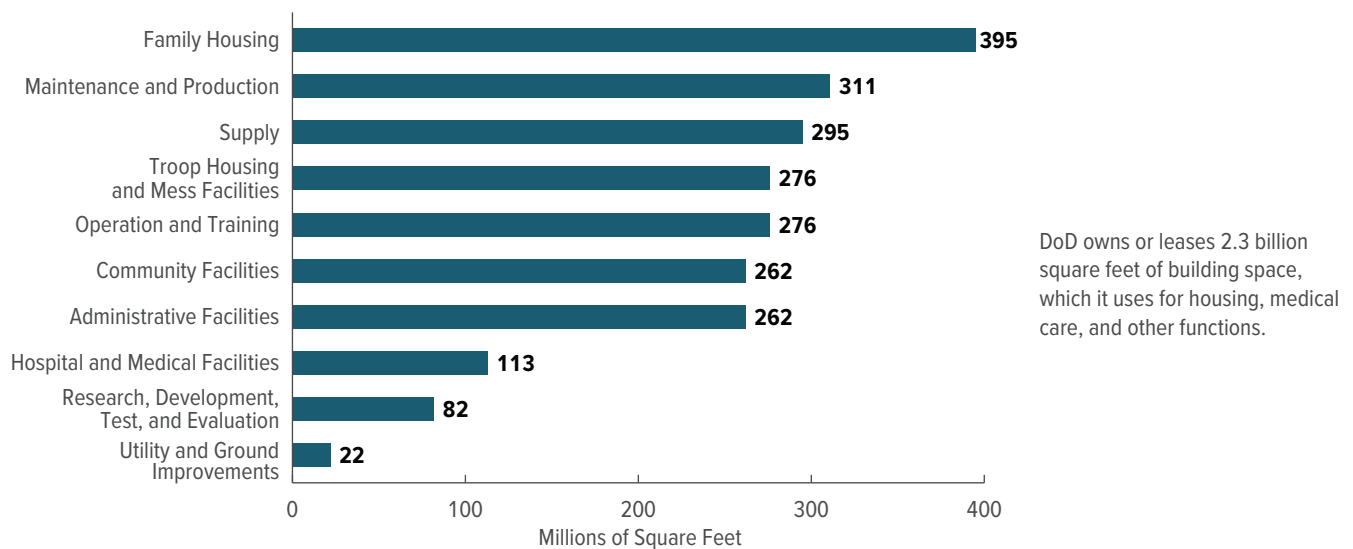
In 2016, the most recent year for which detailed figures are available, DoD's real estate portfolio covered about 27 million acres, and its buildings occupied 2.3 billion square feet of space.<sup>2</sup> Those buildings are used for a variety of functions, including housing, maintenance, supply, and training (see Figure 1). Military bases are the largest share of DoD's real estate portfolio.

In constructing its database, CBO focused on active-duty bases because most DoD bases are in that category and detailed data are available for them. There were 234 active-duty bases in 2017—168 in the United States

1. A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

2. See Department of Defense, *Base Structure Report—Fiscal Year 2018 Baseline*, <https://go.usa.gov/xpB6Z> (PDF, 2.4 MB).

Figure 1.

**Space Occupied by All of DoD's Buildings, by Function, 2016**

Source: Congressional Budget Office, using data provided by the Department of Defense.

Data include buildings assigned to active-duty and reserve forces as well as buildings that have been privatized or are operated by private entities for DoD. A building is defined by DoD as a roofed and floored facility enclosed by exterior walls that protects people and property from direct effects of weather such as rain, wind, or sun.

DoD = Department of Defense.

and 66 overseas.<sup>3</sup> The missions of the units and organizations hosted on those bases span the range of DoD's activities—they include administration, research and development, individual skills training, and air, ground, sea, and underwater combat.

The Army, Navy, and Air Force each operate about 70 active-duty bases, and the Marine Corps operates 23 (see Figure 2). Most of the Army's overseas bases are in Germany and other European countries. The Navy's and Marine Corps' overseas bases are mostly located in Japan and South Korea. Most of the Air Force's overseas bases are in Germany, Japan, and South Korea.

### DoD's Budget and Its Spending on Base Operations Support

During the past two decades, DoD's total budget and BOS costs for the military's service branches rose and fell in tandem even as the number of active-duty personnel

declined.<sup>4</sup> Adjusted for inflation, DoD's budget almost doubled between 2000 and 2010, to 195 percent of its 2000 budget, before declining to 153 percent of the 2000 budget in 2017 (see Figure 3).<sup>5</sup> Similarly, BOS costs for the military's service branches grew by 150 percent from 2000 to 2010, before declining by 2017 to 120 percent of the 2000 figure.<sup>6</sup>

By contrast, the number of active-duty personnel has varied much less. It grew relatively slowly through 2010

3. The number and location of those bases change little from year to year. Some were not included in CBO's analysis because complete data were not available for them.

4. DoD refers to the number of active-duty military personnel on September 30, the last day of the fiscal year, as end strength.

5. Office of the Under Secretary of Defense (Comptroller), *Operation and Maintenance Overview*, Fiscal Year 2019 Budget Estimates, exhibit O-1 (March 2018), and *Overview - FY 2019 Defense Budget*, United States Department of Defense Fiscal Year 2019 Budget Request (February 2018), both available at <https://go.usa.gov/xpB6N>. Those BOS costs exclude roughly \$1 billion in spending managed by the Defense Health Program. DoD's budget includes funding for overseas contingency operations (OCO).

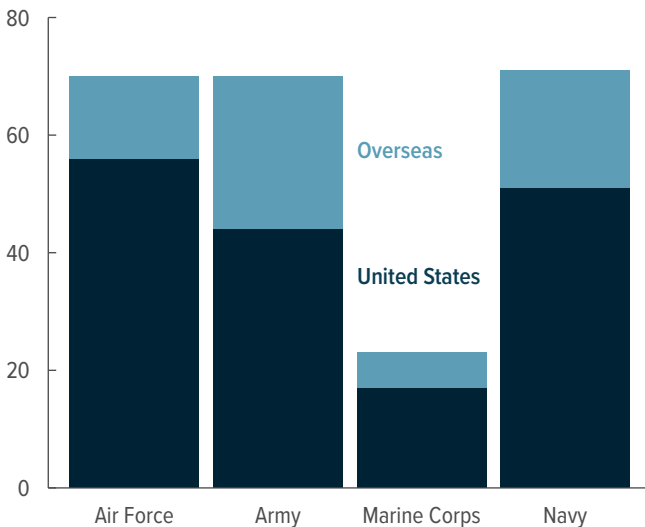
6. BOS costs also include OCO funding. BOS costs shrank as a percentage of DoD's budget from 2000 to 2010, in part because substantial amounts of OCO funding were included in DoD's budget and little of that funding was for BOS costs.

Figure 2.

### Number of Active-Duty Bases, by Service and Location, 2017

Each service branch of the U.S. Armed Forces operates bases in the United States and other countries. The Army and Navy have the largest share of overseas bases.

Number of Bases



Source: Congressional Budget Office, using data provided by the Department of Defense.

Bases that DoD designates as joint bases are included with the service responsible for managing them.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

DoD = Department of Defense.

and then declined. (The number of active-duty personnel grew by 3 percent from 2000 to 2010 as the Army and Marine Corps added military personnel for the wars in Iraq and Afghanistan; however, all services shed personnel in the ensuing years so that, by 2017, the number of personnel was 94 percent of what it had been in 2000.) Those trends suggest that DoD allocates its BOS budget on the basis of factors that are not directly related to the number of personnel: Independent of the overall size of the military force, DoD spends more on BOS when its budget is larger, and less on BOS when its budget is smaller. This report does not look at how total costs for BOS vary over time in relation to DoD's overall budget, but at how the cost of providing daily services at a base in any one year varies with certain characteristics of that base, such as the total number of personnel and the base's location.

### Bases CBO Analyzed

To conduct its analysis, CBO compiled data on funding, size, population, and other characteristics for a sample of 203 individual bases (representing about 90 percent of active-duty bases).<sup>7</sup> Those base-level data are more suitable for a detailed analysis of BOS costs than the consolidated summary of BOS funding for all bases that each military service usually provides to the Congress. CBO's database, described in more detail in the next section of this report, contains information for 2016, the most recent year for which complete information was available.

In total, the bases in CBO's database accounted for \$17.4 billion (in 2019 dollars) in annual BOS costs, 2.1 million employees, 1.7 billion square feet of buildings; and 18 million acres (see Table 1).<sup>8</sup>

The Air Force had the largest number of bases in CBO's sample (66 bases, or 33 percent of the total), followed by the Navy (57 bases, 28 percent of the total), Army (52 bases, 26 percent), Marine Corps (16 bases, 8 percent), and joint bases (12 bases, 6 percent).<sup>9</sup> (See Table 2.) The average characteristics of each service's bases differ in a number of respects. For example, the number of employees at Air Force bases averaged 7,000, and the number of employees at Navy, Army, Marine Corps, and joint bases averaged 8,000, 13,000, 12,000, and 23,000, respectively.

There are also significant variations between the bases within each service. For instance, Air Force bases range in size from Arnold Air Force Base, a research and development base with about 500 military and civilian employees, to Nellis Air Force Base, an aviation combat training base with about 13,000 employees. Similarly, Navy bases in CBO's database range from Naval Weapons Station Earle, which handles ammunition and has about 700 employees, to Naval Station

7. That sample consists of bases for which sufficient information was available.

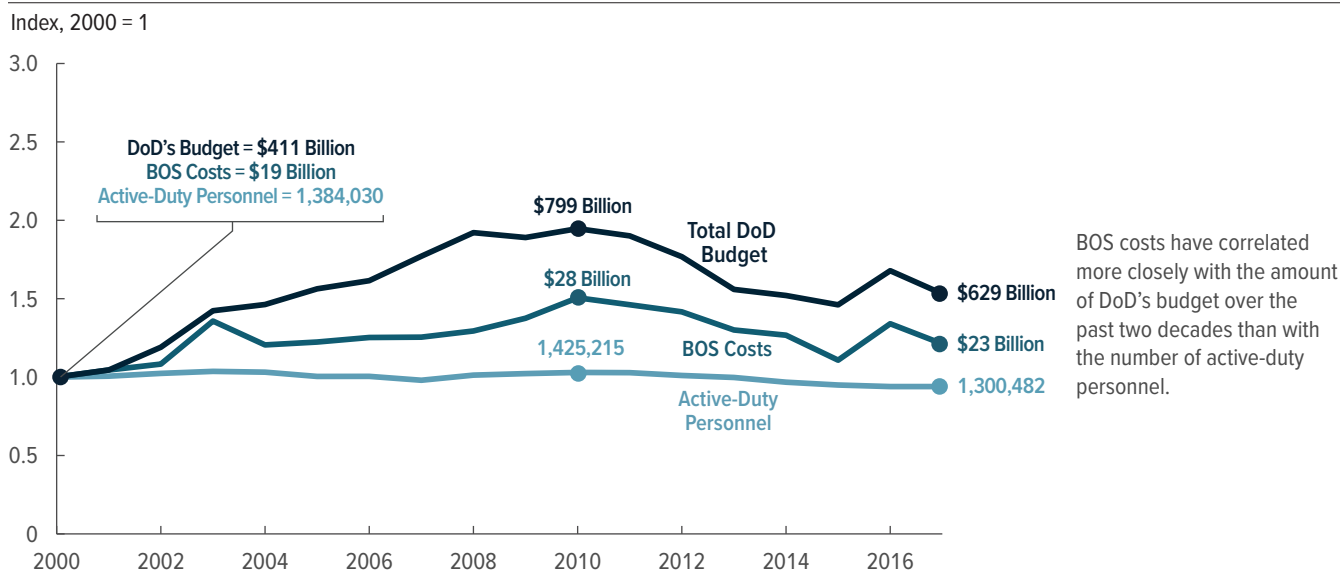
8. The \$17.4 billion represents about 70 percent of DoD's \$25 billion BOS funding in 2016. The bases and smaller sites excluded from CBO's database account for the remaining \$7.6 billion in BOS funding that year.

9. Joint bases are used by multiple military services and hosted by one service. They are consolidations of separate bases next to or near each other that were formerly operated by different services. Because of their unique nature, CBO grouped joint bases in their own distinct category.



Figure 3.

**Growth Since 2000 in BOS Costs, DoD’s Budget, and the Number of Active-Duty Personnel**



Source: Congressional Budget Office, using data provided by the Department of Defense.

Dollar amounts are in 2019 dollars.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD’s jurisdiction, including leased space, that is controlled by or primarily supports DoD’s activities.

BOS costs cover only bases operated by the military’s service branches, including joint installations.

Nearly all BOS costs are in DoD’s base budget. Overseas contingency operations, which are not in the base budget, contribute a negligible share of funding to those costs. (However, DoD’s total budget included substantial amounts of that funding during the period shown.)

Active-duty personnel is the number of active-duty service members on the last day of a fiscal year, also known as end strength.

BOS = base operations support; DoD = Department of Defense.

Norfolk, home port to several Navy warships, with about 65,000 employees.

**How CBO Analyzed Base Operations Support for Each Base**

Because DoD does not routinely provide a detailed breakdown of BOS costs for individual bases, CBO collected data on operating costs and characteristics for 203 bases from a number of sources to create a database of characteristics that might affect the cost of each base’s operations support. The agency then used statistical techniques to explore how particular characteristics of each base, such as its size or geographic location, related to its BOS costs.

**Characteristics CBO Analyzed**

CBO calculated the independent relationships between a number of base characteristics and BOS costs at bases.<sup>10</sup>

The agency examined a number of factors, among them the base’s size, mission, climate, and location; the branch of service running the base; the number of transient personnel; and the cost of living. CBO’s analysis does not establish cause and effect—that is, it does not indicate that a particular base characteristic caused changes in BOS costs.

**Size.** The primary measure of size in CBO’s analysis is the number of employees living or working on a base. CBO also looked at other measures of size, including a base’s land area and the square footage of its buildings, for each base.<sup>11</sup>

10. For an example of previous research in this vein, see Joseph G. Bolten, John Halliday, and Edward G. Keating, *Understanding and Reducing the Costs of FORSCOM Installations* (RAND

Corporation, 1996), [www.rand.org/pubs/monograph\\_reports/MR730.html](http://www.rand.org/pubs/monograph_reports/MR730.html).

11. Building space includes square footage in buildings owned or leased by the federal government, as well as federal buildings that fall in neither of those categories. Acreage includes government-owned land, public land, public land withdrawn for military use, licensed and permitted land, and foreign land used by DoD.

Table 1.

**Average Size of the Bases CBO Analyzed**

	Average per Base	Average per Employee	Total in Data Sample (203 bases)
Annual BOS Costs (Millions of 2019 dollars)	86	0.008	17,374
Number of Military and Civilian Employees <sup>a</sup>	10,170	n.a.	2,064,418
Building Space (Millions of square feet) <sup>b</sup>	8	0.0008	1,651
Land Area (Millions of acres) <sup>c</sup>	0.1	0.00001	18

Source: Congressional Budget Office, using data provided by the Department of Defense.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

BOS = base operations support; DoD = Department of Defense.

- Excludes family members, contractors, and others who are not direct employees of the Department of Defense.
- Includes all federal buildings on a base, including those leased by the federal government.
- Includes land owned or used by the federal government. Does not include land area of bases located outside the United States because that acreage is not enumerated in DoD's Base Structure Report.

Table 2.

**Size of the Bases CBO Analyzed, by Branch of Service**

	Average per Base				All Bases	
	Number of Military and Civilian Employees <sup>a</sup>	BOS Funding in 2016 (Millions of dollars)	Building Space (Millions of square feet) <sup>b</sup>	Land Area (Thousands of acres) <sup>c</sup>	Total	Percentage of Total
Air Force	7,000	68	5	69	66	33
Navy	8,000	55	6	30	57	28
Army	13,000	121	12	189	52	26
Marine Corps	12,000	102	12	68	16	8
Joint	23,000	153	13	49	12	6
All DoD	10,000	86	8	87	203	100

Source: Congressional Budget Office, using data provided by the Department of Defense.

Dollar amounts are in 2019 dollars.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

BOS = base operations support; DoD = Department of Defense.

- Excludes family members, contractors, and others who are not direct employees of the Department of Defense.
- Includes all federal buildings on a base, including those leased by the federal government.
- Includes land owned or used by the federal government. Does not include land area of bases located outside the United States because that acreage is not enumerated in DoD's Base Structure Report.

**Branch of Service.** CBO's analysis took into account whether a base is owned by the Air Force, Army, Marine Corps, or Navy or is operated as a joint base.

**Mission.** Many of the activities and equipment on a base reflect the primary mission of units hosted there. For

example, bases hosting aviation units have runways and those hosting ground combat units often have large areas for training. To assess how mission is associated with BOS costs, CBO considered base type: aviation, ground,

logistics, research and development, naval, space-related, training, or other.<sup>12</sup>

**Location.** Some U.S. military bases are located in foreign countries with high costs of living. Long shipping distances could also contribute to high BOS costs at those bases. However, some of those bases receive support from the host nation, reducing the costs borne by the U.S. military. CBO's analysis considers whether a base is located inside or outside the United States.

**Share of Transient Personnel.** The base population data available to CBO exclude personnel who are at the base for less than six months. To account for the possible effect of such transient personnel on BOS costs, CBO used an indicator to designate bases that have a few thousand or more transient personnel a year. CBO obtained that information from discussions with DoD officials and a review of DoD websites that provide details about missions and current activities on bases. Bases that were identified as having many transient personnel include those that provide training as a primary mission and those that host other individual or unit training programs.

**Climate Extremes.** Extreme temperatures and large amounts of precipitation affect BOS costs by requiring above-average expenditures for such services as snow removal in cold climates (particularly on bases with runways) or upkeep of cooling systems in hot climates. Using information on world climate zones, CBO constructed an indicator for bases in arctic or hot climates to account for the effect of such climates on BOS costs.<sup>13</sup>

**Cost of Living.** Bases in locations DoD designates as having a high cost of living were designated as such in CBO's analysis.

Appendix A discusses CBO's analytical approach in greater detail.

12. The "other" category includes bases that host units and organizations that provide administrative and miscellaneous support.

13. Common climate-zone demarcations include polar or arctic, temperate, arid, tropical, Mediterranean, and mountainous categories. CBO created the indicator using long-term temperature and other climate-related information obtained from the National Oceanic and Atmospheric Administration. See "Data Snapshots: Reusable Climate Maps" (accessed February 5, 2019), [www.climate.gov/maps-data](http://www.climate.gov/maps-data).

### Characteristics CBO Did Not Analyze

The characteristics included in CBO's analysis explain about 75 percent of the observed differences in BOS costs between bases. The unexplained portion could be attributed, in part, to characteristics that CBO's analysis omitted because sufficient data were not available. The omitted characteristics include:

- **Other Populations.** In addition to employees, family members, veterans, and members of the public use the base's services.
- **Age of Infrastructure.** Older buildings and infrastructure may incur higher BOS costs.
- **Types of Services.** The mix of services such as child care, lodging, meals, family counseling, and recreation affects BOS costs. Most bases provide a similar mix of such services.
- **Intensity of Operations.** A high pace of operations, such as during mobilizations for deployment, could increase BOS costs.
- **Family Housing.** DoD uses a separate budget appropriation for family housing that covers the cost of operating the housing.
- **Quality of Services.** Service standards such as the frequency of grounds maintenance may vary between bases. Differences in those standards could affect BOS costs.

### Data and Sources

CBO went to a variety of sources to obtain information on each base's funding, physical size, population, and other relevant features that might potentially affect costs.

**Funding.** CBO obtained figures for BOS funding at each base from budget officials at its service headquarters. CBO adjusted the data provided by the services to more closely reflect BOS activities at certain bases. For example, it is not uncommon for a unit from one service to be located on another service's base. When the parent service allocated BOS funds for such units (usually relatively large ones), CBO added that amount to the host base's BOS funds.<sup>14</sup> In another example, bases that DoD

14. For example, CBO allocated to Marine Corps Base Quantico the amount of BOS funds the Army paid it to maintain the U.S. Army Criminal Investigation Command there.

designates as joint bases sometimes are actually separate bases that do not adjoin each other. When such bases were separately allocated BOS funds by their parent services, CBO combined those amounts under the corresponding joint designation.<sup>15</sup>

**Physical Size.** DoD publishes an annual Base Structure Report (BSR) that provides a fiscal year-end snapshot of the department's real property inventory.<sup>16</sup> The BSR lists individual sites—defined as those that have a specific geographic location with individual land parcels or facilities—that are larger than 10 acres and have a replacement value of more than \$10 million. The report includes information on the number of buildings, square feet of space in those buildings, land area (acreage), and location for each site. A base may consist of one or more sites. CBO obtained the BSR for 2016, the most recent year for which data could be analyzed. Where appropriate, CBO combined individual entries for sites in the BSR to create a record for the base that was identified in the services' budget data.

**Population.** The number and composition of the personnel who work or live on a base greatly influence the provision of services such as housing, health care, and education, and others that support morale, welfare, and recreation. In addition to military service members, many categories of civilians, including DoD's employees, retirees, and their family members, use bases.<sup>17</sup> CBO obtained the number of military personnel and civilian employees of DoD who were assigned full time to each base in 2016 from the Defense Manpower Data Center (DMDC). That number excludes contractors, family members, and transient personnel on a base.<sup>18</sup>

15. For example, CBO allocated to Joint Base San Antonio the BOS costs for the Army's Fort Sam Houston, which is part of that base.

16. The BSR is produced from DoD's Real Property Assets Database, which in turn is a consolidated summary of an inventory of real property owned by the services. Because the report provides a snapshot, it does not capture changes that might occur throughout the year in DoD's real property inventory. However, such changes are relatively small and, in the aggregate, do not significantly affect CBO's statistical analysis. Previous editions of the report are available at [www.acq.osd.mil/eie/Library.html#BSR](http://www.acq.osd.mil/eie/Library.html#BSR).

17. In addition, depending on the base, a number of other personnel flow through on a transient basis for such things as training or temporary duty.

18. However, CBO identified bases with a relatively large transient population of students and other trainees (at least a few thousand

**Additional Information.** Using information obtained from various DoD websites, discussions with DoD officials, and visits to selected bases, CBO compiled data on other relevant base features—the primary mission of resident units, related DoD bases or sites, the local cost of living, and the local climate. In addition to providing that information, those sources also corroborated some of the data on physical characteristics and population that CBO obtained from the BSR and DMDC.

## CBO's Findings

After analyzing all of the characteristics it identified, CBO found five that were clearly connected to a base's BOS costs: its size, primary mission, parent service, location, and climate. Those findings offer insights into how BOS costs can be expected to change when a base's characteristics change. Of the five characteristics, the one most strongly related to BOS costs is size, in terms of both the number of employees and the amount of building space a base has.

### How a Base's Size Related to Its Support Costs

DoD often describes a base's size in terms of its employee population (the military and civilian employees who work either for the base or for the units the base hosts).<sup>19</sup> In general, bases with large populations have more square footage of building space (see Figure 4) and higher BOS costs (see Figure 5). However, some bases with small populations have annual BOS costs that are relatively high.<sup>20</sup>

CBO found that, on average, bases with larger populations do not have proportionately larger annual BOS costs, suggesting that there is an economy of scale for BOS costs related to personnel. Not only are fixed costs spread among a larger population, but employees at larger bases may have more expertise in specific tasks, increasing the overall efficiency and productivity of

annually) and included that as a characteristic of those bases in its analysis.

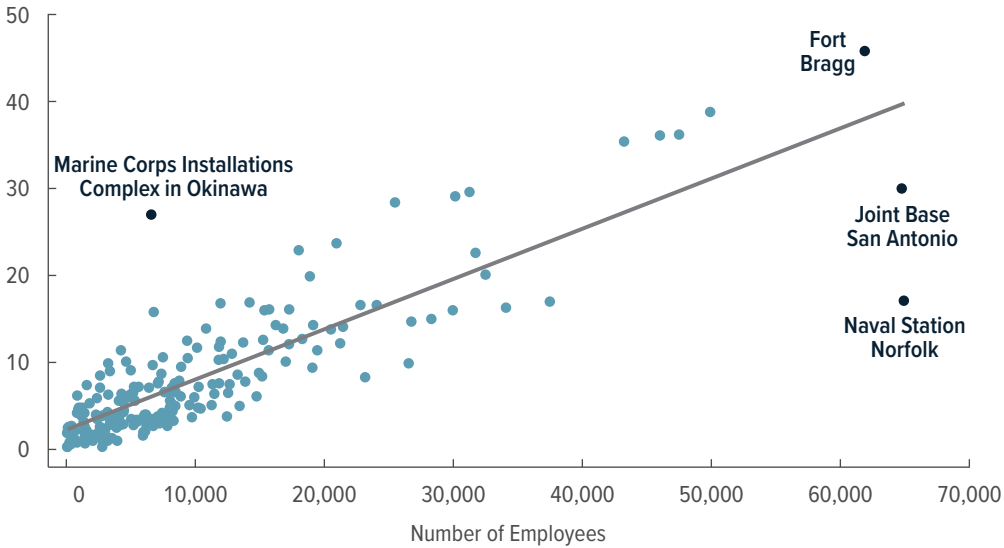
19. Land area and building space also serve as measures of size. However, land area is less precise for that purpose because many bases include large portions of unused land. Building space, which better indicates the utilized portion, is itself determined, for the most part, by population.

20. Units and other transient personnel rotate in and out of some bases located outside the United States, such as the Marine Corps installations complex in Okinawa, Japan (shown in Figure 4). To support those large transient populations, those bases may, therefore, have relatively high building space or BOS costs for a relatively small number of full-time personnel.

Figure 4.

**Building Space and Employee Population at Bases**

Millions of Square Feet



Bases with more people generally have more square feet of building space.

Source: Congressional Budget Office, using data provided by the Department of Defense.

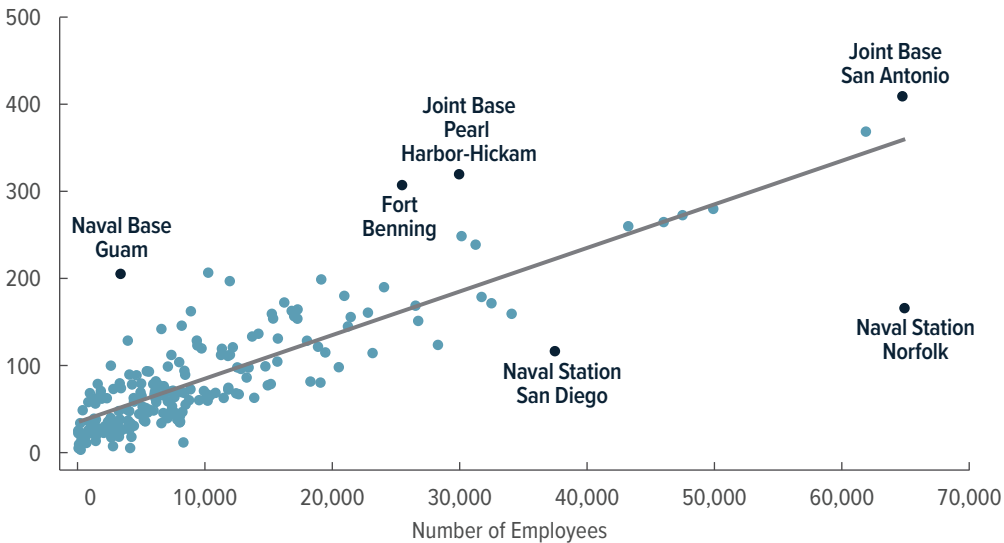
A base is a military base, camp, post, station, yard, center, home port, or other location under DoD’s jurisdiction, including leased space, that is controlled by or primarily supports DoD’s activities.

DoD = Department of Defense.

Figure 5.

**Annual BOS Costs and Employee Population at Bases**

Millions of 2019 Dollars



Bases with large populations do not necessarily have proportionally higher BOS costs—for example, Naval Station Norfolk—because there are some fixed costs to operating a base.

Source: Congressional Budget Office, using data provided by the Department of Defense.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD’s jurisdiction, including leased space, that is controlled by or primarily supports DoD’s activities.

BOS = base operations support; DoD = Department of Defense.

providing services. As a result, a base with twice as many employees as another has BOS costs that are, on average, less than twice as high.<sup>21</sup> One way to examine this pattern is to group bases by size and look at the average of each group's total BOS costs per employee. CBO divided bases into six categories based on population:

- Very small (5,000 or fewer employees),
- Small (5,001 to 10,000 employees),
- Midsize (10,001 to 15,000 employees),
- Large (15,001 to 20,000 employees),
- Very large (20,001 to 25,000 employees), and
- Extremely large (more than 25,000 employees).

The average BOS cost per employee decreases sharply from the first category to the second—from \$18,000 at very small bases to \$10,000 at small bases. (Two-thirds of bases in CBO's database were in those two size categories.) Average BOS costs per person continue to decrease as a base's population grows: to \$8,000 for midsize bases and \$6,000 for extremely large bases (see Figure 6).

In calculating those amounts, CBO did not adjust BOS costs for other base characteristics (such as the branch of service hosting the base or the primary mission of the units it supports). Even when BOS costs are adjusted for those characteristics, as discussed in the next section of this report, the basic finding of an economy of scale persists.

### **How Additional Personnel and Building Space Correlated With BOS Costs**

After adjusting for other base characteristics, the BOS costs associated with adding an employee to a base's population were less, on average, at larger bases than at smaller bases. That result is consistent with the notion that an economy of scale is operating at larger bases, so that an increase in population leads to a less-than-proportional increase in BOS costs. For another measure of size—building space—CBO found no economies of scale. The cost of BOS services to support additional

building space remained constant, regardless of how large the base was.

CBO found that, on average, total BOS costs for an additional employee were much lower at large bases than at smaller ones. At very small bases (5,000 or fewer employees), total BOS costs increased by an average of \$14,000 for every additional employee; for small bases (5,001 to 10,000 employees) that increase was \$4,000 (see Figure 7). BOS costs per additional employee continued to decrease in larger categories, falling to \$1,000 at extremely large bases (more than 25,000 employees).

In addition to analyzing how much BOS costs increase for additional employees, CBO calculated the average BOS cost for current employees at all of the bases it studied to be \$8,000. By contrast, the BOS cost to bring in one more employee was just \$2,000, on average, for all bases, regardless of size. That finding suggests that there are high fixed costs to operate a base.<sup>22</sup> The difference between the average BOS cost for an existing employee and the average BOS cost to add one more employee is also consistent with the notion discussed earlier: that because of an economy of scale, BOS costs do not change in proportion to a base's population (see Figure 5 on page 9).

CBO also found that an additional 1,000 square feet of building space was associated with an increase in annual BOS costs of about \$4,000, on average.<sup>23</sup> The cost of additional space was not affected by a base's size.

CBO conducted its analysis by comparing data on BOS costs in a single year, 2016. Future work could expand the analysis by collecting data for each base over multiple years. Analyzing data for two or more years could more clearly show the effect of changes in size on the growth of BOS costs at particular bases.

### **How Other Characteristics Related to BOS Costs**

In addition to size, the branch of service that operates the base also correlated with BOS costs. Navy and joint

21. Note that, as a result of this relationship, the slope of the trend line in Figure 5 is less than 45 degrees.

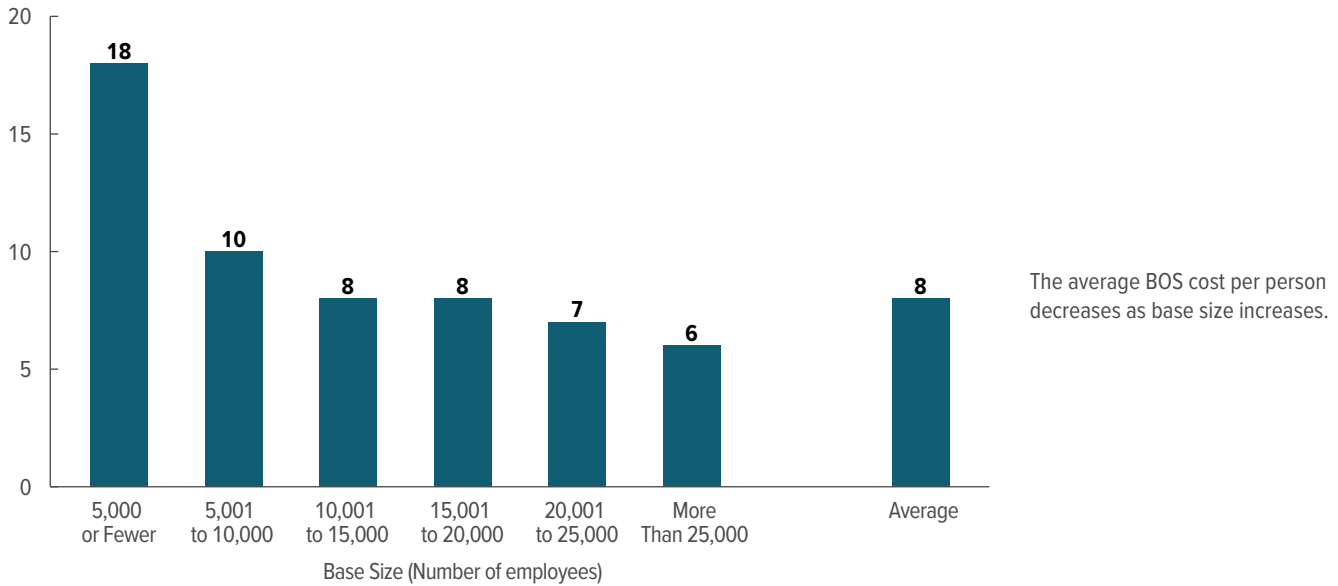
22. The magnitude of fixed costs is indicated by the large intercept in the estimated equation in Table A-1.

23. Building space on some bases may include family housing, which is funded through a separate appropriation. CBO's findings were not adjusted to exclude that housing from its estimate of BOS costs because that information was not included in the data DoD provided.

Figure 6.

**Bases' Average Annual BOS Costs per Employee, by Base Size**

Thousands of 2019 Dollars



Source: Congressional Budget Office, using data provided by the Department of Defense.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD’s jurisdiction, including leased space, that is controlled by or primarily supports DoD’s activities.

BOS = base operations support; DoD = Department of Defense.

Number of bases in each size category: 5,000 or fewer = 77; 5,001 to 10,000 = 60; 10,001 to 15,000 = 25; 15,001 to 25,000 = 16; 20,001 to 25,000 = 7; more than 25,000 = 18.

bases were associated with 24 percent and 23 percent lower annual BOS costs, respectively, than Air Force bases, CBO calculated (see Table 3). CBO also found that Army and Marine Corps bases tended to have annual BOS costs approximating those of Air Force bases. The finding that Navy bases were associated with lower BOS costs may reflect their nature: They provide pier support to relatively self-sufficient ships, which, for example, supply their own housing and meals for parts of the year. For joint bases, lower costs might be an indication of efficiencies gained from resource sharing among two or more military services.

Each base’s mission was also reflected in its BOS costs. Space-related, naval, and administrative-support or miscellaneous-support bases tended to have greater annual BOS costs—by 56 percent, 40 percent, and 42 percent, respectively—than training bases (see Table 3). Those results could be related to additional costs for security and specialized equipment on those

bases.<sup>24</sup> Locations outside the United States were correlated with annual BOS costs that were 27 percent higher than BOS costs at locations within the United States. Lastly, bases in extremely hot and dry, extremely hot and humid, or extremely cold and snowy climates were associated with annual BOS costs that were about 27 percent higher than costs at bases with more moderate climates. The higher costs could result from the additional resources needed for climate control, unusual facility deterioration, and other related problems.<sup>25</sup>

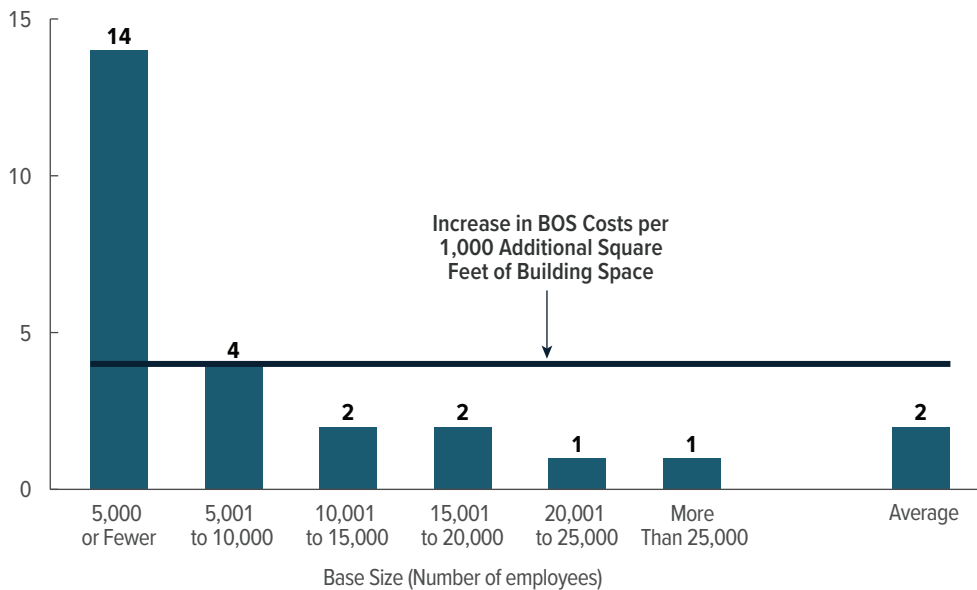
24. CBO found similar relationships for other base types—ground, aviation, logistics, and research and development—but those effects were not statistically significant. That is, those effects were weak enough that they could also have occurred by chance.

25. A large number of transients and a relatively high cost of living also tend to be associated with higher BOS costs, but those effects are not statistically significant.

Figure 7.

**Estimate of the Average Increase in Annual BOS Costs for Each Additional Employee, by Base Size**

Thousands of 2019 Dollars



When employees are assigned to a new base, the additional BOS costs are generally less the larger the base is. However, the cost of adding more building space is about the same, regardless of the base's size.

Source: Congressional Budget Office, using data provided by the Department of Defense.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

BOS = base operations support; DoD = Department of Defense.

**Possible Uses of CBO's Results**

CBO's analysis may provide insights on whether BOS costs would rise or fall when personnel are relocated to different bases. For example, they could be used to explore how BOS costs might change when new units are added to a base or when existing units are relocated among bases. When an existing unit moves from one base to another, BOS costs change at both bases. The net effect of the move would depend on specific characteristics of the two bases, such as size and location.

To illustrate how CBO's findings could be applied to real-world situations, CBO considered how a base's BOS costs for personnel and building space would be affected if an Army brigade combat team (BCT) were relocated.<sup>26</sup> (Box 2 provides more details on the personnel and space

requirements of BCTs.) In its calculations, CBO averaged the personnel and building space requirements for the three types of BCTs: armored, infantry, and Stryker. It then calculated how those needs would affect a base's BOS costs. (Appendix B examines the effect of unit relocations on BOS costs, focusing on how they differ when units are moved to or from bases outside the United States.)

**Expected Costs When a BCT Is Added to a Base.** The addition of a BCT to a base would increase its need for personnel- and space-related BOS services. CBO's analysis implies that annual BOS costs could be expected to increase less at larger bases than at smaller bases. For example, on average, adding a BCT to a very small base would increase the annual BOS costs related to supporting additional personnel and facilities by close to \$70 million, but at small bases, such costs would increase by \$25 million (see Figure 8 on page 15). Those costs would increase even less at larger bases—by \$12 million, on average, at extremely large bases. On average,

26. There may be onetime costs such as environmental cleanup at the base that loses the BCT, and onetime costs at the new host such as the costs of moving the unit and constructing facilities. Estimating those onetime costs is beyond the scope of this report.



**Table 3.**  
**Differences Between BOS Costs Arising From Various Characteristics of Bases**

Percent	
Characteristic	Difference in BOS Costs From Comparison Group
<b>Branch of Service</b>	
Air Force <sup>a</sup>	n.a.
Navy	-24
Joint	-23
Army	*
Marine Corps	*
<b>Base Type</b>	
Training <sup>a</sup>	n.a.
Space-related	56
Sea	40
Aviation	24
Logistics	*
Research and development	*
Ground	*
Other <sup>b</sup>	42
<b>Additional Characteristics<sup>c</sup></b>	
Outside the United States	27
Large number of transients	*
Extremely hot or cold climate	27
High cost of living area	*

Source: Congressional Budget Office, using data provided by the Department of Defense.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

BOS = base operations support; DoD = Department of Defense; n.a. = not applicable; \* = the results of CBO's analysis are not strong enough to indicate a relationship between this characteristic and BOS costs.

a. Used as the comparison group for the analysis.

b. Includes bases that host units and organizations that provide administrative and miscellaneous support.

c. Each of these characteristics is compared with its opposite; for example, bases outside the United States are compared with those inside the country.

the expected increase in annual BOS costs to provide support for additional personnel and facilities for a BCT across all six size categories is about \$17 million.

**Expected Costs When a BCT Moves From One Base to Another.** To illustrate the implications of relocating a BCT from one base to another—which would reduce costs at the former host base and increase costs at the new one—CBO considered two scenarios:

- Scenario 1:** The former host base retains the facilities that supported the BCT (buildings, parking lots, and the like) after the BCT leaves. CBO assumed in this scenario that the new host base would need additional facilities to host the Army BCT. The result of those conditions is that DoD would incur BOS costs to operate and maintain both the existing facilities at the former host base and expanded facilities at the new host base. (The expense of building or expanding facilities is not considered part of BOS in DoD's budget and was not included in CBO's estimate.) Lastly, CBO incorporated any differences in personnel-related BOS costs between the two bases.
- Scenario 2:** The former host base stops using and maintaining the facilities that supported the BCT. This scenario reduces BOS costs at the former host base. (CBO did not consider the costs to close facilities or shut down the former host base because such costs are beyond the scope of this report.) However, DoD still incurs BOS costs to operate and maintain expanded facilities at the new host base. As in Scenario 1, CBO's calculations incorporated the difference in personnel-related BOS costs between the bases and excluded the costs of building new facilities.

In general, relocating a BCT from a small or very small base to a larger one would lead to lower overall BOS costs under both scenarios. Conversely, relocating a unit from a larger base to a small or very small one would increase overall BOS costs, CBO's findings suggest. For example, under Scenario 1, relocating a BCT from a very small base to a small base would reduce DoD's net

## Box 2.

**Personnel and Building Space Requirements of Army Brigade Combat Teams**

A brigade combat team (BCT) is a large ground combat organization in the U.S. Army that includes infantry, artillery, engineering, and other types of units. Each BCT contains roughly 4,000 to 5,000 soldiers. It is customary to refer to them by the type of combat unit that predominates. The Army currently has three types of BCTs, which are roughly analogous to heavy, medium, and light forces: armored BCTs (ABCTs), Stryker BCTs (SBCTs), and infantry BCTs (IBCTs). Each ABCT typically has about 4,200 military personnel directly assigned to it and is equipped with heavy armored combat vehicles such as the M1 Abrams-series tanks. Each SBCT usually has about 4,440 personnel directly assigned to it and is equipped with medium-weight, wheeled armored vehicles of the Stryker family. (Such vehicles are sometimes called armored personnel carriers.) IBCTs—also commonly called light BCTs—typically have about 4,230 personnel. Most of those personnel are expected to engage in combat on foot, although each IBCT also has several hundred wheeled vehicles, generally unarmored, assigned to it for transport.<sup>1</sup> CBO averaged the personnel figures for the three types of BCTs in its estimates of the cost of relocating a BCT.

1. For more details on the structure, assigned personnel, and capabilities of these units, see Congressional Budget Office, *The U.S. Military Force Structure: A Primer* (July 2016), [www.cbo.gov/publication/51535](http://www.cbo.gov/publication/51535). The

BCTs require dedicated facilities for such functions as housing, a brigade headquarters, vehicle maintenance and parking, and oil storage.<sup>2</sup> According to Army documents, the space needed for facilities dedicated to each ABCT, SBCT, and IBCT would total 2.1 million square feet, 1.9 million square feet, and 1.9 million square feet, respectively.<sup>3</sup> CBO averaged the square footage figures for the three types of BCTs in its estimates of the cost of relocating a BCT.

figures in that report are updated in Congressional Budget Office, “CBO’s Interactive Force Structure Tool” (August 2018), [www.cbo.gov/publication/54351](http://www.cbo.gov/publication/54351).

2. Facilities on a base can be categorized as general or specific. General facilities refer to the infrastructure associated with any base, such as utilities and roadways. Specific facilities are buildings associated with a specific type of unit, such as those listed above for BCTs. In this report, CBO’s calculations incorporate the assumption that the recipient base can support additional units and that the base would not need to expand its general facilities. Those estimates also incorporate the assumption that there are no unused facilities available at the recipient base and that the facilities required by an additional BCT would be in addition to the base’s existing inventory.
3. The Army’s Real Property and Analysis System provides facility allowances for units and other organizations.

annual BOS costs by about \$35 million, CBO estimates (see Table 4). Relocating the same unit to a midsize base would result in even greater savings—about \$43 million. Conversely, relocating that BCT from a large base to a small base would increase DoD’s net annual BOS costs by about \$17 million.

Under Scenario 1, moves to bases of a different size that would not involve relocating units from small or very small bases would all increase annual BOS costs (see Table 4). Under Scenario 2, moves from smaller bases to larger ones would give rise to greater savings at the former host base because some facilities would no longer be supported. As a result, relocating a BCT from a very small base to a small base would lower DoD’s

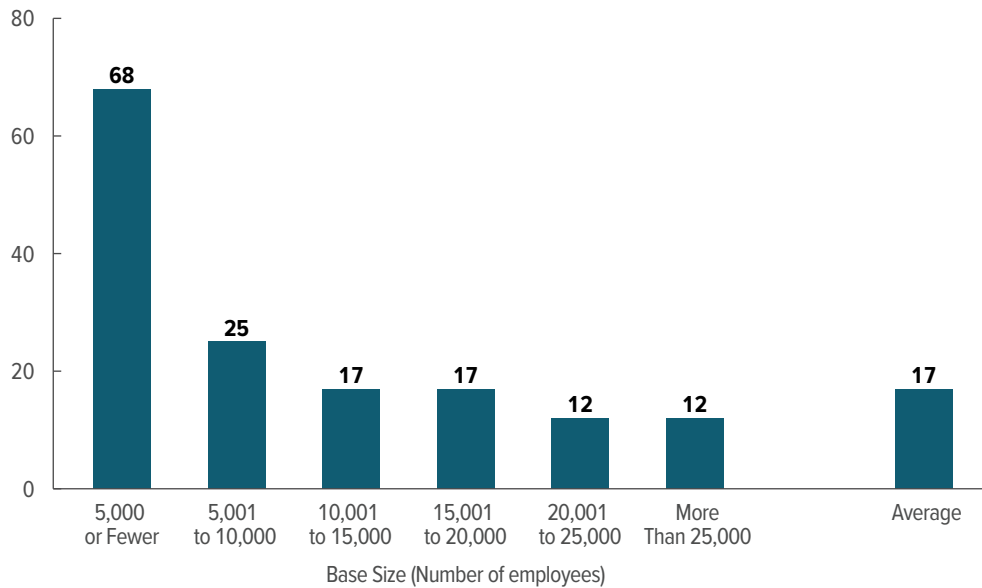
net annual BOS costs by a total of about \$43 million, compared with \$35 million under Scenario 1. Relocating a BCT from a large base to a small base would increase DoD’s net annual BOS costs by about \$9 million under Scenario 2, compared with an increase of about \$17 million under Scenario 1. And moving a unit from a large base to a very large base would save an estimated \$4 million, compared with a cost of \$4 million under Scenario 1.

Those results are general and intended as a starting point. The actual costs and savings of any unit’s move would depend on the specifics of the unit and bases involved.

Figure 8.

**Estimate of Average Annual BOS Costs to Host an Additional Brigade Combat Team, by Base Size**

Millions of 2019 Dollars



The cost to support an additional brigade combat team is expected to be less at large bases than at smaller bases.

Source: Congressional Budget Office.

Estimated BOS costs are based on the average number of troops and average square footage for the Army’s armored, Stryker, and infantry brigade combat teams.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD’s jurisdiction, including leased space, that is controlled by or primarily supports DoD’s activities.

BOS = base operations support; DoD = Department of Defense.

Table 4.

**Estimated Effect on Annual BOS Costs When a Brigade Combat Team Moves to a New Base**

Millions of 2019 Dollars

Size of Unit's Former Base	Size of Unit's New Base					
	Very Small	Small	Midsize	Large	Very Large	Extremely Large
<b>Scenario 1: Effect on Costs If Former Host Base Does Not Reduce Building Space</b>						
Very Small	8	-35	-43	-43	-48	-48
Small	51	8	-1	-1	-5	-5
Midsize	59	17	8	8	4	4
Large	59	17	8	8	4	4
Very Large	64	21	12	12	8	8
Extremely Large	64	21	12	12	8	8
<b>Scenario 2: Effect on Costs If Former Host Base Reduces Building Space</b>						
Very Small	0	-43	-51	-51	-56	-56
Small	43	0	-9	-9	-13	-13
Midsize	51	9	0	0	-4	-4
Large	51	9	0	0	-4	-4
Very Large	56	13	4	4	0	0
Extremely Large	56	13	4	4	0	0

Source: Congressional Budget Office.

Negative numbers (shaded) represent reduced costs. Positive numbers represent increased costs.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

The size of a base is determined by its population, as follows: very small = 5,000 or fewer employees; small = 5,001 to 10,000 employees; midsize = 10,001 to 15,000 employees; large = 15,001 to 20,000 employees; very large = 20,001 to 25,000 employees; extremely large = more than 25,000 employees.

BOS = base operations support; DoD = Department of Defense.

# CBO's Statistical Model for Estimating the Costs of Base Operations Support

The Congressional Budget Office used a regression model to estimate the correlation between annual base operations support (BOS) costs and base characteristics. CBO's model includes 20 characteristics for each of the 203 bases in its database. Each coefficient shows how BOS costs are expected to change with changes in one characteristic, holding the other characteristics constant.

The model is represented by the following equation:

$$\begin{aligned} \ln(\text{BOS costs in 2019 dollars}) = & \beta + \beta_1 \times \ln(\text{Military and civilian employees}) + \beta_2 \times \ln(\text{Military and civilian employees})^2 + \beta_3 \times \ln(\text{Square feet}) + \beta_4 \times \ln(\text{Acres}) + \beta_5 \times \\ & (\text{Thousands of buildings}) + \beta_6 \times (\text{Army}) + \beta_7 \times (\text{Navy}) + \beta_8 \times (\text{Marine Corps}) + \beta_9 \times (\text{Joint}) + \beta_{10} \times (\text{Space-related}) + \beta_{11} \times (\text{Sea}) + \beta_{12} \times (\text{Logistics}) + \beta_{13} \times (\text{Research and development}) + \beta_{14} \times (\text{Ground}) + \beta_{15} \times (\text{Aviation}) + \beta_{16} \times (\text{Other}) + \beta_{17} \times (\text{Overseas}) + \beta_{18} \times (\text{Transients}) + \beta_{19} \times (\text{Extreme climate}) + \beta_{20} \times (\text{High cost of living}) \end{aligned}$$

CBO transformed characteristics with large values (such as BOS costs) into a natural logarithm, or  $\ln$ .<sup>1</sup> That logarithmic transformation allowed CBO to focus on percentage changes in the variables. Also, CBO made that transformation to make the analysis less sensitive to the effects of a few outliers (bases that have much larger values than the bulk of the bases in the database).

Each base characteristic in the equation is further described as follows:

- *Military and civilian employees* refers to the number of military and civilian employees of the Department of Defense who are on a base, excluding contractors, family members, and transient personnel.
- *Square feet* is the measure of space in all of the buildings on a base.
- *Acres* is the number of acres or land area on a base.
- *Thousands of buildings* is the count of the buildings on a base owned by DoD, measured in thousands.
- *Army, Navy, Marine Corps, and joint* are separate indicator variables, accounting for whether a base is owned by the Army, Navy, or Marine Corps, or is operated as a joint base. Each indicator variable equals one when a base is owned by one of those services or operated jointly, and equals zero otherwise. CBO used the Air Force as the comparison group, or base case, against which the other indicators are measured, so the indicator variable for the Air Force is not included in the equation.
- *Space-related, sea, logistics, research and development, ground, aviation, and other* are separate indicator variables representing the primary mission of units located on a base.<sup>2</sup> Each indicator variable is equal to one when the base is one of those types and is equal to zero otherwise. CBO used bases whose primary mission is training as the base case, so the indicator variable for that type is not included in the equation.

1. Generally written as  $\ln$ , the natural logarithm of a number is the power (or exponent) to which the mathematical constant,  $e$  (which is approximately equal to 2.71828), would have to be raised to equal that number. For example,  $\ln(100)$  is 4.61, because  $e^{4.61} = 100$ .

2. The "other" base type includes bases that host units that provide administrative and miscellaneous support.

- *Overseas* is an indicator variable equal to one for bases located in foreign countries and equal to zero for bases located in the United States.
- *Transients* is an indicator variable equal to one for bases with a few thousand or more personnel each year who remained at the base for less than six months and zero for bases for which the opposite is true.
- *Extreme climate* is an indicator variable equal to one when a base's location experiences arctic or hot climates and zero when a base's location is not in any of those climate zones.
- *High cost of living* is an indicator variable equal to one for bases in localities DoD designates as having a high cost of living and zero for bases in localities without such designation.

In the above equation,  $\beta$  is the intercept, or the coefficient on a constant. The coefficients  $\beta_1$  and  $\beta_2$  (for the number of military and civilian employees and the square of that number, respectively) determine the percentage change in BOS costs for each percentage change in the number of military and civilian employees (see Table A-1). That percentage change in BOS costs is equal to the following expression:

$$0.418 - [2 \times (.044) \times (\text{Military and civilian employees})]$$

The value of that expression gets smaller as the number of military and civilian employees at a particular base increases, which indicates that there is an economy of scale related to population for BOS costs. That is, a large base is expected to have lower BOS costs per additional person than a smaller base. The expected increase in annual BOS costs for each additional employee for all

the bases in CBO's analysis averaged about \$2,000. CBO used a similar method with the coefficient  $\beta_3$  (estimated to be 0.312) to calculate that adding 1,000 square feet of building space to a base is expected to increase annual BOS costs by about \$4,000, on average.

The coefficient  $\beta_7$ , for the indicator variable *Navy*, shows how being a Navy base relative to an Air Force base (with all other characteristics unchanged) is related to changes in BOS costs (see Table A-1). The coefficient of -0.269 in that table indicates that a Navy base was associated with roughly 24 percent lower annual BOS costs than an Air Force base—calculated as

$$[\exp(-0.269) - 1] \times 100$$

where  $\exp$  is the inverse function of the natural logarithm.

The P value for each coefficient in Table A-1 is the probability of observing a coefficient at least as large as the one listed if the true coefficient is zero (assuming that all of the model's other conditions are met). Stated another way, P values reflect the strength of evidence against the hypothesis that there is no relationship. A low P value indicates that the chance of obtaining a coefficient at least as large as the one reported is small if in fact there is no relationship—that is, the estimated relationship is unlikely to occur randomly. For example, the P value for the Navy (0.006) suggests that there is strong evidence in the data that Navy bases have lower BOS costs (by about 24 percent) than Air Force bases. The estimated results of base characteristics with P values less than 0.10 are reported in Table 3 on page 13 of this report. The results for coefficients with P values greater than 0.10 were not considered to be statistically significant and, therefore, are not reported in Table 3.

Table A-1.

**Estimated Correlation Between Base Characteristics and Annual BOS Costs**

<b>Base Characteristic</b>	<b>Coefficient Estimate</b>	<b>Standard Error</b>	<b>P Value<sup>a</sup></b>
Natural Logarithm of the Number of Military and Civilian Employees	0.418	0.250	0.095
Square of the Natural Logarithm of the Number of Military and Civilian Employees	-0.044	0.016	0.006
Natural Logarithm of Square Feet of Building Space	0.312	0.071	< 0.001
Natural Logarithm of Total Acres of Land	0.012	0.016	0.473
Thousands of Buildings Owned	0.069	0.101	0.492
<b>Branch of Service</b>			
Air Force <sup>b</sup>	n.a.	n.a.	n.a.
Army	0.169	0.108	0.119
Navy	-0.269	0.097	0.006
Marine Corps	-0.003	0.129	0.982
Joint	-0.259	0.144	0.073
<b>Base Type</b>			
Training <sup>b</sup>	n.a.	n.a.	n.a.
Space-related	0.444	0.200	0.028
Sea	0.339	0.154	0.029
Logistics	0.174	0.140	0.215
Research and development	0.153	0.134	0.256
Ground	0.123	0.144	0.395
Aviation	0.212	0.118	0.074
Other <sup>c</sup>	0.353	0.173	0.042
<b>Additional Characteristics</b>			
Located outside the United States	0.235	0.110	0.034
Large number of transients	0.100	0.074	0.175
Extremely hot or cold climate	0.236	0.122	0.055
High cost of living area	-0.048	0.077	0.536
Intercept	12.963	1.350	< 0.001

Source: Congressional Budget Office, using data from the Department of Defense.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

The data set includes 203 bases. The dependent variable is  $\ln(\text{base operations support costs})$ . The adjusted R squared is 0.749.

BOS = base operations support; DoD = Department of Defense; n.a. = not applicable.

a. The P value is the probability of observing a coefficient at least as large as the one listed in the table if the true coefficient is zero (assuming that all of the model's other conditions are met).

b. Used as the base case, or comparison group, for the analysis.

c. Includes bases that host units and those whose function is to provide administrative and miscellaneous support.





## Estimated Change in Base Operations Support When Units Move Inside or Outside the United States

**T**he Congressional Budget Office's analysis indicates that the cost of supporting personnel is generally higher at bases located outside the United States than at those inside the country. For example, CBO estimates that the personnel-related costs of base operations support (BOS) for an armored brigade combat team (ABCT), a fighting unit of the U.S. Army, average \$6 million annually at a base in the United States (see Table B-1).<sup>1</sup> By contrast, those costs at a base outside the United States average \$23 million. Therefore, moving an ABCT or any other type of brigade combat team from a base outside the United States to one inside the country would, on average, reduce personnel-related BOS costs for that unit. By contrast, the BOS costs associated with acquiring space or facilities would be lower abroad, on average, than it would be in this country because the cost of BOS services for building space is slightly less expensive outside the United States (see Table B-1).

The net effect of a relocation on overall BOS costs would vary depending on whether the former host base stopped using or maintaining its facilities space (which would reduce costs) and whether the move occurred within the United States, outside of the United States, or between the United States and another country. If facilities at the former host base remained in use or continued being maintained and new facilities were constructed at the new host base, the Department of Defense's total square footage of buildings would increase. In that case, there would be net savings in BOS costs only if there were large savings in personnel-driven BOS costs. Such savings would probably only be realized if an overseas unit were relocated to a base inside the United States, or if a

unit were relocated within the United States from a small or very small base to a much larger base, as discussed in the body of this report.

More specifically, if an ABCT were relocated between bases of comparable size in the United States, the change in personnel-related BOS costs at the new and former host bases would cancel each other out. However, if the former host base continued to use or maintain the team's old facilities, the BOS costs for new facilities at the new host base would amount to an additional \$10 million annually (see Table B-2, top panel).<sup>2</sup> Relocating a unit from outside the United States to inside the country would reduce personnel-related BOS costs but would generate additional BOS costs related to facility space at the new host base. For example, for an ABCT, personnel-related BOS costs would decrease by about \$17 million annually, from \$23 million to \$6 million, if the bases were of comparable size (see Table B-1). But BOS costs related to new facilities would increase by about \$10 million a year, resulting in a net decrease of about \$7 million annually. Conversely, a move in the opposite direction (from a base in the United States to a comparable one outside the United States) would result in a net increase in annual BOS costs of \$25 million for an ABCT, Stryker brigade combat team (SBCT), or infantry brigade combat team (IBCT) (see Table B-2, top panel). If the move was between two bases of comparable size that were located outside the United States, personnel-related BOS costs would again cancel each other out, but annual BOS costs related to expanded facilities at the new host base would amount to an additional \$8 million for an ABCT and \$7 million for an SBCT or an IBCT.

1. That amount reflects the average BOS cost for all bases located outside the United States without regard to size. All other amounts discussed in this appendix are, similarly, averages for the relevant bases without regard to size differences.

2. The increase in annual BOS costs associated with SBCTs or IBCTs would be about \$9 million.

Table B-1.

**BOS Costs for Selected Army Units at Bases Inside and Outside the United States**

Category	ABCT	SBCT	IBCT
Number of Troops	4,200	4,440	4,230
Estimated Personnel-Related Costs at a Base in the United States (Millions of 2019 dollars)	6	7	6
Estimated Personnel-Related Costs at a Base Outside the United States (Millions of 2019 dollars)	23	25	24
Square Feet of Brigade-Specific Space Required	2,094,000	1,897,000	1,919,000
Estimated Costs for Brigade Facilities at a Base in the United States (Millions of 2019 dollars)	10	9	9
Estimated Costs for Brigade Facilities at a Base Outside the United States (Millions of 2019 dollars)	8	7	7

Source: Congressional Budget Office, using data from the Army Corps of Engineers.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD's jurisdiction, including leased space, that is controlled by or primarily supports DoD's activities.

ABCT = armored brigade combat team; BOS = base operations support; IBCT = infantry brigade combat team; SBCT = Stryker brigade combat team.

If facilities at the former host base were reduced, personnel-related and space-related BOS costs would cancel each other out when a unit is relocated between bases of comparable size within the United States or between bases of comparable size outside the United States (see Table B-2, bottom panel). A move from a base outside the United States to a base of comparable size

inside the country would result in a decrease in annual BOS costs of roughly \$16 million for an ABCT, SBCT, or IBCT. Conversely, a move in the opposite direction (from a base in the United States to a comparable one outside the United States) would result in an increase in annual BOS costs of the same amount (roughly \$16 million).

Table B-2.

**Estimated Change in BOS Costs When a Unit Relocates Inside or Outside the United States to a Base of Comparable Size**

Millions of 2019 Dollars

Type of Relocation	ABCT	SBCT	IBCT
<b>Effect on Costs If Former Host Base Does Not Reduce Building Space</b>			
From a Location in the United States to a Different Location in the United States	10	9	9
From a Location Outside the United States to a Location Within the United States	-7	-9	-9
From a Location in the United States to a Location Outside the United States	25	25	25
From a Location Outside the United States to a Different Location Outside the United States	8	7	7
<b>Effect on Costs If Former Host Base Reduces Building Space</b>			
From a Location in the United States to a Different Location in the United States	0	0	0
From a Location Outside the United States to a Location Within the United States	-15	-16	-16
From a Location in the United States to a Location Outside the United States	15	16	16
From a Location Outside the United States to a Different Location Outside the United States	0	0	0

Source: Congressional Budget Office.

A base is a military base, camp, post, station, yard, center, home port, or other location under DoD’s jurisdiction, including leased space, that is controlled by or primarily supports DoD’s activities.

Estimates incorporate the assumption that other characteristics of bases, such as their size and climate, remain fixed.

ABCT = armored brigade combat team; BOS = base operations support; IBCT = infantry brigade combat team; SBCT = Stryker brigade combat team.





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## About This Document

This Congressional Budget Office report was prepared at the request of the Chairman of the House Budget Committee. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

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CBO continually seeks feedback to make its work as useful as possible. Please send any comments to [communications@cbo.gov](mailto:communications@cbo.gov).

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