

## **Converting Resources from Military to Non-Military Uses**

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**A**s a proportion of gross national product, U.S. military spending has declined steadily since the mid-1980s. The end of the Cold War has given rise to calls for even more cuts in military spending. In early 1992, President George Bush proposed to reduce military spending by 3 percent per year, in real dollars, for the next five years. The Democratic leadership in the House of Representatives countered with a plan calling for substantially deeper cuts.

Any substantial changes in military expenditures imply a “conversion” of physical and human resources from military to non-military uses. Since a dynamic economy should exhibit various sorts of interindustry and interregional structural change—for example, industry shifts from agriculture to steel to automobiles and on to electronics, and regional shifts from the “rust-belt” to the “sun-belt” to the “gun-belt”—economists, in principle, are familiar with issues of resource conversion.

These shifts have provided economists and various interested parties with a variety of experiences in resource conversion, but each structural shift presents individual peculiarities. A reduction in military spending may have far-reaching consequences for the economy, depending on the eventual size of the “peace dividend,” and whether it is used for deficit reduction, tax cuts, higher domestic spending, or in other ways. However, this article will set aside possible uses of money saved from reduced military spending, and focus instead on some distinctive characteristics of the U.S. military sector and on some adjustment

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costs that reduced military spending are likely to impose on military industries, occupations, regions, and communities.

## Scope and Magnitudes

Since 1930, U.S. military outlays exceeded \$300 billion in constant 1991 dollars only during four World War II years (1943–1946), three years during the Korean War (1952–1954), four years during the Vietnam War (1967–1970), and six years during the Reagan/Bush build-up (1985–1990) (OTA, 1992, Table A-1, p. 229). This corresponds to four military spending cycles. As a percentage of gross national product, military spending fell from 40 percent of the nation's GNP during World War II to about 4 percent of GNP by 1947. The Korean War build-up followed, with peak military expenditures at about 14 percent of GNP in the early 1950s. A third cycle occurred during the Vietnam War, when military expenditures topped out at around 9 percent of GNP in the second half of the 1960s and then began a sustained drop until the late Carter years. The fourth military spending cycle occurred mainly during President Reagan's first term, when congressional authority for military spending peaked at 6.5 percent of GNP in fiscal year 1985.<sup>1</sup>

Military- (or defense-) related private-sector employment during and since World War II closely mirrors the changes in military expenditures.<sup>2</sup> According to Schmidt and Kosiak (1991, Table 3, Graph 2), military-industry employment at the *height* of the Reagan build-up in 1986 amounted to 3.63 percent of the U.S. private-sector labor force, about equal to the *low* point between the Korean and Vietnam conflicts, which stood at 3.59 percent in 1965. However, the 3.63 percent in 1986 represented a military-industry employment of 3.3 million, more than 50 percent higher than the 1965 employment of 2.1 million. The industry actually added 1.2 million workers. Thus, whereas the military cuts appear in relative terms “merely [as] an intensification of an ongoing trend” (Weidenbaum, 1990, p. 235), in absolute terms many more people are affected than during previous periods of military cuts.

<sup>1</sup>Some point out that U.S. military spending entails more than merely the Congressional military appropriations and eventual military outlays. For example, a large part of the U.S. Department of Energy's \$11 billion FY91-budget is devoted to military-nuclear installations and operations. Part of NASA's budget is military-related, as is part of the foreign aid budget. The budget of the Veteran's Administration should properly be counted as a military related expense. Some also assign a portion of the interest payment on the federal debt to U.S. military expenditures. Many of these adjustments are reasonable in principle, but in practice each is subject to a wide margin of disagreement.

<sup>2</sup>Military-related employment, often referred to as “defense-industry employment,” is an estimate of direct and indirect private employment generated through military spending. For example, a defense contractor's insurance agent would be counted as military-related employment for that portion of the agent's insurance business accounted for by military spending. For details and references see, for example, OTA (1992, Ch. 3).

By 1991, there were about 2.9 million military-industry employees, about 2 million active-duty military forces (including roughly 700,000 stationed outside the U.S.), and roughly 1 million Department of Defense civilian employees, for a total military-related employment of about 6 million (industry, active-duty, and civilians) or about 4.5 percent of the U.S. labor force.

The eventual effect of a reduction in military spending will depend, of course, on congressional and presidential actions. One recent study offers a projection assuming spending cutbacks of 26 percent from 1991 to 1996 (Schmidt and Kosiak, 1991). This spending reduction was associated with a loss of 814,000 jobs in military industries, a cut of 207,000 in resident active-duty military personnel, and a 108,000 decline in Department of Defense civilian personnel. The total job loss of 1.13 million, in this projection, would be just over 21 percent of that study's 1990 employment base of 5.266 million military jobs.<sup>3</sup> The average yearly direct job loss would be 188,000 jobs during each of fiscal years 1991 to 1996. Of course, one must also consider multiplier effects on the rest of the economy, at least in the short run. A multiplier of two would double the military-related gross job loss to about 376,000 people ( $2 \times 188,000$ ).<sup>4</sup>

More recent projections by the Congressional Budget Office (February 1992) and Congress' Office of Technology Assessment (February 1992) confirm these estimates. CBO suggests a direct gross employment loss of 1.1 million workers between 1991 and 1995, composed of 400,000 direct jobs lost in the private military industry, another employment loss of 200,000 suffered by military-industry supplier firms, 360,000 active-duty personnel cuts, and 130,000 federal government civilian jobs lost (CBO, 1992, p. 22). OTA estimates a range of between 1.0 and 1.4 million lost jobs by 1995, 400,000 active-duty, 100,000 civilian DoD, and between 530,000 and 920,000 industry jobs (OTA, 1992, p. 59).

All these estimates are for gross job loss—that is, unadjusted for the re-employment that some laid-off military workers undoubtedly will find. Moreover, some (possibly large) part of lost employment positions will be obtained through attrition, hiring freezes, and early retirement options. Other “lost” positions will actually be lost only years hence as military contractors work off their Pentagon order backlog. In any case, the net job loss, OTA suggests, might lie around 250,000 per year in 1992 to 1995. During the 1980s economy-wide “involuntary job separations” occurred at an annual rate of about 2 million; hence an estimated annual net loss of 250,000 positions would

<sup>3</sup>Schmidt and Kosiak excluded non-resident U.S. armed forces from their study. The most detailed collection of data on the impact of military spending and related taxation on localities has been assembled over the years by Employment Research Associates (ERA) of Lansing, MI, sometimes in conjunction with economic models developed by Regional Economic Models, Inc. (REMI). Two recent samples are ERA (1989, 1991).

<sup>4</sup>Employing a multiplier of, say, 2, the 5.266 million direct defense jobs implies 10.52 million jobs, dependent on military spending, a figure roughly equal to the estimate of 10.84 million made by Lall and Marlin (1992, p. 54).

increase the separations level to 2.25 million, an additional 12.5 percentage points (OTA, 1992, pp. 60–61).

These estimates suggest that military spending cuts are not likely to cause a short-run macroeconomic catastrophe, although the gross job loss might add as much as an unwelcome 0.3 percentage points to the short-run nationwide unemployment rate and a net loss of perhaps 0.2 percentage points.<sup>5</sup> Instead, the cuts present regional and community- and occupation-specific problems. We now discuss some aspects of the U.S. military industry, the regional and community effects, and the impact on specific occupations.

## **Military Industries**

Cancellation of major weapons programs tends to put production workers out of work immediately and curtails military demand for scientists and engineers. Employment in the ground, sea, and air transportation, ordnance, military-communications, and the underlying electronic-components industries will be hit hardest. To illustrate, Table 1 presents CBO simulations based on the administration's 1992–1997 "Future Years Defense Program" plan, submitted to Congress in February 1991. The final column in Table 1 is an estimate of *net* output in the named industry. For example, CBO anticipates a 36 percent net output loss in the tank and tank component industry, but a 10 percent net gain in the aircraft industry, in part because the simulations assume that the civilian aircraft industry will make up for military aircraft order losses. At first glance, then, it might seem that those industries that possess potential substitute customers and prospects for an expanding market—such as aircraft, aircraft equipment, and scientific instruments—will eventually be able to weather military cutbacks well. Other industries, more completely tied to military production—tanks, shipbuilding, and missiles—will be more heavily affected.

The issue of conversion involves not only just what is produced, but also the corporate culture and customary approach to business of military-oriented industries, which often differs dramatically from a more free-market environment. Among many others, Gansler (1989, pp. 159–160) has provided an extensive list of deviations of military-market conditions from the perfect-competition, free-market model of economics textbooks. For example, competitive markets consist of many buyers and sellers, dealing with relatively inexpensive items bought in large quantities, with market forces impersonally determining the price. Military markets, in contrast, often operate with one

<sup>5</sup>Long-run macroeconomic effects depend on how the "peace dividend" is spent. The Congressional Budget Office (1992, Ch. 2) study points out that increases in consumptive expenditures will lessen the short-run regional defense reduction effects but also lower the long-run nationwide benefits, whereas investment spending would prolong the short-run negative effects but improve the long-run competitive world market prospects of the United States.

*Table 1*  
**U.S. Military Reductions' Effect  
 on Selected Military Industries**

<i>Industry</i>	<i>1990 Output (Billions of Dollars)</i>	<i>Military Share of 1990 Output</i>	<i>1990- 1995 Output Change (in %)</i>
Tank and Tank Components	2.4	100	-36
Shipbuilding and Repair	12.3	99	-11
Complete Guided Missiles	17.5	84	-16
Other Ordnance and Accessories	2.9	51	0
Explosives	1.6	44	-9
Aircraft, Missile Engines	34.5	43	0
Communications Equipment	67.6	42	9
Aircraft	60.7	40	10
Nonferrous Forgings, n.e.c.	1.7	35	20
Aircraft, Missile Equipment	45.3	27	13
Small Arms Ammunition	1.8	26	5
Ammunition, Except Small Arms	7.3	24	-10
Small Arms	1.8	19	2
Engineering and Scientific Instruments	7.5	18	21

Source: CBO (1992, p. 23, Table 6).

buyer (the Department of Defense) and very few suppliers, producing a limited number of extremely expensive goods, with prices set through a process of formal negotiation. In addition, as Gansler points out, competitive companies must battle on the basis of cost, whereas military companies often function under cost-plus pricing, where almost any price is paid for a unique level of performance. Whereas free-market competitors must be concerned with entry and exit, new military-oriented firms rarely enter the market and old ones rarely exit.

In our context, the question of barriers-to-exit is of particular interest. Barriers include excessively large, but government required, overhead costs; specialized capital equipment unsuitable for alternative employment; specialized labor forces working with disregard for cost minimization; lobbying, rather than marketing, staffs combined with lack of knowledge on how to scout commercial markets and locate potential customers. Moreover, military companies often lack access to the capital markets because financial institutions are reluctant to lend to companies without track records in civilian markets. As a result of these and other factors, many military companies are unable to

function in a market-driven, civilian-product oriented economy (Gansler, 1989, pp. 246–247; National Governors' Association, 1992, p. 2).

With this background, it should be no surprise to learn that some previous attempts to convert military industry failed. However, some of the celebrated examples of failures appear to be based on deficient, and then repeatedly quoted, research, creating more of an impressionist "lore" of conversion failure than is properly attributable to the industry's efforts. For example, Weidenbaum (1992b, p. 98) refers to Grumman's failed attempt to produce aluminum canoes. But the aluminum canoe, introduced in 1945, was a good and durable product that quickly developed a significant following. Not until 1990, when technological developments made aluminum boats obsolete—just as the aluminum boat made its predecessor (made of bark) obsolete—did Grumman sell its Boats Division to Outboard Marine Corporation.

Similar "lore" surrounds Grumman's aluminum-vehicle production, which has also been successful. In 1946, Grumman started the Grumman Olson Division making aluminum delivery-truck bodies and in 1986 Grumman won its largest single contract ever (\$1.1 billion) to supply 99,150 aluminum-body long-life vehicles (LLVs) to the U.S. Postal Service, followed by another contract in 1991 for \$555 million for another 43,505 such vehicles.<sup>6</sup>

Other "failures" of conversion efforts were failures indeed, but their lack of success is not necessarily attributable to the military backgrounds of the contractors. Again, Grumman's solar-energy products were quite successful until energy prices declined in the early 1980s, and with it federal energy tax-credits that had supported not only Grumman's efforts but the entire incipient solar-energy industry. Similarly, flawed and discontinuous federal mass-transit policies and support led to a treacherous climate for trolley and rail-car contractors which included, among others, military contractors attempting to diversify (like Boeing and Rohr). "In retrospect," writes DeGrasse (1987), "it was no disgrace for these two companies to pull out; so did the ones that had been in it for years—Budd . . . , Pullman Standard and St. Louis Car. The big loser was U.S. industry."

It is correct that the various military-industry conversion or diversification attempts were smallish in relation to the size of contemporary military spending cuts. Nonetheless, it appears that the conversion history of the late 1960s and early 1970s deserves a second, more careful look. On the other hand, in recent years, the idea of conversion has itself changed, away from the wholesale conversion of specific physical capital toward converting the knowledge of individual military specialists to new, civilian uses. This approach to conversion can claim some genuine successes. For example, Hughes Aircraft, a GM subsidiary, created the position of Senior Vice-President for Diversification whose mission it is to use military-aerospace experts to solve problems in the civilian

<sup>6</sup>All Grumman information based on interview with John Vosilla, Grumman Corporation, July 30, 1992.

automotive divisions of General Motors. The position now oversees some 50 small diversification projects. TRW's Center for Automotive Technology takes the same approach. Lockheed has made substantial inroads into civilian services that require the handling of large amounts of data, such as for the collection of parking fines and child-support payments. Scientists at the Los Alamos nuclear laboratory in New Mexico recently developed a test to detect salmonella contamination of eggs, and the lab has applied for a patent (Council on Economic Priorities, 1992; Wartzman, 1992; Bishop, 1992). Events like these may herald a new era for conversion, based on top-management supported, small-scale, specifically targeted commercial areas, where the comparative advantages of military industry can be transferred and applied to the civilian market.

All of the above are examples of human capital conversions. To our knowledge, there are no studies available to demonstrate, nor does economic theory appear to provide *a priori* reasons to predict, which type of firm (small vs. large, single product vs. joint products, regional vs. national market, and so on) might possess specific advantages or be beset with particular disadvantages toward human-resource conversion. One may perhaps state that the post-Vietnam approach was characterized by releasing human resources and letting the adjustment process work via the labor market at large. In contrast, the examples just cited may be seen as experiments in bearing the labor market adjustment cost within the firm. From the military firm's point of view, this new approach may analytically be understood in terms of sunk human capital investments that the concerned firms do not wish to waste.

Nonetheless, in relative terms conversion via the labor market, through employee layoffs, far exceeds within-firm human-resource conversion. Table 2 presents some statistics on layoffs at leading defense contractors. Whereas corporations can and do downsize or completely dismantle and disappear with relative ease, employees and communities find such transitions more costly.

## Regions and Communities

All 50 states and the District of Columbia receive some military spending.<sup>7</sup> Indeed, all states house some uniformed military personnel, some Pentagon civilian employees, and some military-industry employees. However, the distribution of the military cuts across states is uneven. Table 3 presents some computations on the basis of Schmidt and Kosiak (1991). From the Pentagon one can obtain annual lists, by state, of military-industry employment, active-duty military personnel, and Department of Defense civilian personnel to compute total military-related employment, which is shown in the first data

<sup>7</sup>To our knowledge, the economic effects of U.S. military spending reductions on the economies of overseas hosts—like the Philippines, Germany and Spain—have not been explored systematically.

**Table 2**  
**Military-Industry Dependency and Layoffs**

<i>Leading Prime Contractors (1991 by prime contract dollars)</i>	<i>Current Employees</i>	<i>1991 Military Dependency: Percentage of total revenues that are military related</i>	<i>1991 Military-Related Workforce Reductions</i>	<i>1992-3 Actual and Projected Military-Related Workforce Reductions</i>
McDonnell Douglas	100,000	55	12,000 <sup>a</sup>	15,000 <sup>a</sup>
General Dynamics	73,200	85	9,600 <sup>b</sup>	7,400 <sup>b</sup>
General Electric	30,000	13	7,600	3,000 <sup>d</sup>
GM-Hughes Aircraft	60,000	70	4,000	12,000
Raytheon	70,400	54	5,100	2,177
Northrop	36,000	90	2,000	3,500
United Technologies	185,000	19	7,000	13,900 <sup>c</sup>
Martin Marietta	58,000	74	3,200 <sup>c</sup>	4,300-4,500
Lockheed	71,400	70	700	900
Grumman	22,090	82	2,500	2,000

*Notes:*

<sup>a</sup>18-month total (November 1990-April 1992) is 22,000; an additional 5,000 layoffs are expected by the end of 1992. Some reductions stem from 'dual-use' (i.e., government and commercial) production lines.

<sup>b</sup>17-month total (January 1991-May 1992). Excludes 7,900 employees lost with the sales of the Cessna Aircraft and Data Systems divisions. Most of those employees were kept by the acquiring firms.

<sup>c</sup>Excludes early retirement and other attrition.

<sup>d</sup>Further cuts planned.

<sup>e</sup>Projected through 1994.

*Sources:* Council on Economic Priorities conducted company interviews July 20-28, 1992; company annual reports, the Department of Defense, and *The Wall Street Journal* (24 July 1992, p. B6).

column of Table 3. Applying projected 1991-1996 cuts of 25.8 percent to military-industry employment, 17.5 percent to active-duty forces, and 11.6 percent to civilian employees, the total projected 1991-1996 *weighted* cuts per state (plus Washington, D.C.) can be computed, as shown in the next column. Combined with information on the size of the state labor force in some base year, one can then compute the averaged, annual additional gross unemployment as a percentage of each state's labor force, as shown in the final column. For example, Washington, D.C., would see a little more than half a percentage point of its 1990 labor force being cut for *each* of fiscal years 1991 to 1996. The numbers in the table show only the direct impact. They do not include multiplier effects or other adjustments to arrive at the net job loss effect, as discussed earlier.



**Table 3**  
**U.S. States' Military-Employment Cuts**  
**Ranked by Impact**

State	Total DoD Employment (1990)	Weighted Total DoD Employment Cuts (1991- 1996)	Yearly DoD Employment Cut over State Labor Force in 1990 (%)	State	Total DoD Employment (1990)	Weighted Total DoD Employment Cuts (1991- 1996)	Yearly DoD Employment Cut over State Labor Force in 1990 (%)
DC	51,089	9,584	0.55	DE	14,746	3,180	0.15
AK	37,432	7,057	0.45	FL	246,215	52,678	0.14
HI	81,788	14,977	0.44	KY	72,612	14,384	0.14
VA	348,814	67,292	0.36	NJ	136,621	30,153	0.13
CA	837,236	184,683	0.22	NH	19,712	4,677	0.13
MD	161,815	32,908	0.22	WY	9,088	1,892	0.13
WA	149,996	31,671	0.22	PA	179,759	38,603	0.12
CT	88,322	21,514	0.21	OH	165,284	36,812	0.12
SC	99,266	19,724	0.20	IN	87,374	20,041	0.12
UT	48,608	9,049	0.20	AR	35,210	7,667	0.12
NM	41,845	8,182	0.20	NE	30,432	6,212	0.12
CO	92,332	19,260	0.19	SD	13,186	2,651	0.12
KS	65,118	14,110	0.19	NY	236,532	56,067	0.11
MS	58,857	12,483	0.19	NV	20,093	4,118	0.11
GA	161,821	32,633	0.18	IL	156,486	34,477	0.10
OK	82,560	15,786	0.18	TN	58,568	13,298	0.10
ME	32,204	6,411	0.18	ID	12,831	2,725	0.10
TX	382,212	80,958	0.17	MT	10,701	2,217	0.10
MA	127,742	30,585	0.17	MI	99,112	23,358	0.09
MO	115,925	25,900	0.17	MN	49,764	12,365	0.09
AL	90,269	18,100	0.17	VT	6,824	1,660	0.09
AZ	79,539	17,128	0.17	WI	44,983	11,071	0.07
ND	17,037	3,293	0.17	IA	22,908	5,649	0.07
NC	152,893	31,398	0.16	WV	11,895	2,778	0.07
LA	76,848	16,531	0.15	OR	22,054	5,196	0.06
RI	21,084	4,502	0.15				

Source: Our computations are based on Schmidt and Kosiak (1991, Tables 4 to 8). The Table is sorted by column 4; ties in column 4 are sorted by column 3.

Some areas will be affected more harshly than others. For example, as might be expected, the Washington, D.C./Virginia/Maryland area stands to lose substantial military employment (0.55, 0.36, and 0.22 percent of their 1990 labor force, respectively). Measuring the impact of military spending cuts on a state in this way is somewhat problematic, of course. For example, to gauge the likely economic impact better, one should keep in mind that some regional labor markets are more flexible than others at absorbing the newly unemployed. In states or sub-state regions already suffering from above average unemployment, such as southern California, the military cuts will exacerbate the problem of adjustment.

Moreover, to gauge the short-run impact, one should consider that the multiplier effect of a military base closure is likely to be much smaller than that of military-industry layoffs. The reason is that active-duty military personnel conduct most of their economic activities on the base itself, rather than in the community to which the base may be attached, whereas military-industry workers, like other industrial workers, are more fully integrated into their respective communities. Moreover, since military-industry employees, especially the many military scientists and engineers, tend to receive substantially higher earnings than, say, civilian Department of Defense employees, one would also expect a multiplier difference between military-industry and civilian-DoD employees. One study put the military-base multiplier at 1.2, the civilian-DoD multiplier at 1.8, and the military-industry multiplier at 2.5 (Lall and Marlin, 1992, p. 53).<sup>8</sup>

For example, in 1990 the state of Georgia hosted 44,583 active-duty personnel, 38,437 civilian Department of Defense personnel and 78,801 military-industry employees (Schmidt and Kosiak, 1991). If one assumes cuts of 17.5 percent to active-duty personnel, 11.6 percent to civilian DoD personnel and 25.8 percent to military-industry procurement (and thereby employment) over fiscal years 1991 to 1996, applies the multipliers and uses 3.9 million as the state labor force, then the expected yearly creation of military-related unemployment in Georgia would add 11,369/3,900,000 or 0.29 percentage points to the present civilian-unemployment rate. This is substantially different from the estimate of 0.18 given in Table 3.

This short-run measure, as discussed earlier, is a gauge of the *gross* unemployment stemming from potential military cuts; the actual *net* unemployment effect is likely to be smaller. However, since state unemployment compensation payments and other social service obligations are precisely intended to cover immediate needs, the short-run measure may be of some practical value to help assess short-run state assistance needs.

But even this adjusted measure is problematic since it still assumes equal "across-the-states" cuts in each spending category: military industry, civilian Department of Defense employees, and military bases. In Georgia, for example, no bases are presently slated for closure. One therefore really needs to pick through the various specific House, Senate and Administration military spending cut proposals to identify exactly which procurement programs will be phased out when and where, which bases will be closed or consolidated when and where, and how the Pentagon proposes to curtail its civilian workforce across the nation.<sup>9</sup> Even then, such measure would not have tracked subcon-

<sup>8</sup>The 1.2 and 1.8 multipliers are actually the rural/urban multipliers used by the Pentagon. With some slight stretch of imagination, one may think of a number of military bases located in rural areas and civilian Department of Defense employees primarily located in urban areas. The 2.5 multiplier for military-industry employees is an empirical estimate derived for the state of New Jersey. For similar multipliers, see OTA (1992, p. 156).

<sup>9</sup>One attempt to do just that is provided in Brauer and Marlin (forthcoming 1993).

tracting. Military spending data are available only by location of prime contractor, but contract dollars awarded to, for instance, Connecticut will partially leak to other states. No database anywhere in the nation traces military subcontracting.<sup>10</sup> Thus, state-based measures assume implicitly that the net-effects of subcontracting across states cancel each other out.

To complicate things further, military spending within states is heavily concentrated at a few sites. To know that Georgia's unemployment rate may increase by roughly 0.3 percentage points per year might be dismissed as "small" indeed. But if one looks at a county or metropolitan area, the effects may be far more dramatic. For example, the four-county area known as the Augusta metropolitan statistical area in east-central Georgia relies heavily on the Savannah River Site (SRS) military-nuclear complex with about 26,000 employees and on Fort Gordon (20,000 employees), the U.S. Army's Signal Corps training and education center.<sup>11</sup> With employment of just over 200,000 people (in 1986), a phasing out of these activities would most seriously affect the retail, restaurant and real-estate business and force a major shake-out, especially since SRS personnel include some 13,000 highly paid engineers.

For another concrete example, Bath, Maine, is host to Bath Iron Works, a Navy shipbuilder for the past 100 years. About 90 percent of the company's sales are military-oriented, and it holds an order backlog of about \$1.5 billion, enough to carry it through until the mid-1990s (CBO, 1992, pp. 36-39). However, the company has already announced plans to lay off 2,000 to 3,000 of its 11,000 employees. If the company closed altogether, the south-Maine coastal unemployment rate would increase by as much as 6.8 percentage points (including a multiplier effect of 2). Some workers will find alternative work, of course, but likely with reduced income, since the income of Bath Iron Works employees is 26 percent above the south-coastal region average income.

Many communities around the nation, such as St. Louis, Colorado Springs, Seattle, and Dallas/Fort Worth face problems similar to Augusta and Bath. Various states, particularly those that are most military-dependent, are beginning to construct surveys and collect information on their military-industry related employment. California has an excellent, though irregular, report. Rhode Island, New York, Maryland, Virginia, and Washington State have also undertaken or are undertaking such efforts (NGA, 1992). Generally, they attempt to trace subcontractors and small military prime-contractors (with contract values below \$25,000) not identified in Pentagon data; to inform affected firms and workers about existing federal and state assistance programs; to coordinate ("one-stop") those programs at the state-level; and sometimes to design additional programs. But, as the examples of the New England states

<sup>10</sup>The National Governors' Association is assisting a small number of states to put together subcontractor databases. However, no nationwide database is available. In the name of paperwork reduction, subcontractor tracing was eliminated by the Nixon Administration's Office of Management and Budget, although it involved only a simple postcard to be returned with each contract.

<sup>11</sup>SRS actually is located in South Carolina (near Aiken, S.C.) but is part of the Augusta MSA.

and southern California show clearly, by the time data are collected, programs put in place and funding authorized and appropriated, "adjustment assistance" often comes very late.

Despite the enumerated difficulties of pinpointing military-induced unemployment to specific *communities*, at the *state* level certain states appear consistently on almost any list of most-affected states. They include Washington state, California, Arizona, Texas, Missouri, the DC-Maryland-Virginia area and almost all the New England states.

## Occupations

Some occupations occur more frequently in military than in other industries. Consequently, sustained cuts in military-industrial spending will affect some occupations disproportionately. To determine the within-occupation percentage that is military-related, Ann Markusen collected Bureau of Labor Statistics (BLS) data for 1986 for various occupations. For selected occupations, her findings are reproduced in Table 4. For example, in 1986, the Bureau reported that out of 24,000 aircraft assemblers in the nation (column 3), 12,200 worked in military-related employment (column 2)—that is, a military share of almost 51 percent (column 4).

Assuming that military spending is reduced by 55 percent, from 6.5 percent of GNP in 1986 to about 3.6 percent of GNP in 1996, one can then compute a rough measure of the additional (unadjusted) supply of occupation-specific workers spilling into the civilian market (column 5). For example, take aero/astronautical engineers: an eleven-year 55 percent cut in military procurement might lead to a release of 10,400 out of 18,900 military-employed aero/astro engineers. Non-military employed aero/astro engineers (51,600 – 18,900) are 32,700. By 1996, the released 10,400 previously military-employed engineers increase the supply of non-military employed engineers by 32 percent (10,400/32,700) relative to its 1986 base. As Table 4 demonstrates, the most heavily affected occupations, not surprisingly, involve those related to aircraft production as well as numerous species of engineers.

The BLS data on which Table 4 is based may well understate the dependence of certain scientific occupations on military spending (Markusen and Yudken, 1992; OTA, 1992). The National Science Foundation and the National Research Council regularly survey degree holders as to their employment and other characteristics. In the mid-1980s, the surveys found that at the Ph.D. level 12 percent of all mathematicians, 22 percent of all physicists and astronomers, 10 percent of all environmental scientists, and 20 percent of all engineers worked on military-financed projects. In subcategories the numbers are more astounding still: 62 percent of all aero/astronautical engineers, 25

*Table 4*  
**Selected Military-Related Occupational Dependencies, 1986**

<i>Occupation</i>	<i>Military Related Jobs (thousands)</i>	<i>Total Employment (thousands)</i>	<i>Military Share (%)</i>	<i>Supply Increase from Cuts (%)</i>
Aircraft Assemblers	12.2	24.0	50.83	56.86
Aero/Astronautical Engineers	18.9	51.6	36.63	31.80
Tool Programmers, Numerical Control	1.6	8.8	18.18	12.22
Electrical/Electronic Assemblers	30.0	170.1	17.64	11.78
Metallurgical/Materials Engineers	2.9	17.8	16.29	10.74
Electrical/Electronic Engineers	57.0	391.5	14.56	9.37
Mechanical/Industrial Engineers	44.2	345.1	12.81	8.08
Procurement, Planning, Expediting Clerks	27.2	251.5	10.82	6.67
Machinists, Metalworkers, Shipfitters	94.8	900.0	10.53	6.48
Machine Tool Operators	99.8	966.1	10.33	6.34
Aircraft Mechanics, Engine Specialists	10.8	105.1	10.28	6.30
Welders, Cutters, Solderers, Brazers	29.1	283.5	10.26	6.29
Nuclear Engineers	1.4	13.8	10.14	6.21
Engineering Technicians	65.1	682.9	9.53	5.80
Inspectors, Testers, Graders	65.7	689.9	9.52	5.79

*Source:* Markusen and Yudken (1992, Tables 6.1 and 6.2, pp. 141–142); last column based on our calculations. “Supply Increase from Cuts” means percent increase in civilian labor force attributable to projected 55 percent military spending cuts between 1986–1996. See text for details.

percent of applied mathematicians, and 35 percent of operations researchers worked on military-sponsored projects (National Research Council, 1986).<sup>12</sup>

As military spending decreases, where do these people go? Numerous House proposals surfaced in the spring of 1992 to provide assistance for such transition. They were incorporated in the House defense bill in June 1992, and in the defense bill reported out of the Senate Arms Services Committee in

<sup>12</sup>The numbers are even more startling at the M.A. and B.A. levels (see National Research Council, 1986, for details). It is not immediately clear why the self-reported numbers differ at times drastically from those of the BLS.

August. President Bush joined in May with an announcement of his own conversion program. But since the military-spending cuts began in 1986, this remedial action comes rather late.

Moreover, military-industry workers can face adjustment difficulties not faced by laid-off workers in other industries. In contrast to a more volatile civilian labor market, Weidenbaum notes that many military workers have had no recent unemployment experience in their work lives (1992a, pp. 76–77) and therefore little social experience coping with unemployment, income reduction, and the attending uncertainties. Military workers also tend to be more advanced in age and this despite their job experience, makes them less desirable for retraining and employment by civilian firms (OTA, 1992). Furthermore, almost 60 percent of military-industry workers are employed in the manufacturing sector. But during the 1980s, U.S. manufacturing employment has decreased (in absolute numbers) and is experiencing an additional severe and continued downsizing since the 1990 recession. Many released military workers can therefore be expected to face weak civilian labor market conditions. Indeed, OTA (1992, p. 64) reports that released manufacturing workers tend to remain unemployed longer than other worker groups.

At any rate, whereas some feel that there is really no particular reason to assist displaced military workers any more or less than, say, displaced textile, or steel, or autoworkers (*Economic Report of the President*, 1991, pp. 151–152), others believe that economic efficiency generally requires that assistance should be offered to smooth the structural transition from military to civilian work, especially for so valuable a resource as military scientists and engineers in whose training the nation has invested so much. In essence, the arguments on both sides tend to reflect prior notions on the merits of non-interventionist versus interventionist policies.

## **Behavioral Aspects and Some Principles of Conversion**

How do specific communities react to military cuts and what are some determinants of their reaction? Drawing on a review of various conversion case-studies, we present some general observations and chronicle typical reactions of firms, labor, and communities.<sup>13</sup>

Perhaps the foremost observation is that communities, firms and labor seldom set about reducing their military dependence in the absence of actual or imminent military cuts. Conversion is usually “forced from above” by the cuts and the affected actors apply little forethought in anticipating changes in military orders. For example, the typical reaction path for a company threatened with military cutbacks is first to lobby against the cuts, then to lay off labor

<sup>13</sup>This section is based, in part, on Brauer (1991).

and then to try to diversify into other military-related work. Only after those steps have been tried is the firm likely to sell its military subsidiaries or diversify into civilian work (whether through acquisitions or an actual conversion of facilities and manpower). Marlin (1990) offers a number of specific examples of this pattern. However, as military cuts become more likely and commonplace, as in 1990–1992, more firms are likely to initiate “diversification” programs. As mentioned before, these programs tend to be of a smaller scale than in the 1970s and are proving quite successful (CEP, 1992).

The firm has a relatively straightforward path to adjustment—after all, it can always go out of business. But labor and communities find it more painful to liquidate. Laborers and communities are not usually as “single-minded” as firms and suffer the consequences of delayed action.

For example, few labor unions actively engage in economic-conversion planning. Instead, labor usually responds to proposed cuts by lobbying against them, denying the problem of imminent or potential layoffs, then suffering the layoffs and waiting to be recalled. Most unions in the military industry identify with the companies they work for and even when the union does express concerns, they do not always penetrate to the workers at the plant level.<sup>14</sup> Only after the layoffs have occurred does labor seem able to face the facts, retrain and seek new work.

Of course, there are exceptions. In the United States, the most persistent and active “pro-conversion planning” union was and is the International Association of Machinists (IAM). In March 1990, for the first time, IAM succeeded in persuading the AFL-CIO to support conversion legislation. However, IAM has a reputation among military contractors for not working in the industry’s self-interest. In England, the most celebrated case was that of union activity at Lucas Aerospace in the 1970s. The union, at one location, developed an extensive conversion plan, but management was concerned about the precedent set by such activities, and never implemented the plan at the location that prepared it.

Most communities affected by forced conversion, especially those particularly dependent on the military dollar, react in a surprised and helpless manner, often simply swallowing the job loss when the cuts arrive. They seem quite at loss with the processes of regional economic development planning. Citizens and community leaders often do not appear to appreciate that a new business may require several years of time to scout out, occupy, and settle in a suitable location. Without lead time and planning, forced conversion and acute layoffs then cannot be handled other than in emergency fashion (for examples see Lynch, 1987). Recent literature on regional economic development

<sup>14</sup>For example, in a study that one of Brauer’s students conducted in early 1990 at the AMC General plant that produces the “Hummer” Jeep in Mishawaka, Indiana, workers were quite opposed to economic conversion and did not seem to care much at all about long-run job security.

planning specifies the potential gains from emphasizing physical and human resource infrastructure planning and development that communities might take to heart (Fosler, 1991; Smith and Drabenstott, 1991).

The cost of not planning ahead may be seen in delayed adjustment to base or plant closures. For example, Glasgow Air Force Base in Montana and the Bainbridge Navy Training Center in Maryland met with a lukewarm community response when they closed. The neighboring locality could not implement an alternative for the base, at least not in a timely way. If these bases cannot be reused for other military purposes or sold to private developers, the Department of Defense can only padlock the facilities. But that embodies the waste of a potential community resource.<sup>15</sup>

Of course, some communities have reason for hesitancy—in a variety of cases, especially where military installations were deliberately constructed in somewhat isolated regions, conversion at the plant- or site-level may literally be impossible. For example, Grissom Air Force Base in Indiana is a huge tract around which some modest economic activity has sprung up. The few remaining shipbuilding communities (Bath, ME; Groton, CT; Newport News, VA) are almost entirely dependent on military contracts, as are nuclear facilities (reactors and test sites) maintained for the Pentagon. Military cutbacks could easily mean disaster for these local economies, as conversion to commercial production is highly unlikely. In general, the more military-dependent a community (prime and sub-contractors) and the more military-specific the task carried out at that site, the smaller the probability of conversion to some other form of economic activity.

Other communities may show a willingness to convert, only to find that government regulations stand in the way. For example, Fort Ord in Monterey, California, is slated for closure (CBO, 1992). It is also on the EPA Superfund list but “it takes an average of about 10 years to complete cleanup of a Superfund site” (p. 36), years during which little other activity will take place. Under present law, the whole area is transferred clean to non-governmental owners, or none is transferred at all. Legislation has been introduced into the Congress to permit transfer of uncontaminated parcels of military bases but as of June 30, the bill was pending (Defense Budget Project, 1992, p. 10).

In other cases, successfully converting a military-dependent plant or site may still fail to convert employment. For example, decommissioning and dismantling a military-nuclear reactor (or indeed many bases contaminated in a variety of ways) should result in enormous environmental-cleanup operations. However, the people who maintain and run the nuclear reactors are not necessarily qualified to do the cleanup, even with retraining. Hence, whereas the regional level of economic activity might be maintained or only slightly impaired, there will be some amount of transitional dislocation.

<sup>15</sup>Example based on Marlin's interview with David McKinnon, Office of Economic Adjustment, Department of Defense, July 31, 1992.



For example, in February 1988, the U.S. Department of Energy decided to decommission the N-Reactor at the Hanford, Washington, nuclear reservation. Weida (1992) estimated that the decommissioning will result in a loss of about 6,000 direct jobs over the 1989–1995 time period or, using Weida's multiplier of 2.2, 13,200 total jobs. To convert Hanford to a nuclear-waste management site "could replace from 10% to 50% of lost employment. And the waste cleanup programs mentioned in [a] report to Senator Glenn could replace up to 20% of the jobs lost" (p. 282). A roughly similar estimate was made in 1988 by Scott and Belzer (1988, p. 150). But because of a drastic expansion of Hanford's environmental restoration mission to compensate for employment losses due to the loss of nuclear materials production, total employment by September 1991 actually *exceeded* that of previous periods (Pacific Northwest Laboratory, 1991). Even though the economic region around Hanford suffered a transitional dip in economic activity as this mission change took place, the economic losses were not nearly as sharp as previously anticipated. The Hanford experience serves as a good example for how planning and quick, concerted government action can mitigate economic losses. Nonetheless, the nuclear-production workers are by and large not the ones obtaining the environmental restoration jobs.

Communities hosting private military contractors might take heart from the experience of successful military-base conversions. John E. Lynch (1987), formerly associate director of the Pentagon's Office of Economic Adjustment, reported: "A survey of the 1961–1986 community reuse achievements by 100 former bases indicates that the affected communities were successful in replacing the loss of 93,424 former DoD civilian jobs with 138,138 civilian jobs at the former bases; another 7,330 off-base jobs were directly attributable to the base reuse process." Lynch adds that industrial parks and plants were established at 75 former military sites; that 42 former bases are now used for aviation; and that 33 post-secondary and 14 vocational-technical high schools are sited on former bases.

The most successful communities were usually those that "took the bull by the horns," rather than stalling and appealing Washington's decision to close a base.<sup>16</sup> Experience shows that economic conversion often works best with the extensive involvement of management, labor and their unions, other community groups and state and local economic development agencies. The phrase "economic planning" has carried a negative connotation in Washington recently, but in this case of severe local economic dislocation, extensive and long-term involvement and planning is precisely what is needed. In this respect, of course, military-dependent communities are not different from the textile-, or steel-, or automobile-dependent communities that have seen severe economic disruptions over the last ten or fifteen years.

<sup>16</sup>For military-base conversion case studies, see John E. Lynch (1987) and various publications that can be obtained through the Pentagon's Office of Economic Adjustment, which also has some resources available for base-closure assistance.

## Conclusion

What is so different or unique about military cuts at this time? It is the severity of the cuts, combined with the way they are highly concentrated: in specific, specialized industries with few potential alternative civilian products; in particular military-dependent regions of the country; in particular occupational categories with skills that may not easily be transferable to alternative employment. All of this coincides with and is exacerbated by a generalized nationwide economic slowdown. Consumers are holding back spending, employers are holding back hiring, and manufacturing employment in general is falling across the United States. Former and present flagship industries such as commercial shipbuilding, autos, and civilian aircraft either have already lost to (shipbuilding), are perhaps about to lose to (autos), or are increasingly drawn into a life-and-death competitive struggle with overseas competitors (aircraft).

It seems to us that the current travails of the U.S. military sector offer a welcome opportunity to debate again the gains and costs of explicit federally guided medium-run structural adjustment and long-run growth policies, policies that major U.S. competitors, in western Europe and Japan, already possess and employ.

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