

# Defense spending in the 1990's— the effect of deeper cuts

*Extension of Outlook 2000 projections  
explores the economic impact  
of further military reductions  
in light of the dramatic improvement  
occurring in East-West relations*

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In recent years, the United States has placed a strong emphasis on military preparedness and development of future weapons systems. Real defense spending climbed from \$159.2 billion in 1977 to \$265.2 billion in 1987, increasing the Defense Department's share of real gross national product (GNP) from 5.4 percent to almost 7 percent. The rise in defense spending as a proportion of overall Federal purchases of goods and services was even more striking, jumping from 68.7 percent in 1977 to 78.1 percent by 1987.

Combined with continuing pressure to ease the Federal budget deficit, the thaw in East-West relations and the startling political changes in Eastern Europe have led to widespread discussion of defense cuts. This article offers two new scenarios for defense spending based on the moderate-growth version of the *Outlook 2000* economic projections, issued by the Bureau of Labor Statistics last fall.<sup>1</sup>

The first scenario envisions an annual reduction of 4 percent in real defense outlays from 1989 to 2000. The second scenario assumes that defense spending will remain constant (in 1982 dollars). Five alternatives to the first scenario—low-defense—are set forth, and three to the second scenario—high-defense.

This analysis also examines detailed industry and occupational employment projections under three of the new defense alternatives. Finally, the effects of spending less on conventional arms or less on highly sophisticated weapons are assessed.

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The earlier *Outlook 2000* projections had assumed that defense purchases of goods and services, stated in 1982 dollars, would decline at an average annual rate of 1.3 percent, from \$262 billion in 1988 to \$225 billion in 2000—an overall decrease of about 14 percent. As part of the spending decline, it was projected that the

## The Middle East Crisis

When work on this article began, extensive debate was taking place, both in the press and in the U.S. Congress, about the possibility of reduced defense spending. As the article goes to press, attention is focused on U.S. military presence in the Middle East. The quickness of this change points to the large uncertainty about long-run defense expenditures and its implications for Government spending. This article describes the impact on the economy in the year 2000 of alternative trends in defense spending. These alternatives range from continued spending at inflation-adjusted 1989 levels to a 4-percent annual decline in real defense spending between 1989 and 2000. While other scenarios could be envisioned, the alternatives explored in this article provide insight on the long-term implications of changes in defense spending.

*Defense Spending in the 1990's*

level of military forces would drop from 2.1 million to 1.9 million, Defense Department civilian employees by 14,000, and private defense-related employment by just over 1 million jobs between 1988 and 2000:

	1988	Projected 2000	Percent decline, 1988-2000
Defense purchases of goods and services (billions of 1982 dollars) . . .	261.5	225.3	13.8
Compensation . . .	87.9	85.3	3.0
All other purchases . . . . .	171.8	140.0	18.5
Total defense-related employment (in thousands) . . . . .	6,312	5,081	19.5
Military force level . . . . .	2,121	1,982	6.6
Federal civilian defense employment . . . . .	1,054	1,040	1.3
Private defense-related employment . . . . .	3,137	2,089	33.3
Manufacturing . . . . .	1,549	936	39.6
All other industries . . . . .	1,588	1,153	27.3

Most of the employment decline was in the private sector because, for the most part, the cuts were assumed to be accomplished by trimming purchases of goods or services, rather than by cutting the armed forces or civilian defense employment.

The increases in defense spending over the 1977-86 period occurred primarily in the areas of research and development and in material purchases. Defense Department civilian employment increased slightly during the 1980's. For that reason, most of the declines that BLS assumed for the 1990's occur not in direct employment levels (either military or civilian) but in material purchases. The effect of this cost-cutting on private sector employment is exacerbated by the fact that many of the largest spending cuts were expected to occur in manufacturing industries with projected high productivity growth:

	Employment	
	Absolute change (in thousands)	Percent change
Change, 1988-2000 . . . . .	-1,048	100.0
Due to defense spending declines . . . . .	-633	60.4
Due to output per hour increases . . . . .	-388	36.3
Due to structural change in the economy . . . . .	-027	3.3

As shown, three-fifths of the drop is attributed to lower defense spending, but over one-third is projected to result from productivity—output per hour—increases.

In 1988, 2.9 percent of total private wage and salary employment was estimated to be related to defense expenditures.<sup>2</sup> This estimate includes both direct defense expenditures, such as purchases of aircraft or supplies, and indirect expenditures, such as employment generated by purchases made by defense suppliers. By the year 2000, total defense-related employment was pro-

**Table 1. GNP and alternative defense spending assumptions, 1988 and 2000**

[Billions of 1982 dollars]

Item	1988	Base 2000	Low 1	Low 2	Low 3	Low 4	Low 5	High 1	High 2	High 3
Gross national product . . . . .	\$4,024.4	\$5,222.4	\$5,215.0	\$5,226.1	\$5,204.8	\$5,209.4	\$5,206.9	\$5,230.6	\$5,222.6	\$5,242.8
Government . . . . .	785.1	858.9	798.6	859.1	799.8	812.7	819.6	895.5	859.0	895.1
Federal . . . . .	328.9	315.8	258.5	315.8	258.5	264.2	264.2	350.4	315.8	350.8
Defense . . . . .	261.5	225.3	166.5	166.5	166.5	166.5	166.5	260.9	260.9	260.9
Civilian . . . . .	67.4	90.5	90.5	144.5	90.5	95.9	95.9	90.5	57.8	90.5
State and local . . . . .	456.2	543.1	541.1	543.3	542.2	549.3	556.2	544.5	543.2	544.1
Consumption . . . . .	2,598.4	3,356.5	3,338.7	3,359.4	3,363.3	3,386.8	3,374.4	3,366.7	3,355.6	3,354.2
Investment . . . . .	715.8	956.2	962.0	960.8	965.8	958.5	958.8	952.8	954.5	954.8
Nonresidential . . . . .	493.8	697.1	701.8	697.0	703.1	696.1	696.8	695.8	698.0	697.4
Equipment . . . . .	371.6	530.1	532.1	528.5	532.5	528.3	528.6	529.6	531.4	530.9
Structures . . . . .	122.2	167.0	169.9	168.9	171.0	168.0	168.4	166.1	166.4	166.3
Residential . . . . .	194.1	244.9	247.4	249.6	247.2	246.7	246.9	243.3	242.7	244.4
Inventory change . . . . .	27.9	14.2	13.6	14.4	15.1	15.2	14.8	13.9	14.0	13.5
Exports . . . . .	530.1	879.9	903.7	874.9	889.7	882.0	880.7	867.7	883.3	876.6
Imports . . . . .	605.0	829.1	794.9	827.5	815.6	828.7	825.4	848.4	830.1	837.5

Table 1. Continued—GNP and alternative defense spending assumptions, 1988 and 2000

[Billions of 1982 dollars]

Item	1988	Base 2000	Low 1	Low 2	Low 3	Low 4	Low 5	High 1	High 2	High 3
<b>Percent distributions</b>										
Gross national product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Government	19.5	16.4	15.3	16.4	15.4	15.6	15.7	17.1	16.4	17.1
Federal	8.2	6.0	5.0	6.0	5.0	5.1	5.1	6.7	6.0	6.7
Defense	6.5	4.3	3.2	3.2	3.2	3.2	3.2	5.0	5.0	5.0
Civilian	1.7	1.7	1.7	2.8	1.7	1.8	1.8	1.7	1.1	1.7
State and local	11.3	10.4	10.4	10.4	10.4	10.5	10.7	10.4	10.4	10.4
Consumption	64.6	64.3	64.0	64.3	64.6	65.0	64.8	64.4	64.3	64.0
Investment	17.8	18.3	18.4	18.4	18.6	18.4	18.4	18.2	18.3	18.2
Nonresidential	12.3	13.3	13.5	13.3	13.5	13.4	13.4	13.3	13.4	13.3
Equipment	9.2	10.2	10.2	10.1	10.2	10.1	10.2	10.1	10.2	10.1
Structures	3.0	3.2	3.3	3.2	3.3	3.2	3.2	3.2	3.2	3.2
Residential	4.8	4.7	4.7	4.8	4.7	4.7	4.7	4.7	4.6	4.7
Inventory change	0.7	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Exports	13.2	16.8	17.3	16.7	17.1	16.9	16.9	16.6	16.9	16.7
Imports	15.0	15.9	15.2	15.8	15.7	15.9	15.9	16.2	15.9	16.0
<b>Percent change from Base 2000</b>										
Gross national product			-0.14	0.07	-0.34	-0.25	-0.30	0.16	0.00	0.39
Government			-7.02	0.02	-6.88	-5.38	-4.58	4.26	0.01	4.22
Federal			-18.16	0.00	-18.16	-16.34	-16.34	10.96	0.00	11.09
Defense			-26.09	-26.09	-26.09	-26.09	-26.09	15.80	15.80	15.80
Civilian			0.00	59.71	0.00	5.99	5.99	0.00	-36.16	0.00
State and local			-0.37	0.04	-0.17	1.14	2.41	0.26	0.02	0.19
Consumption			-0.53	0.09	0.20	0.90	0.53	0.30	-0.03	-0.07
Investment			0.61	0.48	1.01	0.24	0.28	-0.36	-0.17	-0.14
Nonresidential			0.68	-0.01	0.86	-0.14	-0.04	-0.18	0.12	0.04
Equipment			0.38	-0.30	0.45	-0.33	-0.28	-0.09	0.24	0.16
Structures			1.71	1.12	2.37	0.59	0.86	-0.53	-0.33	-0.40
Residential			1.03	1.93	0.94	0.73	0.82	-0.64	-0.90	-0.21
Inventory change			-4.51	1.64	6.56	7.38	4.51	-2.05	-1.23	-4.92
Exports			2.71	-0.57	1.11	0.24	0.09	-1.38	0.38	-0.37
Imports			-4.12	-0.19	-1.63	-0.05	-0.44	2.32	0.12	1.01

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

jected to decline by one-third, and, as a consequence, would be only 1.7 percent of total private wage and salary employment. Nearly 60 percent of this decline was projected in manufacturing.

The real spending cutbacks had the effect of changing defense spending from a 6.6-percent share of GNP in 1988 to a projected 4.3-percent share by 2000, the lowest proportion since 1980, when defense spending accounted for only 5.1 percent of production.

### New defense spending alternatives

The BLS *Outlook 2000* projections illustrate one possible scenario for declining defense expenditures. Obviously, many others with either sharper or more modest declines are possible. Differing periods or differing mixes of personnel/material cuts could also be explored. This

article looks at two basic scenarios covering 1989 to 2000: an upper level of defense spending derived by assuming no change in real defense spending, the high-defense scenario, and a lower level of defense spending derived by assuming a 4.0-percent annual decline in real defense spending, the low-defense scenario. This provides a projected range for real defense spending in 2000 of almost \$95 billion—\$260.9 billion in the high-defense scenario and \$166.5 billion in the low-defense scenario.<sup>3</sup>

The effects of the various assumptions on GNP demand categories and on major economic indicators are presented in tables 1 and 2. In each case, the results should be viewed in comparison with the moderate-growth projections from BLS' *Outlook 2000*, noted in the tables as "Base 2000."

Exhibit 1 specifies the alternatives, which range from low-defense 1 to high-defense 3.

*Low alternatives.* Cutting real defense spending by 4 percent each year results in a cumulative reduction of almost \$60 billion by 2000, relative to the Base 2000 projection, the moderate-growth estimate. In the context of the aggregate economic model, however, the decline lowers real gross national product by only \$7.4 billion in 2000. As defense spending grows less rapidly, the loss in production generally weakens the economy, at least initially, leading to lower inflation and interest rates.

### Exhibit 1. Defense spending alternatives, 1989–2000

Base 2000. The moderate-growth economic projection from *Outlook 2000*.

The eight alternatives (in 1988 dollars):

**Low-defense 1.** Spending assumed to decline at a 4-percent annual rate. No other modifications to Base 2000.

**Low-defense 2.** Spending declines at 4 percent annually, and offsetting increases assumed in real civilian purchases of goods and services.

**Low-defense 3.** Spending declines at 4 percent annually, offset by personal tax cuts or like amounts.

**Low-defense 4.** Spending declines at 4 percent annually, offset by increases in other Federal spending: 10 percent for purchases of goods and services, 10 percent for grants-in-aid to State and local governments, and 80 percent for Federal transfer programs.

**Low-defense 5.** Spending declines at 4 percent annually, offset by increases in other Federal spending: 10 percent for purchases of goods and services, 30 percent for grants-in-aid to State and local governments, and 60 percent for Federal transfer programs.

**High-defense 1.** No change in levels from 1989. No other modifications to Base 2000.

**High-defense 2.** No change in spending levels, offset by lower civilian purchases of goods and services.

**High-defense 3.** No change in spending levels, offset by increased personal tax revenues.

These results, combined with a much larger Federal surplus, lead to lower pressure on foreign exchange rates. The exchange value of the dollar drops approximately 4.0 percent in 2000, resulting in higher exports and lower imports, both of which offset part of the defense cut. Further offsets are provided by small increases in investment as demand is spurred by the lower interest rates. The investment increases are broad-based, occurring in both business spending for plant and equipment and in new residential construction. Personal spending on nondurable goods and services generally declines slightly. The spending cut also results in a military force level in 2000 that is 460,000 lower than the Base 2000 projection. Most of the veterans enter the civilian labor force and account for increased employment levels in the private economy (table 2). Because GNP is changing very little, this implies slightly lower labor productivity growth.

Under the low-defense 1 alternative, the so-called "peace dividend" appears as a large budget surplus in 2000 and opens the possibility of exploring alternative approaches that offset the defense spending cut. (See table 2.) One approach is to increase Federal nondefense purchases of goods and services by an amount equal to the cuts in defense spending (low-defense 2). This leads to a year 2000 economy virtually identical with that in the base run. Shifts would no doubt be seen at the industry level of detail, but the differences between what the nondefense portion of the Federal Government is buying and what the defense portion is buying are not great enough at the aggregate level to make appreciable differences in either the level or the distribution of GNP. As in the low-defense 1 alternative, however, major military reductions in force result, leading to small increases in the civilian labor force and employment and compensating small declines in labor productivity, relative to the Base 2000 projection.

Another way to absorb the "peace dividend" would be through lower taxes, offsetting defense cuts with a like cut in personal taxes (low-defense 3). Under this alternative, GNP drops slightly because defense reductions are only partially offset by increases in consumption and investment. The balance of the higher spendable income flows into personal savings, providing a further small boost to investment. As in the low-defense 2 alternative, the Federal surplus is virtually unchanged from that in the Base 2000 projection.

Yet another approach to account for the "peace dividend" is to assume increases among several major categories of Federal civilian

**Table 2. Impact of alternative defense assumptions on major economic variables, 1988 and 2000**

[Numbers in millions]

Economic variable	1988	Base 2000	Low 1	Low 2	Low 3	Low 4	Low 5	High 1	High 2	High 3
Civilian labor force	121.7	141.1	141.4	141.4	141.4	141.4	141.4	141.4	141.0	141.0
Civilian employment	115.0	133.3	133.6	133.6	133.7	133.6	133.6	133.2	133.2	133.3
Unemployment rate	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Military force level	2,121	1,982	1,525	1,525	1,525	1,525	1,525	2,243	2,243	2,243
Nonagricultural establishment employment	104.9	122.1	122.7	122.5	122.6	122.4	122.6	122.0	122.0	122.1
Nonagricultural private productivity	1,111	1,285	1,281	1,281	1,279	1,282	1,282	1,287	1,288	1,289
GNP implicit deflator	1,213	2,265	2,233	2,244	2,211	2,246	2,241	2,282	2,276	2,291
Federal surplus/deficit	-145.8	26.4	98.8	22.0	25.9	-2.2	-9.0	-59.0	29.8	27.2
Personal savings rate	4.2	4.0	4.0	4.0	4.1	4.1	4.1	4.0	4.0	3.9
Corporate bond rate	9.71	7.17	6.04	6.94	6.36	6.79	6.80	7.81	7.30	7.60
Real disposable personal income	2,793.2	3,590.1	3,566.1	3,593.7	3,604.2	3,632.1	3,616.1	3,604.1	3,589.3	3,584.2
<b>Percent change from Base 2000</b>										
Civilian labor force			0.2	0.2	0.2	0.2	0.2	-0.1	-0.1	-0.1
Civilian employment			0.2	0.2	0.3	0.2	0.2	-0.1	-0.1	0.0
Unemployment rate			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Military force level			-23.1	-23.1	-23.1	-23.1	-23.1	13.1	13.1	13.1
Nonagricultural establishment employment			0.4	0.3	0.4	0.2	0.2	-0.2	-0.2	-0.1
Nonagricultural private productivity			-0.3	-0.3	-0.5	-0.2	-0.2	0.2	0.2	0.3
GNP implicit deflator			-1.4	-0.9	-2.4	-0.8	-1.1	0.8	0.5	1.1
Federal surplus or deficit			274.2	-16.7	-1.9	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )	12.9	3.0
Personal savings rate			0.0	0.0	3.5	3.5	3.5	0.0	0.0	-1.8
Corporate bond rate			-15.8	-3.2	-11.3	-5.3	-5.1	9.0	1.8	6.0
Real disposable personal income			-0.7	0.1	0.4	1.2	0.7	0.4	0.0	-0.2

<sup>1</sup> Not computable.

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

spending (low-defense 4 and 5). The major effect is to raise personal disposable income, and hence personal consumption spending, by increasing transfer payments, while allowing the Federal budget to shift from a \$26 billion surplus in Base 2000 to a deficit in both of these alternatives. The redistribution of income from taxable sources to nontaxable transfers leads to revenue loss. Investment is virtually unchanged, as small declines in business spending are offset by increases in residential investment. Overall GNP is \$14 billion lower in these alternatives than in Base 2000, as interest rates remain high, and there is no consequent boom in investment spending (table 1).

*High alternatives.* Allowing real defense expenditures to remain unchanged from their 1989 level, high-defense 1, puts defense spending approximately \$36 billion higher than in the Base 2000 projection, but GNP rises by only \$8.0 billion. The Federal deficit continues over the entire decade, ending up at \$60 billion. The budget shortfalls exert more pressure on prices and interest rates, resulting in slower growth for both business and residential investment, lower export growth, and somewhat higher import

growth, all offsetting the economic stimulus of high defense spending. Military force levels are 261,000 higher than the Base 2000 projection,

**Table 3. Industries with the most defense-related employment, 1988 and projected to 2000**

[Thousands of jobs]

Industry	1988	Projected 2000	Absolute difference	Percent change
Aircraft and missile engines and equipment	211.5	121.6	-89.9	-42.5
Radio and TV communications equipment	193.3	105.4	-87.9	-45.5
Wholesale trade	214.8	136.1	-78.7	-36.6
Aircraft	179.3	113.1	-66.2	-36.9
Construction	178.7	124.4	-54.3	-30.4
Trucking and warehousing	92.6	57.8	-34.8	-37.5
Guided missiles and space vehicles	135.0	102.6	-32.4	-24.0
Eating and drinking places	113.4	83.1	-30.3	-26.7
Ship- and boatbuilding and repair	100.9	71.3	-29.6	-29.3
Miscellaneous electronic components	59.1	32.7	-26.4	-44.7
Hotels and other lodging places	69.9	48.3	-21.6	-30.9
Research, management, and consulting services	143.4	125.7	-17.7	-12.3
Ordnance	51.8	34.6	-17.2	-33.2
Semiconductors and related devices	32.7	17.8	-14.9	-45.6
Miscellaneous nonelectrical machinery	31.5	18.4	-13.1	-41.6
All other industries	1,329.1	896.1	-433.0	-32.6

NOTE: 1988 is based on preliminary data.

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reducing the labor force somewhat and leading to slightly lower private employment levels, especially in construction and durable manufacturing.

The higher Federal deficit is offset in high-defense 2 by a cut of Federal civilian purchases of goods and services and in high-defense 3 by an increase in personal taxes. The first alternative results in only very minor differences from the Base 2000 projection. In the second alternative, the higher personal tax rates reduce personal consumption and result in higher inflation and interest rates, as well as a less favorable foreign trade situation. Although GNP ends up slightly higher in this alternative compared to Base 2000, the costs are clear.

*Military force levels.* The armed forces stood at 2.1 million in 1988. The BLS moderate-growth projections to 2000 included a modest cut of 139,000 in personnel to slightly under 2 million. All of the low-defense alternatives result in a much sharper drop in military levels: 1.5 million or a cut of almost 600,000 from 1988. The resulting inflow of labor to the private sector increases the civilian labor force by almost 400,000 above the level of the moderate-growth projection. In the high-defense alternatives, holding real defense expenditures constant at 1989 levels actually results in a small increase in military force levels over the period, a rise of 120,000 to 2.2 million in 2000. The military increase in turn leads to a decline of

**Table 5. Occupations with the largest decrease in defense-related employment, 1988-2000**

Occupation	Employment decline (thousands)
Electrical and electronic assemblers . . . . .	21.6
Electrical and electronic equipment assemblers, precision . . . . .	19.1
Machinists . . . . .	14.0
Electrical and electronics engineers . . . . .	14.0
Aeronautical and astronautical engineers . . . . .	11.0
Electrical and electronics technicians and technologists . . . . .	9.1
Production, planning, and expediting clerks . . . . .	9.1
Mechanical engineers . . . . .	7.7
Aircraft assemblers, precision . . . . .	7.2
Machine tool cutting operators and tenders, metal and plastic . . . . .	6.8
	<b>Percentage decrease</b>
Electrical and electronic assemblers . . . . .	69.4
Electrical and electronic equipment assemblers, precision . . . . .	69.0
Electronic semiconductor processors . . . . .	54.3
Coil winders, tapers, and finishers . . . . .	51.7
Machine builders and other precision machine assemblers . . . . .	50.3
Electrolytic plating machine operators and tenders . . . . .	49.1
Electromechanical equipment assemblers, precision . . . . .	48.5
Heat treating machine operators and tenders, metal and plastic . . . . .	47.4
Solderers and brazers . . . . .	46.7
Machine tool cutting operators and tenders, metal and plastic . . . . .	45.4

NOTE: Includes only occupations for which 1988 defense-related employment was over 10 percent.

**Table 4. Defense-related employment in industries that are the most dependent on defense spending, 1988 and 2000**

[Thousands of jobs]

Industry	1988	Projected 2000	Absolute difference	1988 percent share of total employment
Guided missiles and space vehicles . . . . .	135.0	102.6	-32.4	87.2
Ordnance . . . . .	51.8	34.6	-17.2	67.9
Aircraft and missile engines and equipment . . . . .	211.5	121.6	-89.9	54.9
Ship- and boatbuilding and repair . . . . .	100.9	71.3	-29.5	52.2
Aircraft . . . . .	179.3	113.1	-66.2	48.8
Radio and TV communication equipment . . . . .	193.3	105.4	-87.9	42.4
Engineering and scientific instruments . . . . .	21.5	15.8	-5.7	22.7
Forgings . . . . .	8.1	3.5	-4.6	21.4
Electronic tubes . . . . .	6.9	3.1	-3.9	17.8
Research, management, and consulting services . . . . .	143.4	125.7	17.7	17.7
Miscellaneous electronic components . . . . .	59.1	32.7	-26.3	17.7
Miscellaneous transportation equipment . . . . .	8.3	4.8	-3.5	13.5
Metal coating, engraving, and services . . . . .	15.9	9.1	-6.8	13.1
Nonferrous foundries except aluminum . . . . .	4.4	2.6	-1.8	12.9
Engines and turbines . . . . .	11.8	6.4	-5.4	12.6

NOTE: 1988 is based on preliminary data.

100,000 in the civilian labor force, compared to the moderate-growth labor force.

Although large relative to overall defense spending, the 4-percent annual reductions in 5 of the 8 alternatives remain relatively small proportions of aggregate U.S. demand. To explore the economic effects, it is necessary to carry the analysis further, to the industry and occupational level of detail.

**Industry and occupational projections**

The decline in defense expenditures in the original 1988-2000 BLS projections has been used to calculate future employment requirements for defense. When those calculations are performed, total defense-related employment is projected to drop by almost 20 percent between 1988 and 2000. Table 3 identifies those industries with the largest absolute declines in employment. While some industries are directly related to defense purchases, such as aircraft and missile engines and

equipment, others are indirectly related but provide jobs, such as wholesale trade. Table 4 shows the industries most dependent on defense spending in 1988, ranked by projected employment decline. This grouping includes only those industries directly related to defense, such as ordnance, ships, and aircraft.

Table 5 shows occupations with the sharpest projected defense-related declines in the original 1988–2000 projections. The table lists occupations prominent in defense production, such as electrical and electronic assemblers, machinists, electrical and electronic engineers, and mechanical engineers. Employment in all of the occupations examined and 11 of the 25 indus-

tries listed in table 6 is projected to decline in absolute terms from 1988–2000.

### Employment alternatives

The employment impact under three of the economic alternatives is now examined in industry and occupational detail. For each alternative the following calculations are made: (1) demand GNP was translated into detailed commodity distributions of sales to final users; (2) total output estimates at both the commodity and industry level of detail were estimated based upon inter-industry flows for 2000 from the previously published moderate-growth BLS projections and

**Table 6. Industries with largest percentage loss in employment due to alternative defense spending**

[Employment in thousands]

Industry	Base 2000	Percent change from Base 2000
<b>Low-defense 1</b>		
Guided missiles and space vehicles . . . . .	170.8	-16.6
Ordnance, except vehicles and missiles . . . . .	65.8	-15.8
Ship- and boatbuilding and repairing . . . . .	175.2	-11.0
Federal general government . . . . .	1975.8	-10.1
Aircraft and missile engines and equipment . . . . .	404.0	-8.3
Aircraft . . . . .	385.9	-7.7
Radio and TV communication equipment . . . . .	464.5	-6.0
Miscellaneous transportation equipment . . . . .	51.6	-2.9
New nonbuilding facilities <sup>1</sup> . . . . .	77.7	-2.8
Engineering and scientific instruments . . . . .	125.8	-2.5
<b>Low-defense 5</b>		
Guided missiles and space vehicles . . . . .	170.8	-16.2
Ordnance, except vehicles and missiles . . . . .	65.9	-15.6
Federal general government . . . . .	1975.8	-10.1
Ship- and boatbuilding and repairing . . . . .	175.2	-9.9
Aircraft and missile engines and equipment . . . . .	404.0	-8.6
Aircraft . . . . .	385.9	-8.6
Radio and TV communication equipment . . . . .	464.5	-6.5
Engineering and scientific instruments . . . . .	125.8	-5.6
Miscellaneous electronic components . . . . .	360.5	-3.4
Forgings . . . . .	29.5	-3.1
<b>High-defense 1</b>		
Footwear, except rubber and plastic . . . . .	70.7	-4.9
Watches, clocks, and parts . . . . .	9.1	-2.9
Luggage, handbags, and leather products <sup>1</sup> . . . . .	45.6	-2.8
Metal mining . . . . .	50.7	-2.1
Electronic home entertainment equipment . . . . .	71.0	-2.0
Jewelry, silverware, and plated ware . . . . .	59.0	-1.9
Office and accounting machines . . . . .	44.0	-1.8
Toys and sporting goods . . . . .	101.4	-1.7
Crude petroleum, natural gas, and gas liquids . . . . .	175.9	-1.4
Primary nonferrous metals, except aluminum . . . . .	13.8	-1.3

<sup>1</sup> Not elsewhere classified.

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

**Table 7. Industries with largest percentage gain in total employment due to alternative defense spending**

[Employment in thousands]

Industry	Base 2000	Percent change from Base 2000
<b>Low-defense 1</b>		
Footwear, except rubber and plastic . . . . .	70.7	8.3
Watches, clocks, and parts . . . . .	9.1	5.5
Luggage, handbags, and leather products <sup>1</sup> . . . . .	45.6	4.8
Metal mining . . . . .	50.7	3.7
Office and accounting machines . . . . .	44.0	3.6
Electronic home entertainment equipment . . . . .	71.0	3.4
Jewelry, silverware, and plated ware . . . . .	59.0	3.4
New commercial buildings except offices . . . . .	338.3	3.3
Toys and sporting goods . . . . .	101.4	3.2
Primary nonferrous metals except aluminum . . . . .	13.8	2.9
<b>Low-defense 5</b>		
Footwear, except rubber and plastic . . . . .	70.7	4.1
New conservation and development facilities . . . . .	40.3	2.9
New roads . . . . .	222.7	2.4
New local transit facilities . . . . .	12.3	2.4
State and local government . . . . .	5538.7	2.4
State and local education . . . . .	8275.6	2.4
State and local hospitals . . . . .	1150.2	2.4
Luggage, handbags, and leather products <sup>1</sup> . . . . .	45.6	2.2
New water supply and sewer facilities . . . . .	141.2	2.2
New educational buildings . . . . .	129.8	1.9
<b>High-defense 1</b>		
Guided missiles and space vehicles . . . . .	170.8	11.5
Ordnance, except vehicles and missiles . . . . .	65.9	10.9
Ship- and boatbuilding and repairing . . . . .	175.2	7.5
Aircraft and missile engines and equipment . . . . .	404.0	6.0
Aircraft . . . . .	385.9	5.5
Federal Government . . . . .	1975.8	5.1
Radio and TV communication equipment . . . . .	464.5	4.3
New nonbuilding facilities <sup>1</sup> . . . . .	77.7	2.5
Miscellaneous transportation equipment . . . . .	51.6	2.0
Engineering and scientific instruments . . . . .	125.8	2.0

<sup>1</sup> Not elsewhere classified.

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

the foregoing GNP estimates; (3) the resulting industry output levels were then used to determine associated industry employment levels; and (4) the structure of occupational demand in 2000 was estimated. Defense Department expenditure distributions were patterned after the Base 2000 projection.

The effects of reduced defense spending on industry and occupational employment are viewed from two perspectives, the largest percent changes and the largest absolute differences. For industry employment, see tables 6 through 9 and for occupational employment, tables 10-13. The following discussion focuses

on the employment changes associated with the low-defense 1 alternative. Generally, the opposite results and interpretations apply to high-defense 1. For example, employment rises 3.3 percent in construction and new commercial buildings, except offices, under the low alternative (table 6) but falls 3.7 percent under the high alternative (table 7).

*Industry perspective.* Turning first to the largest percentage job losers, we note those industries most heavily dependent upon direct defense spending, such as guided missiles and space vehicles; ordnance; ship- and boatbuild-

Table 8. Industries with largest absolute loss in total employment due to alternative defense spending

(Employment in thousands)

Industry	Base 2000	Difference from Base 2000
<b>Low-defense 1</b>		
Federal Government	1,975.8	-200.0
Retail trade, except eating and drinking places	16,834.9	-169.2
Eating and drinking places	7,984.2	-51.1
Research, management, and consulting services	1,352.9	-33.9
Aircraft and missile engines and equipment	404.0	-33.7
State and local government education	8,275.6	-30.6
Aircraft	385.9	-29.9
Guided missiles and space vehicles	170.8	-28.4
Radio and TV communication equipment	464.5	-27.8
Personnel supply services	2,326.1	-27.7
<b>Low-defense 5</b>		
Federal Government	1,975.8	-200.0
Aircraft and missile engines and equipment	404.0	-38.9
Aircraft	385.9	-33.1
Radio and TV communication equipment	464.5	-30.3
Guided missiles and space vehicles	170.8	-27.6
Research, management, and consulting services	1,352.9	-26.7
Ship- and boatbuilding and repairing	175.2	-17.3
Miscellaneous electronic components	360.4	-12.2
Ordnance, except vehicles and missiles	65.8	-10.3
Semiconductors and related devices	286.4	-6.8
<b>High-defense 1</b>		
New nonfarm housing, single units	1,374.2	-8.7
Other agricultural products	1,290.2	-5.1
Agricultural services, forestry, fishing	1,228.4	-3.9
New commercial buildings, except offices	338.3	-3.7
Electronic computing equipment	454.2	-3.7
Apparel	746.0	-3.6
Footwear, except rubber and plastic	70.7	-3.5
New office buildings	327.0	-2.8
Motor vehicle parts and accessories	377.5	-2.7
Crude petroleum, natural gas, and gas liquids	175.9	-2.4

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

Table 9. Industries with largest absolute gain in total employment, alternative scenarios regarding defense cuts in spending, 1988-2000

(Employment in thousands)

Industry	Base 2000	Difference from Base 2000
<b>Low-defense 1</b>		
New nonfarm housing, single units	1,374.2	14.1
New commercial buildings, except offices	338.3	11.2
Other agricultural products	1,290.2	10.3
New office buildings	327.0	8.8
Agricultural services, forestry, fishing	1,228.4	8.6
Electronic computing equipment	454.2	8.1
Real estate	1,843.5	7.0
Apparel	746.0	6.0
Footwear, except rubber and plastic	70.7	5.9
Crude petroleum, natural gas, and gas liquids	175.9	5.0
<b>Low-defense 5</b>		
State and local government education	8,275.6	199.4
State and local general government <sup>1</sup>	5,538.7	133.5
Retail trade, except eating and drinking places	16,834.9	113.4
State and local government hospitals	1,150.1	27.7
Hospitals, private	4,252.0	17.4
Offices of health practitioners	3,176.0	11.4
New nonfarm housing, single units	1,374.2	11.2
Educational services, private	1,917.3	11.0
Apparel	746.0	8.5
Nursing and personal care facilities	1,926.1	6.8
<b>High-defense 1</b>		
Federal Government	1,975.8	100.0
Retail trade, except eating and drinking places	16,834.9	88.5
Eating and drinking places	7,984.2	32.1
Research, management, and consulting services	1,352.9	24.5
Aircraft and missile engines and equipment	404.0	24.3
State and local government education	8,275.6	21.5
Aircraft	385.9	21.2
Personnel supply services	2,326.1	20.0
Radio and TV communication equipment	464.5	19.9
Guided missiles and space vehicles	170.8	19.6

<sup>1</sup> Not elsewhere classified.

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.



**Table 10. Occupations with largest percentage loss in employment due to alternative defense spending**

[Employment in thousands]

Occupation	Base 2000	Percent change from Base 2000
<b>Low-defense 1</b>		
Shipfitters	12.2	-15.0
Riggers	14.7	-8.9
Electronics repairers, commercial and industrial equipment	79.3	-8.9
Aircraft engine specialists	19.1	-8.8
Aircraft assemblers, precision	30.8	-8.7
Aeronautical and astronautical engineers	85.4	-7.3
All other motor vehicle operators	53.8	-6.8
Procurement clerks	46.6	-6.8
Budget analysts	72.0	-5.2
Aircraft mechanics	123.4	-5.1
<b>Low-defense 5</b>		
Shipfitters	12.2	-14.1
Aircraft assemblers, precision	30.8	-9.6
Aircraft engine specialists	19.1	-9.0
Riggers	14.7	-8.8
Electronics repairers, commercial and industrial equipment	79.3	-8.7
Aeronautical and astronautical engineers	85.4	-7.8
Procurement clerks	46.6	-7.0
All other motor vehicle operators	53.8	-6.4
Aircraft mechanics	123.4	-4.8
Budget analysts	72.0	-4.7
<b>High-defense 1</b>		
Shoe sewing machine operators and tenders	13.3	-4.1
Shoe and leather workers and repairers, precision	19.0	-3.0
Sewers, hand	13.7	-1.1
Fallers and buckers	16.4	-1.0
Log handling equipment operators	13.6	-0.9
Petroleum engineers	18.1	-0.8
All other timber cutters and related logging workers	15.2	-0.8
Logging tractor operators	25.4	-0.8
Chemical plant and system operators	27.6	-0.5
Cementing and gluing machine operators and tenders	35.8	-0.5

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

**Table 11. Occupations with largest percentage gain in employment due to alternative defense spending**

[Employment in thousands]

Occupation	Base 2000	Percent change from Base 2000
<b>Low-defense 1</b>		
Shoe sewing machine operators	13.3	7.1
Shoe and leather workers and repairers, precision	19.0	5.1
Sewers, hand	13.7	1.9
Fallers and buckers	16.5	1.8
Log handling equipment operators	13.6	1.7
All other timber cutting and related logging workers	15.2	1.5
Logging tractor operators	25.4	1.5
Petroleum engineers	18.1	1.5
Chemical plant and system operators	27.6	1.2
Cementing and gluing machine operators and tenders	35.9	1.1
<b>Low-defense 5</b>		
Shoe sewing machine operators and tenders	13.3	3.4
Shoe and leather workers and repairers, precision	19.0	2.6
Correction officers and jailers	262.2	2.1
Teachers, kindergarten and elementary	1,566.8	2.1
Teachers, special education	316.4	2.1
Teachers, secondary school	1,387.9	2.1
College and university faculty	868.9	2.1
Court clerks	51.3	2.1
Highway maintenance workers	190.2	2.1
Government chief executives and legislators	71.4	2.0
<b>High-defense 1</b>		
Shipfitters	12.2	9.0
Aircraft assemblers, precision	30.8	6.2
Aeronautical and astronautical engineers	85.4	5.2
Aircraft engine specialists	19.1	4.8
Riggers	14.7	4.7
Electronics repairers, commercial and industrial equipment	79.3	4.6
Procurement clerks	46.6	3.5
All other motor vehicle operators	53.8	3.4
Budget analysts	72.0	2.9
Aircraft mechanics	123.4	2.7

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

ing; and aircraft. Significant job losses occur in the five most affected industries, with percentage losses tapering sharply in the other industries. The only industry among the biggest 10 job losers that may be unfamiliar is "new non-building facilities." This industry covers a myriad of facilities: ports, military base road and rail systems, and missile silo systems, to name just a few.

Because military spending inherently affects certain industries, the list of job losers presents no real surprises. Other areas of the economy

benefit from the reduction in defense spending, as the deficit improves (table 7). Increasing consumer demand results in significant employment increases in the manufacture of footwear; watches, clocks, and parts; luggage and handbags; electronic home entertainment equipment; jewelry and silverware; and toys and sporting goods. Increases in the demand for producers' durable equipment lead to significant employment increases in metal mining and in office and accounting machines. Finally, rising demand for commercial buildings leads to signif-

ificant employment increases in construction and in primary nonferrous metal mining. Many other industries show similar but smaller positive effects from the defense spending cutback.

The industries with the largest percentage changes in employment are either those most closely related to the Defense Department or those with relatively low employment levels. In the latter case, even a small change in employment can significantly alter the overall level. Another perspective is to examine the industries with the largest absolute changes in employ-

ment. The industries selected tend to show small percentage changes in employment.

However, a few categories also show large percent changes—Federal Government; aircraft and missile engines; aircraft; guided missiles and space vehicles; and radio and TV communication equipment. Perhaps more interesting, though, are those industries or activities which undergo relatively large job losses but which are generally not readily associated with defense spending: retail trade; eating and drinking places; research, management, and consulting

**Table 12. Occupations with largest absolute loss in employment due to alternative defense spending**

[Employment in thousands]

Occupation	Base 2000	Difference from Base 2000
<b>Low-defense 1</b>		
Sales persons, retail	4,393.8	-41.9
All other clerical and administrative support workers	644.7	-24.7
Accountants and auditors	1,055.6	-23.3
Cashiers	2,583.0	-22.2
Janitors and cleaners, including maids and housekeeping cleaners	3,194.4	-19.6
Typists and word processors	892.2	-17.8
All other sales and related workers	4,368.0	-16.9
General managers and top executives	3,508.7	-15.8
Computer systems analysts	569.9	-15.8
Stock clerks, stockroom, warehouse, or yard	839.7	-14.9
<b>Low-defense 5</b>		
All other clerical and administrative support workers	644.7	-18.1
Accountants and auditors	1,055.6	-17.3
Computer systems analysts	569.9	-14.4
Electrical and electronics engineers	603.7	-11.1
Stock clerks, stockroom, warehouse, or yard	839.7	-9.4
Typists and word processors	892.2	-8.7
Machinists	428.1	-8.1
Inspectors, testers, and graders, precision	630.8	-6.9
Electronics repairers, commercial and industrial equipment	79.3	-6.9
Aeronautical and astronautical engineers	85.4	-6.7
<b>High-defense 1</b>		
Sewing machine operators, garment	519.5	-2.2
Farm workers	674.8	-1.6
Textile draw-out and winding machine operators and tenders	194.5	-0.9
Shoe and leather workers and repairers, precision	19.0	-0.6
Shoe sewing machine operators and tenders	13.3	-0.6
Head sawyers and sawing machine operators and tenders	80.3	-0.4
Farm operators and managers	160.0	-0.4
Machine feeders and offbearers	216.7	-0.3
Plastic molding machine operators and tenders	176.0	-0.3
Supervisors, farming, forestry, and farm-related occupations	76.8	-0.2

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

**Table 13. Occupations with largest absolute gain in employment due to alternative defense spending**

[Employment in thousands]

Occupation	Base 2000	Difference from Base 2000
<b>Low-defense 1</b>		
Farm workers	674.8	3.6
Sewing machine operators, garment	519.5	3.5
Textile draw-out and winding machine operators and tenders	194.5	1.6
Helpers, construction trades	630.6	1.4
All other assemblers and fabricators	971.9	1.4
Shoe sewing machine operators	13.3	1.0
Shoe and leather workers and repairers, precision	19.0	0.9
Plastic molding machine operators and tenders	176.0	0.9
Machine feeders and offbearers	216.7	0.9
Farm operators and managers	160.0	0.8
<b>Low-defense 5</b>		
Teachers, kindergarten and elementary	1,566.8	32.7
Teachers, secondary school	1,387.9	28.9
Salespersons, retail	4,393.8	28.0
College and university faculty	868.9	18.1
Registered nurses	2,164.2	15.6
Teacher aides and educational assistants	827.2	14.1
Cashiers	2,583.0	13.6
All other teachers and instructors	879.2	12.6
General office clerks	2,958.5	12.5
Secretaries, except legal and medical	3,216.3	12.2
<b>High-defense 1</b>		
Salespersons, retail	4,393.8	22.2
Janitors and cleaners, including maids and housekeeping cleaners	3,194.4	13.8
All other sales and related workers	4,368.0	13.2
All other clerical and administrative support workers	644.7	13.2
Accountants and auditors	1,055.6	13.0
Cashiers	2,583.0	12.2
General managers and top executives	3,508.7	11.5
Secretaries, except legal and medical	3,216.3	10.4
Typists and word processors	892.2	10.2
General office clerks	2,958.5	9.9

NOTE: Base 2000 is the moderate-growth projection for 2000 originally published by BLS in November 1989.

## Monitoring defense employment

In addition to estimating the employment implications of alternative projections of defense spending, the Bureau of Labor Statistics has several efforts under way to monitor the effects of current employment changes in defense spending. These initiatives draw upon a variety of Government programs providing employment and unemployment statistics.

The BLS Current Employment Statistics program, which produces monthly industry employment estimates, has developed a special series to measure employment in industries that rely on defense outlays for a majority of their shipments. This monthly series is available from 1982 forward.

A joint Department of Commerce and Department of Labor study, published in the August 1987 *Monthly Labor Review*, identified defense-dependent industries using an input-output model at the four-digit level of the Standard Industrial Classification. Those industries with at least 50 percent of output produced for defense purposes during 1985 were included in the defense-dependent series. Industries meeting this criterion were ordnance and accessories, radio and TV communication equipment, aircraft and parts, shipbuilding and repairing, guided missiles and space vehicles, and tanks and tank components.

Employment in these six industries cannot be viewed as an exact measure of the number of jobs generated by defense spending. For one thing, many jobs are in industries that do not meet the 50-percent criterion. By the same token, many jobs in defense industries stem from the production of civilian goods. With careful interpretation, however, the series can be used to approximate the effect of defense spending on payrolls, particularly over the longer term.

The series shows that employment in the six defense industries continued to decline even after the recession of 1981-82, touching a low point in April 1983. Job growth was vigorous during the next 3½ years, however, as employment expanded by 250,000, reach-

ing a peak in October 1986. Employment then declined gradually and as of mid-1990, the number of jobs in these industries had fallen by almost 85,000.

The BLS Mass Layoff Statistics program is also a source of information on worker dislocation in defense industries. BLS collects quarterly reports on plant closings and layoffs involving at least 50 persons and lasting 30 days or longer. A review of reports from the 44 States participating in the survey during 1989 found that defense industries reported 77 layoffs involving 16,000 workers. In 28 layoffs, employers cited slack work as the reason for the action. Contract completion was cited in 17 layoffs, while shortage of materials and contract cancellation accounted for five each. While these data should only be used as a proxy for the level of defense layoffs, they illustrate the impact of procurement cutbacks.

In addition, BLS has asked cooperating State agencies to assign a special "reason for layoff" code for defense-related employment cutbacks in any industry. The first reports incorporating this information were received in May. BLS also has added special comment codes to the Current Employment Statistics program to identify employment changes that reflect cutbacks or increases in defense spending. These steps are expected to aid in the analysis of current defense-related employment and layoffs.

Data derived from the BLS program (ES-202), covering establishments included in the unemployment insurance system, are being analyzed to identify local areas with relatively high concentrations of defense employment. As such areas are identified, they may be more intensively tracked through the BLS local area unemployment statistics program.

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Office of Employment  
and Unemployment Statistics

services; State and local education; and personnel supply services. The job losses in these categories are small in percentage terms but add up to almost 313,000 jobs, a not insignificant total. But the projected decline in defense-related

employment does not produce absolute declines in these industries.

Turning to the largest absolute job gains, we note that increases in demand lead to increasing employment in the construction of commercial

buildings and office buildings, as well as real estate—an overall increase of 42,000 jobs. An upturn in demand for producers' durable equipment creates 8,000 jobs in the electronic computing equipment industry. Employment in the remaining industries rises as a result of increasing consumer demand.

*Occupational perspective.* Just as the industries with the largest percentage of job losses are readily predictable, so too are those occupations with the largest percentage of cuts. Of the top 10 losers, 8 occupations are heavily and directly involved with the design, production, maintenance, or use of military hardware: shipfitters; riggers; electronics repairers; aircraft engine specialists; aircraft assemblers; aeronautical and astronautical engineers; all other motor vehicle operators; and aircraft mechanics. The two remaining occupations, procurement clerks and budget analysts, are heavily represented in the Defense Department.

Occupations with the largest percentage of employment gains tend to be in industries serving burgeoning consumer demand and demand for construction. For the most part, these occupations

are in relatively labor-intensive, low-productivity areas of the economy. Further, as with industry employment, relatively few people work in these occupations, although job increases are large from a percentage point of view.

Looking at those occupations with the largest absolute losses, we tend to see support workers such as sales persons, clerical staff, and general management—occupations employed across many industries and likely, as a result, to change in line with employment.

Finally, occupations with the largest absolute job gains are relatively widespread, with no occupation accounting for a very large increase. Most of the gainers are in occupations serving the increase in demand for consumer goods and investment demand.

### Alternative spending cutbacks

As noted, it was assumed that cuts in defense spending would affect all types of defense purchases in the same proportions as in the *Outlook 2000* projections. The final step of this analysis examines alternative approaches to cuts among purchases of commodities with the concomitant effects on industry employment and occupational demand. Two variations of the low-defense 1 alternative were developed: cuts aimed more at conventional defense spending (alternative-distribution 1), and cuts aimed more at high-technology and research and development spending (alternative-distribution 2).

In both cases, modifications were made to the low-defense "bill-of-goods," that portion of GNP spent by the Defense Department and distributed by the commodities purchased. The redistributed GNP was then used to derive total industry and commodity output estimates, and both employment and occupational estimates were derived. The results appear in table 15 as percent changes from the low-defense 1 alternative. The effects of cuts in high-tech purchases are the opposite of those listed in table 15.

Forcing the cuts into more conventional areas such as ships and ordnance has a positive impact on employment in industries supplying strategic weapons and much of the electronics associated with such weapons. (See table 15.) Not surprisingly, highly skilled professional and technical occupations also benefit. (See table 16.)

Redirecting cuts into high-tech weaponry leads to some increases in the more traditional defense industries—ship- and boatbuilding and ordnance, along with the manufacturing sector industries which support these industries. This alternative has the further effect of raising demand for the less-skilled technical, construction, and manufacturing occupations related to these industries.

Table 14. The effects of deeper cuts in conventional defense spending, by industry, 1988–2000

Industry	Millions of 1982 dollars
Total cuts	-5,400
Fabricated structural metal products	-100
Ordnance, except vehicles and missiles	-1,000
Miscellaneous fabricated metal products	-100
Engines and turbines	-400
Ship- and boatbuilding and repairing	-1,000
Miscellaneous transportation equipment	-400
Petroleum refining	-1,600
Noncomparable imports	-800
Total increases	+5,400
Electronic computing equipment	+800
Office and accounting machines	+100
Radio and TV communication equipment	+900
Electronic tubes	+40
Semiconductors and related devices	+60
Miscellaneous electronic components	+200
Aircraft	+400
Aircraft and missile engines and equipment	+400
Guided missiles and space vehicles	+1,400
Engineering and scientific instruments	+100
Measuring and controlling devices	+100
Optical and ophthalmic products	+100
Computer and data processing services	+400
Research, management, and consulting services	+400

**Table 15. Industries with largest total employment percentage gain due to various defense cuts in spending**

[Employment in thousands]

Industry	Percent increase from low-defense 1	
	Number	Percent
<b>Conventional cuts</b>		
Guided missiles and space vehicles . . . . .	142.4	7.2
Radio and TV communication equipment . . . . .	436.7	1.6
Engineering and scientific instruments . . . . .	122.6	1.5
Electronic tubes . . . . .	32.0	1.6
Miscellaneous electronic components . . . . .	359.3	1.4
Aircraft and missile engines and equipment . . . . .	370.3	1.3
Aircraft . . . . .	356.0	1.1
Office and accounting machines . . . . .	45.6	0.9
Optical and ophthalmic products . . . . .	74.9	0.8
Semiconductors and related devices . . . . .	289.8	0.7
<b>High-tech cuts</b>		
Ship- and boatbuilding and repairing . . . . .	155.9	20.7
Ordnance, except vehicles and missiles . . . . .	55.4	15.0
Miscellaneous transportation equipment . . . . .	50.1	5.4
Engines and turbines . . . . .	76.9	2.5
Crude petroleum, natural gas, and gas liquids . . . . .	180.9	0.9
Petroleum refining . . . . .	105.8	0.7
Pipelines, except natural gas . . . . .	18.9	0.5
Miscellaneous fabricated metal products . . . . .	223.7	0.4
Fabricated structural metal products . . . . .	412.9	0.3
Blast furnaces and basic steel products . . . . .	244.9	0.2

**Table 16. Occupations with largest employment percentage gain, alternative scenarios regarding cuts in defense spending**

[Employment in thousands]

Occupation	Percent increase from low-defense 1	
	Number	Percent
<b>Conventional cuts</b>		
Aeronautical and astronautical engineers . . . . .	79.2	1.8
Aircraft assemblers, precision . . . . .	28.1	1.6
Electronic semiconductor processors . . . . .	33.8	1.1
Electromechanical equipment assemblers, precision . . . . .	52.3	0.8
Electrical and electronic equipment assemblers, precision . . . . .	89.3	0.8
Electrical and electronic assemblers . . . . .	133.3	0.6
Electrical and electronics engineers . . . . .	596.4	0.5
Industrial engineers, except safety engineers . . . . .	152.3	0.5
Coil winders, tapers, and finishers . . . . .	20.6	0.5
Electrical and electronic technicians . . . . .	466.3	0.4
<b>High-tech cuts</b>		
Shipfitters . . . . .	10.4	16.7
Riggers . . . . .	13.4	5.5
Painters, transportation equipment . . . . .	32.8	2.0
Welders and cutters . . . . .	283.0	1.0
Petroleum engineers . . . . .	18.4	0.6
Grinders and polishers, hand . . . . .	73.4	0.8
Boilermakers . . . . .	24.6	0.7
Gas and petroleum plant and system occupations . . . . .	22.4	0.5
Painting, coating, and decorating workers, hand . . . . .	35.1	0.8
All other electrical and electronic equipment mechanics . . . . .	54.4	0.8

IN SUMMARY, the Bureau has explored several alternatives for future defense spending, in aggregate economic terms and in terms of employment in specific industries and occupational groups. Although the effects tend to be relatively minor at the aggregate level, they may be significant in certain industries and occupations most closely tied to the Department of Defense. While those industries and occupations may suffer from significant defense spending cutbacks, other industries and occupations may improve as a re-

sult of offsetting economic factors.

Further efforts could fruitfully be aimed at the estimation of regional effects of defense spending cuts,<sup>4</sup> or by estimating the employment and occupational effects of more narrowly defined cuts.<sup>5</sup> At this point, both the extent and timing of any possible cuts in defense spending are unknown. When the first round of budget-making for the 1990's defense establishment is completed, more narrowly defined approaches might be feasible. □

**Footnotes**

<sup>1</sup> "Outlook 2000," *Monthly Labor Review*, November 1989, pp. 3-74. This series of five articles on the BLS projections to 2000 outlines the shape of the economy and detailed labor supply and demand.

<sup>2</sup> The estimate of defense-related employment in 1988 was derived by multiplying a 1988 employment-requirements matrix by a detailed vector of Defense Department commodity purchases. An employment-requirements matrix shows the direct and indirect employment in all industries generated by \$1 of final production and is derived from a detailed total-requirements input-output matrix and similarly detailed estimates of total industry employment for the year in question.

<sup>3</sup> The initial calculations for each scenario assumed only the change noted in defense spending in order to determine

the sensitivity of the aggregate economic model to these changes alone. The aggregate economic projections of the Bureau of Labor Statistics are performed in the context of Data Resources, Inc., Long Term Model of the U.S. Economy. For a full description of the model, refer to "The DRI Annual Model of the U.S. Economy," by Joyce Yanchar, in *Data Resources U.S. Long-Term Review*, Winter 1986-87, pp. 30-43.

<sup>4</sup> This type of regional analysis was presented in "The Peace Economy," *Business Week*, Dec., 11, 1989, pp. 50-55.

<sup>5</sup> For an example of these types of studies, which are just now beginning to appear, see *Budgetary and Military Effects of a Treaty Limiting Conventional Forces in Europe*, a Special Study of the Congressional Budget Office, January 1990.