AFTER THE COLD WAR

LIVING WITH LOWER DEFENSE SPENDING

AD-A251 892



92-11933

CONGRESS OF THE UNITED STATES OFFICE OF TECHNOLOGY ASSESSMENT

Best
Available
Copy

AFTER THE COLD WAR
LIVING WITH LOWER DEFENSE SPENDING



92 5 01 58

CONGRESS OF THE UNITED STATES OFFICE OF TECHNOLOGY ASSESSMENT

Recommended Citation:

U.S. Congress, Office of Technology Assessment, *After the Cold War: Living With Lower Defense Spending*, OTA-ITE-524 (Washington, DC: U.S. Government Printing Office, February 1992).

For sale by the U.S. Government Printing Office
Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328
ISBN 0-16-036108-7

Accesion For
NTIS CRA&I ☒
DTIC TAB ☐
Unannounced ☐
Justification .....
By 12.00
Distribution /
Availability Codes
Dist | Avail and / or Special
A-1 | 24

Office of Technology Assessment
Congressional Board of the 102d Congress

GEORGE E. BROWN, JR., *California, Chairman*

TED STEVENS, *Alaska, Vice Chairman*

Senate	House
EDWARD M. KENNEDY *Massachusetts*	JOHN D. DINGELL *Michigan*
ERNEST F. HOLLINGS *South Carolina*	CLARENCE E. MILLER *Ohio*
CLAIBORNE PELL *Rhode Island*	DON SUNDQUIST *Tennessee*
ORRIN G. HATCH *Utah*	AMO HOUGHTON *New York*
CHARLES E. GRASSLEY *Iowa*	JOAN KELLY HORN *Missouri*

JOHN H. GIBBONS
(Nonvoting)

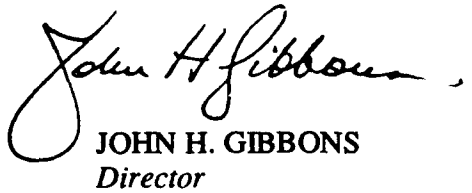
Foreword

The great events of 1991 ended the Cold War, banished the threat of global nuclear conflict, and freed us to redefine national security. While future U.S. defense needs are still unclear, they will surely require less money and fewer people, as well as shifting in kind. It is now safe to contemplate very substantial reductions in defense spending—perhaps to the lowest level in 40 years—and to turn our attention to other pressing national needs.

Welcome as these changes are, adjustment to lower defense spending is not painless. Many of the workers and communities that depend for their livelihood on the military will have to find new jobs and new sources of economic strength. Defense companies will have to adapt to commercial demands, or shrink, or possibly go under. On the bright side, the size of the adjustment is modest, compared to defense build-downs of the past and to the present size of the U.S. economy. From 1991 to 2001, perhaps as many as 2.5 million defense-related jobs will disappear. That averages to 250,000 a year, or two-tenths of 1 percent of the employed work force in 1991.

Averages, however, can be misleading. The decline could be uneven, with steep drops in short time periods, making adjustment more difficult. And hardships will be much greater than average in some communities where defense spending and jobs are concentrated. Another caveat: the U.S. economy is not as sturdy as it was during earlier defense cutbacks. American industry faces tough challenges by foreign competitors, especially the Japanese; well-paid jobs to take the place of defense manufacturing jobs are scarce; and the 1990-91 recession shows few signs of lifting in early 1992. Government programs can help defense industry workers, veterans of the armed forces, and communities make the transition, and can lend assistance to defense firms that want to get into more commercial production. But their prospects will depend most fundamentally on growth in the national economy.

This is the first report of OTA's assessment of Technology and Defense Conversion, requested by several congressional committees and members of the Technology Assessment Board to examine effects of the defense build-down on the civilian side of the economy. This report focuses on ways to handle the dislocation of workers and communities that is, to some degree, inevitable in the defense cutback. It opens a discussion of how defense technologies might be converted to commercial applications. The second and final report of the assessment will continue that discussion and will concentrate on opportunities to channel human and technological resources into building a stronger civilian economy.



JOHN H. GIBBONS
Director

Advisory Panel—Technology and Defense Conversion

McGeorge Bundy, *Chairman*
Professor Emeritus of History
New York University

Michael Borrus
Deputy Director, Berkeley Roundtable on International Economics
University of California

H. Kent Bowen
Co-Director, Leaders for Manufacturing
Massachusetts Institute of Technology

Charles Bradford
Director, Apprenticeship, Employment Training, and Rehabilitation Programs
International Association of Machinists and Aerospace Workers

Anne Buck
Manager, Economic Adjustment Unit
California Department of Commerce

Philip W. Cheney
Vice President of Engineering
Raytheon Co.

Robert W. Carlton
Vice President, Community and Business Services
Jackson Community College

Robert S. Cooper
President
Atlantic Aerospace Electronics Corp.

Jerry R. Crowley
Entrepreneur

Christopher Demisch
Partner
McFadden Brothers

R.C. Dynes
Department of Physics
University of California, San Diego

Craig Fields
President
Microelectronics and Computer Technology Corp.

Arthur Flathers
Director of Independent Research and Development
GE Aerospace Division

Douglas Fraser
Professor of Labor Studies
Wayne State University

Gregory S. Frisby
Chief Executive Officer
Frisby Airborne Hydraulics

Donald A. Hicks
Professor of Political Economy
University of Texas at Dallas

Frank J. Lewis
Senior Vice President
Harris Corp.

Ira Magaziner
President
SJS Inc.

Ann Markusen
Director, Project on Regional and Industrial Economics
Rutgers University

John P. McTague
Vice President for Technical Affairs
Ford Motor Co.

Basil Papadales
Businesss Development Manager
W.J. Schaefer Associates

Suzanne Teegarden
Executive Director
Industrial Services Program
State of Massachusetts

Charles D. Vollmer
Vice President, Technology Initiatives
Booz-Allen and Hamilton Inc.

NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this background paper. OTA assumes full responsibility for the background paper and the accuracy of its contents.

After the Cold War: Living With Lower Defense Spending
OTA Project Staff

Lionel S. Johns, *Assistant Director, OTA*
Energy, Materials, and International Security Division

Audrey B. Buyrn, *Program Manager*
Industry, Technology, and Employment Program

Katherine Gillman, *Project Director*

Robert Atkinson, *Senior Analyst*

Jeffrey Lewis, *Research Analyst*

Terry Mitchell Mark Roberts Jenifer Robison

Elizabeth Sheley, *Editor*

Administrative Staff

Carol A. Guntow, *Office Administrator*

Diane D. White, *Administrative Secretary*

Publishing Staff

Martha Dexter, *Acting Manager, Publishing Services*

Denise Felix

Cheryl Davis Dorinda Edmondson Chip Moore

Christine Onrubia Bonnie Sparks Susan Zimmerman

Contractors

Linda Kravitz

Takashi Mashiko

Letitia L. Oliveira

Contents

	Page
Chapter 1: Summary and Findings	3
Chapter 2: Policy Issues and Options	39
Chapter 3: Displaced Defense Workers	59
Chapter 4: Engineers: A Special Case	103
Chapter 5: Veterans' Adjustment	129
Chapter 6: Adjustment for States and Communities	153
Chapter 7: Defense Companies	193
Appendix A: Defense Spending and Employment	229

Chapter 1

Summary and Findings

Contents

	Page
INTRODUCTION	3
MACROECONOMIC EFFECTS: A HISTORICAL PERSPECTIVE	6
After World War II	6
After the Korean War	7
After the Vietnam War	8
Structural Changes in the Civilian Economy	9
After the Cold War: The 1990s	10
LOCAL AND SECTORAL EFFECTS	11
States and Localities	12
Industries	14
DISPLACED DEFENSE WORKERS	18
The Dimensions of Displacement	18
Prospects for Displaced Defense Workers	18
Adjustment Assistance for Displaced Defense Workers	19
ENGINEERS: A SPECIAL CASE	23
VETERANS' ADJUSTMENT	24
DEFENSE-DEPENDENT COMMUNITIES	25
DEFENSE COMPANIES	28
The Outlook for Major Defense Companies	28
Small Business and the Defense Industry	30
POLICY ISSUES AND OPTIONS	31
Displaced Defense Workers	33
Defense-Dependent Communities	34
Defense Companies	35

Figures

Figure	*Page*
1-1. Defense Spending, 1940-91	4
1-2. National Defense Spending, 1950-2001	4
1-3. Defense Employment Levels, 1944-91	5
1-4. Defense Employment Levels, 1950-2001	6
1-5. Eight States Totaling One-Half of U.S. Defense Spending, 1991	12
1-6. Defense Spending as a Percent of State Purchases, 1991	13
1-7. Eight States Totaling One-Half of U.S. Defense-Related Employment, 1991	14
1-8. Percent of State Employment in Defense, 1991	15
1-9. Direct Defense Spending in California, 1964-90	15
1-10. Leading Defense Industries by Value of Defense Output, 1990	16
1-11. Leading Defense Industries by Defense Share of Industry Output, 1990	16
1-12. Prime Contracts for Hard Goods	17

Table

Table	*Page*
1-1. Projected Defense Spending and Employment Levels	19

Chapter 1
Summary and Findings

INTRODUCTION

The dissolution of the Soviet Union and the end of the Cold War have profoundly changed U.S. defense needs. Just what a prudent U.S. national defense system will be in the post-Cold War era is not yet clear. But it will almost certainly require less money and fewer people than it did in the 40 years when this Nation faced a hostile and obdurate military superpower with a huge army poised at the borders of Western Europe. Welcome as these changes are, they have serious implications for the people, companies, and communities that have depended on defense spending for their livelihood. The changes also raise some potentially troubling questions about adjustment for the Nation as a whole.

Compared to the size of the national economy, the current cutbacks in defense spending do not loom very large. Even at the height of the Reagan buildup, defense spending never reached as big a share of gross national product (GNP) as in the Korean or Vietnam Wars, not to mention World War II, nor has the decline so far been as steep as in those earlier eras (figure 1-1). It is quite conceivable that retrenchment will go farther than either the Congress or the President has yet contemplated—perhaps far enough to cut another 40 percent from defense spending by the year 2001[1] (figure 1-2). That would accelerate the build-down and drop defense spending, in constant dollars as well as share of GNP, to the lowest levels in half a century; it would also mean bigger impacts on defense workers and communities than those envisioned so far. Even so, the decline would average out to about $12 billion a year (1991 dollars) over 10 years—not a huge amount in an economy running at $5.5 to $6 trillion a year. Defense-related employment in defense industries, civilian jobs in the U.S. Department of Defense (DoD), and the armed forces might drop from 6.0 million in 1991 to as low as 3.5 million a decade later, or an average of 250,000 a year[2] (figures 1-3 and 1-4), a substantial number, but only about 0.2 percent of the 119 million jobs in the U.S. economy in 1991.

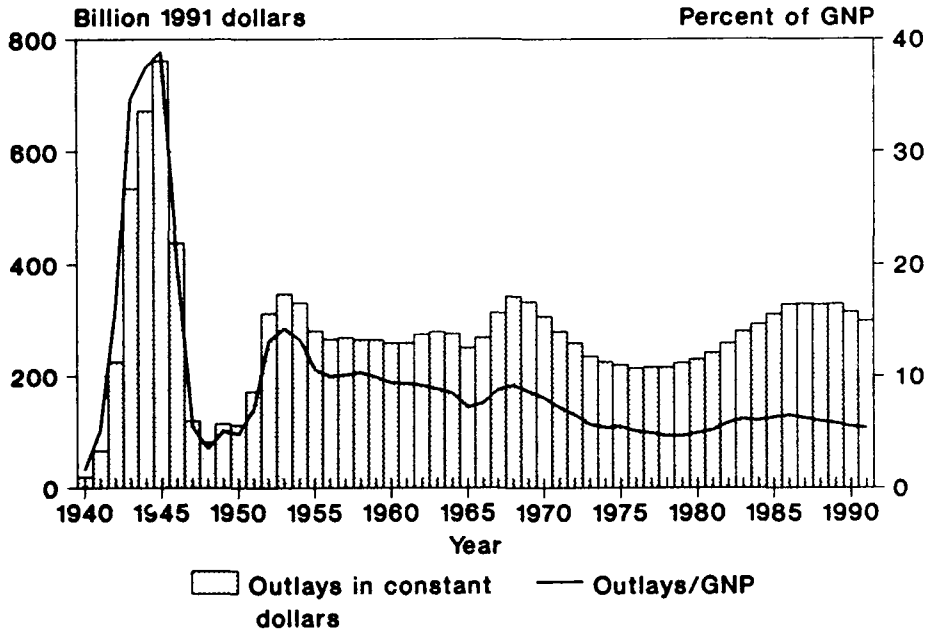
Several cautions should be noted. First, the decline may not be gradual; steep cutbacks could occur in single years, making adjustment more difficult. Moreover, effects in some localities will be much more troublesome than the aggregate figures suggest. Approximately one-half of the defense-related jobs within the United States are in eight States, and within the States certain local areas are exceptionally dependent on defense employment. For example, up to one in five workers in the Norwich-New London labor market of southeastern Connecticut hold defense-related jobs, and many more are in service, transportation, and commercial jobs that serve the everyday needs of these workers. It is in these defense-dependent communities that reductions in defense spending can hurt most. Without detailed analysis at the local level, it is impossible to say just how many American communities are highly defense-dependent, but a rough estimate (based on the value of prime defense contracts per capita and the presence of military bases scheduled for closure) is 160 of the Nation's 3,137 counties.

Some defense-dependent communities might still escape serious problems if their local economies are strong and diverse enough to take up the slack. Also, the adjustment programs discussed in this report—

[1]This figure is based on the estimate of Department of Defense (DoD) spending at a level of $169 billion (1991 dollars) in 2001, as presented in William Kauffman and John Steinbruner, *Decisions for Defense* (Washington, DC: The Brookings Institution, 1991). The Kauffman-Steinbrunner estimate is chosen for illustrative purposes because it is near the low end of well-informed estimates. A panel of the Electronic Industries Association (EIA) forecast in September 1991 that the DoD budget in 2001 would be between $160 billion and $240 billion, with the most likely level at about $208 billion; this panel's forecasts are well-regarded because they have proved reasonably accurate in the past. See Electronic Industries Association, Government Division/Requirements Committee, Ten Year Forecast Subcommittee, *Defense Electronics Market: Ten-Year Forecast, U.S. Department of Defense and National Aeronautics and Space Administration Budgets, FY1992 to FY2001* (Washington, DC: 1991). For a discussion of future defense needs and the industrial base required to support them, see U.S. Congress, Office of Technology Assessment, *Redesigning Defense: Planning the Transition to the Future U.S. Defense Industrial Base*, OTA-ISC-500 (Washington, DC: U.S. Government Printing Office, July 1991).

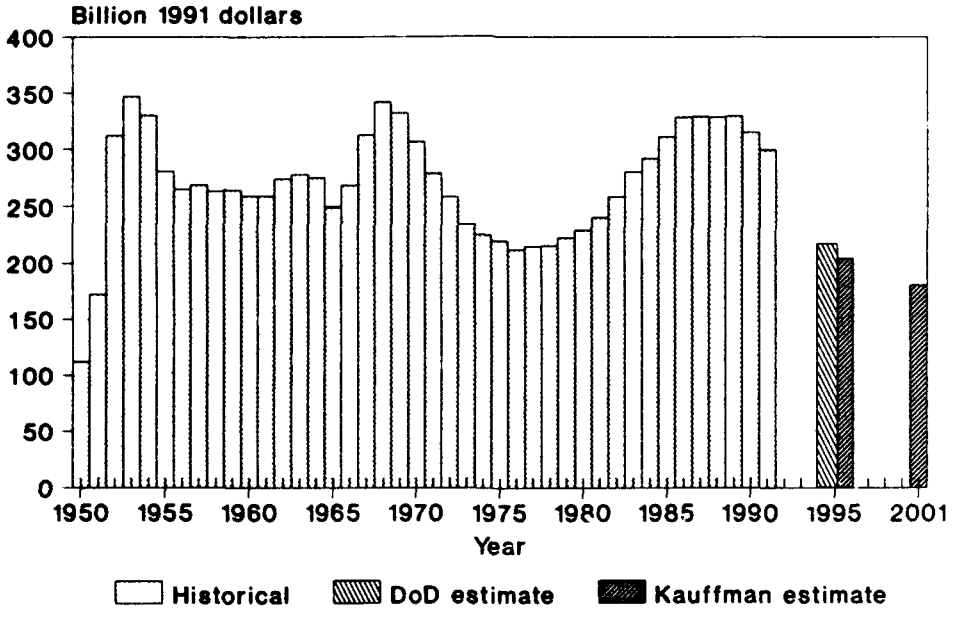
[2]Based on the Kauffman-Steinbruner projection of DoD spending of about $169 billion a year in 2001, OTA estimates that the active duty military forces would number 1.34 million, DoD civilian employment 700,000, and jobs in the defense industries 1.50 to 1.62 million. The total decline in defense-related jobs from 1991 to 2001 would be 2.3 to 2.5 million (see table 1-1 and the discussion in ch. 3). This figure is for positions lost; as discussed below, actual job loss in the active duty armed forces and in DoD civilian employment is likely to be substantially lower.

Figure 1-1—Defense Spending, 1940-91



SOURCE: Steven Alexis Cain, *Analysis of the FY 1992-93 Defense Budget Request, With Historical Budget Tables* (Washington, DC: Defense Budget Project, February 1991).

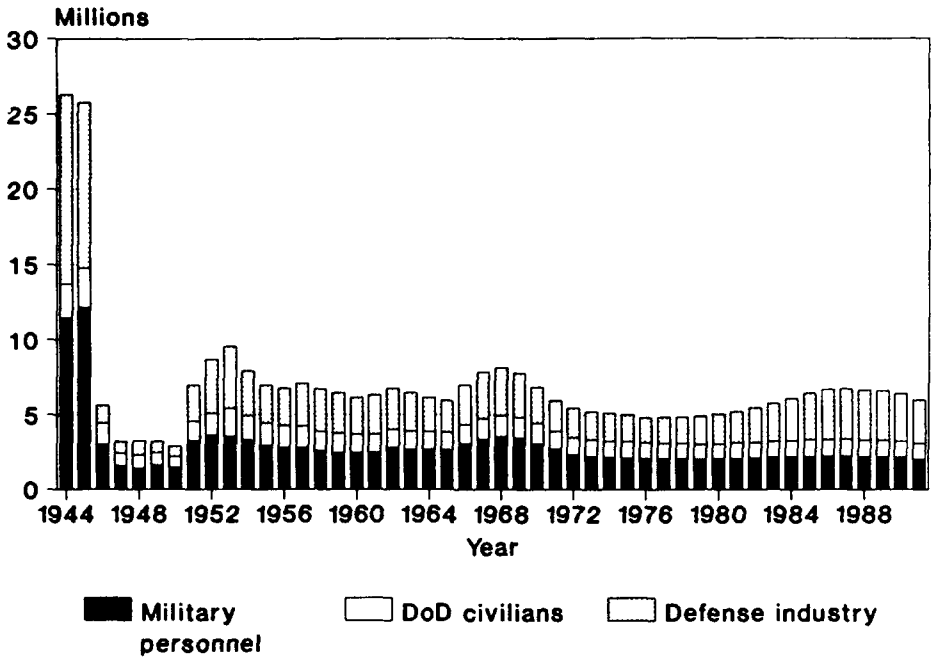
Figure 1-2—National Defense Spending, 1950-2001



SOURCES: Steven Alexis Cain, *Analysis of the FY 1992-93 Defense Budget Request, With Historical Budget Tables* (Washington, DC: Defense Budget Project, February 1991); and OTA projections based on Kauffman, see note to table 1-1.

retraining and reemployment help for displaced workers and veterans of the armed services, local and regional economic development efforts, assistance to firms converting to civilian production—can contribute to a smoother transition. However, if the national economy falters, these moderating influences could count for little. Adjustment problems that are manageable in good times are much more serious matters in a stagnant or recessionary economy, when even small losses in demand can

Figure 1-3—Defense Employment Levels, 1944-91



SOURCE: Department of Defense, Office of the Comptroller, *National Defense Budget Estimate for FY 1992* (Washington, DC: March 1991).

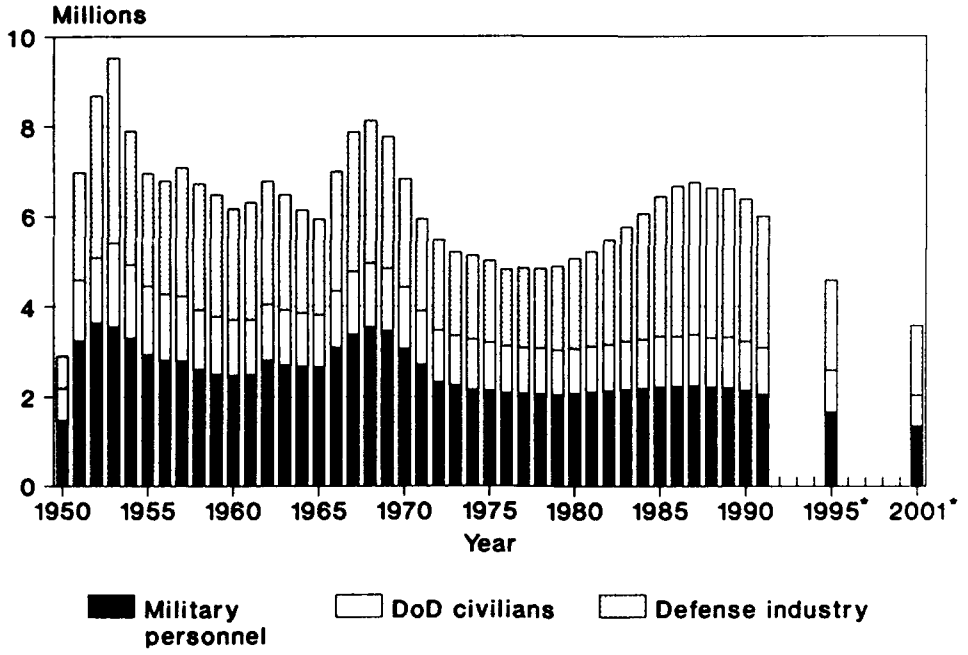
aggravate a downward spiral. While a strong recovery from the 1990-91 recession may yet happen, there were few signs of it at the end of 1991.

More fundamentally, the U.S. economy is not as robust as in earlier defense build-downs. Twenty years ago, the United States was still the world's dominant economic power. Now, it is under challenge as never before from extremely able foreign competitors (principally Japan). U.S. commercial manufacturing in particular is under siege, and will be hard put to take the place of defense industries, which are heavily tilted to manufacturing. Declines in manufacturing are especially costly to the Nation because manufacturing provides well-paid jobs, supports most privately funded research and development (R&D), and dominates international trade.[3] The profile of job creation in the United States in the last decade has been skewed toward low value-added services with low pay, poor benefits, and little knowledge generation.

Other kinds of losses could also follow cutbacks in defense spending. During four decades of Cold War, national defense usually has had more money, prestige, and power than any other government activity, and it has taken on some important social and economic responsibilities beyond the strictly military. A prominent example is equal opportunity employment. The armed forces have become the most color-blind large institution in the United States, providing opportunities for good jobs, good training, and advancement to high positions hardly available to minorities elsewhere. Another example is in technology advance. DoD pays for some R&D that has as much importance for commercial as for military purposes; moreover, defense purchases have sometimes launched whole new high technology industries (e.g., semiconductors and computers) and have contributed both new technology and financial stability to others (aircraft). Granted, military spending is an expensive, unreliable, and unfocused way of providing support to technologies and industries of great commercial importance, but we have relied on it for many decades. If national defense shrinks as an exemplary source of jobs for minorities, if its support for the generation of

[3]For a discussion of the place of manufacturing in the national economy and international trade, see U.S. Congress, Office of Technology Assessment, *Paying the Bill: Manufacturing and America's Trade Deficit*, OTA-ITE-390 (Springfield, VA: National Technical Information Service, June 1988). For analysis of the competitive situation of American manufacturing, see *Making Things Better: Competing in Manufacturing*, OTA-ITE-443 (Springfield, VA: National Technical Information Services, February 1990); and *Competing Economies: America, Europe and the Pacific Rim*, OTA-ITE-499 (Washington, DC: U.S. Government Printing Office, October 1991).

Figure 1-4—Defense Employment Levels, 1950-2001



SOURCES: Department of Defense, Office of the Comptroller, *National Defense Budget Estimate for FY 1992* (Washington, DC: March 1991). Future year estimates by OTA, see note to table 1-1.

advanced technologies and industries declines, and if no other institutions are created to take on these responsibilities, then the Nation will be the poorer.

MACROECONOMIC EFFECTS: A HISTORICAL PERSPECTIVE

After World War II

In the past half century, by far the greatest adjustment to a fall in defense activity was the shift to a peacetime economy after World War II. By 1948, defense spending fell from a wartime peak of 38.7 percent of GNP to 3.2 percent, 12.4 million people left employment in defense industries, 10.6 million were discharged from the armed services, and 1.8 million left civilian defense jobs (figures 1-1 and 1-3). This huge adjustment was made with little difficulty; indeed it ushered in a period of growth and prosperity.[4] In hindsight, it might seem obvious that consumers' wartime savings and pent-up demands, private firms' retained war profits, and lower taxes would provide enough economic stimulus to avert community dislocations and unemployment, but it was not so clear at the time, when memories of the Great Depression were still fresh.

In addition, some credit for easing the adjustment is due to government foresight in planning for the transition, or "reconversion" as it was then called.[5] As early as 1943, Federal procurement agencies and the Office of War Mobilization were preparing for speedy termination of contracts when the war ended. Included in the scheme were advance agreements with contractors on how to handle termination and, most important, partial payments to contractors—up to 90 percent of their claims—pending final settlement. The partial payments were a vital source of working capital for many contractors, especially smaller ones, during reconversion.[6]

Government tax policy also contributed to companies' ability to retool and quickly swing into

[4]Real (constant dollar) GNP actually declined every year from 1944 through 1947, most steeply in 1946. However, the main reason for this decline was the changeover to civilian production and the rapid departure of women from the labor force. Unemployment rose from the extraordinarily low point of 1.2 percent in 1944, but only to about 3.9 percent in the years 1946-48; this compares to 14.6 percent in 1940 and 9.9 percent in 1941.

[5]Material on government policies easing reconversion after World War II is drawn largely from Jack Stokes Ballard, *The Shock of Peace* (Washington, DC: University Press of America, Inc., 1983), pp. 132-136.

[6]Ibid, p. 136. Congress rejected advice from the Comptroller General to delay payments pending a review and audit of settlements by his office, on the grounds that this would freeze billions in working capital and "would mean unemployment by audit."

postwar civilian production. During the war, companies were allowed to charge off new investments in plant and equipment in just 5 years. This liberal amortization fattened record wartime earnings, and because managers generally kept a large share of the earnings in reserve rather than paying them out to stockholders, many companies were able to finance internally their postwar investment needs. At the same time, banks were overflowing with individuals' wartime savings, and were eager to lend to industry. The ample supply of capital drove interest rates to historic lows, which encouraged further investment.

Many companies—perhaps as many as 80 percent—did not even need to retool for the first wave of postwar production. They simply took their prewar machines out of storage and put them back into service in a matter of weeks. General Motors, for example, started producing its prewar models within a couple of months of the war's end. However, some industries (e.g., aluminum, magnesium, and above all, the aircraft industry) faced a glut of production capacity. Postwar unemployment of ex-aircraft workers might have been a real problem, since the industry's jobs had surged from 40,000 in 1939 to 2 million in 1944.

Yet it didn't happen. Although there were no special programs for reemployment and retraining of war production workers, the prompt revival of the auto and other civilian industries opened up millions of jobs. At the same time, many people withdrew from the labor force—a total of about 3 million older workers who normally would have retired if not for the war and younger people who would have stayed in school. Moreover, some 2.7 million women dropped out of the work force between 1944 and 1947. The decline of the average work week from over 45 to 42 hours also eased the transition to civilian employment.

For the millions of returning service men and women, the main adjustment program was the GI Bill. It offered unemployment benefits for a full year; government-guaranteed loans for home, farm, or business; and, most remarkably, financial support for 4 full years of education or training. All this enabled 11 million veterans to reenter the labor market gradually. An estimated 1.7 million ex-service men and women did not immediately look for jobs, and 800,000 enrolled in college in 1946. The programs gave veterans and their families about $20 billion in Federal money over 3 years, supplemented by more than $1.5 billion in State bonuses.[7]

In sum, macroeconomic factors—especially the high business and personal savings during the war and the prompt use of them afterwards, both for investment and for personal consumption—were central to the surprisingly trouble-free conversion after World War II. Government adjustment policies helped. Veterans were given generous choices for reentry to the civilian world, and industry got favorable tax treatment for investment during the war, plus fast, liberal contract termination and disposal of government property afterwards. The phrase "back to business" and the term "reconversion" sum up one more reason for the ease of the transition. There was no large, permanent defense industry in 1945 as there is today after 40 years of Cold War. Civilian production and civilian jobs were the norm for nearly everyone, and people couldn't wait to get back to them.

After the Korean War

Adjustment after the Korean War was a much smaller but rougher affair. Defense spending as a share of GNP fell from 13.4 percent in 1953 to a post-Korea low of 9.4 percent in 1956—still more than double the share in 1948. As figure 1-1 shows, defense spending never afterwards dropped as low as it had been before the Korean War, either in constant dollars or as a share of GNP. Nor did defense employment ever again fall so far (figure 1-3), though it did drop substantially from 1953 to 1956—by 1.6 million in defense industries, 750,000 in the active military services, and 150,000 in civilian DoD jobs. The difference was the onset of the Cold War and the scaling up of American military power to face the Soviet Union. The cutback after the Korean War was to a level that became the Cold War norm.

Despite the higher floor for defense spending and the comparatively moderate size of the adjustment, experience after Korea was bumpier than after World War II. The economy stalled into recession in 1954 and following a brief recovery grew sluggishly in 1956 and 1957; 1958 brought another recession

[7]Ibid., p. 201.

year. Unemployment rates climbed during the period and spiked to 6.8 percent in 1958.

Government macroeconomic policy was a major cause of the postwar recessions. No fiscal policies were adopted to offset the decline of military spending. Federal spending was cut by 10 percent between 1954 and 1957 (in constant dollars). Meanwhile revenues rose, producing budget surpluses in 1956 and 1957 and a consequent deflationary effect. Unlike the situation after World War II, there was no economic stimulus from pent-up consumer demand, since the Korean War had cut very little into consumption. No special government programs were adopted to help defense companies or workers adjust, but returning veterans got much the same provisions as World War II veterans (the GI Bill, guarantees of former jobs, and preference for civil service jobs).

Altogether, the strains in the post-Korean War transition were felt rather generally throughout the economy instead of being concentrated in particular sectors. Within the defense industry, producers of conventional battlefield equipment, such as guns and ammunition, felt the cutbacks most, but some defense sectors suffered very little, or even grew with the Cold War buildup. Military aircraft prospered. The Eisenhower administration emphasized strengthening the Air Force, and by 1955 aircraft purchases were three-fifths of defense procurement. The increasing complexity of weapons required for a strategic intercontinental vigil, rather than for conventional battles in the field, contributed to the growth of a dedicated defense industry—as President Dwight D. Eisenhower recognized in his farewell address, when he cautioned the Nation about the growing power of the military-industrial complex.

After the Vietnam War

The experience after the Vietnam War was uneven, but was especially harsh on the aerospace industry and the communities dependent upon it. Although defense spending was $342 billion (1991 dollars) at its height in 1968—about the same as the high point of Korean War spending—it was never as prominent a part of GNP as in the Korean War, and the decline was more gradual—from 9.6 percent of GNP in 1967 to 5.6 percent in 1974. From 1968 to 1974 employment in defense industries dropped by 1.4 million, armed forces strength by 1.4 million, and DoD civilian employment by 250,000. These declines reflected not only the progressive disengagement from Vietnam during the Nixon years, but also the Nixon-Kissinger policy of detente with the Soviet Union.

Mindful of the two recessions, slow growth, and rising unemployment after the Korean War, the Johnson administration had planned compensatory fiscal policies—a modest tax cut combined with public sector spending—to spur continued expansion after the Vietnam War. However, the Nixon administration, taking office in 1969, rejected these policies in favor of fiscal restraint to counter inflation; the $25-billion Federal deficit of 1968 was turned into a $3-billion surplus in 1969. The sharp but brief recession of 1970-71 followed. Then, a turnaround to more expansionary fiscal and monetary measures helped to bring about 2 years of strong recovery. The leading cause of the much deeper 1974-75 recession was the oil price shock, although continuing declines in defense spending may have aggravated the downturn.

Throughout the post-Vietnam War retrenchment, even in years when the economy as a whole was booming, the cutbacks in military procurement were the direct cause of some crushing impacts on particular industries and regions. Defense reductions, combined with a steep drop in orders for commercial aircraft and reductions in the space program, led to severe shrinkage in aerospace production and employment. For example, jobs at the Boeing aircraft company in the Seattle area dropped from more than 100,000 in the late 1960s to about 30,000 in the mid-1970s. This was the time when aerospace engineers were driving taxicabs and the wry joke in Seattle was, "Last one out turn off the lights."

When the defense spending reductions of the period began, there were few Federal Government adjustment programs to soften the effects. However, regional distress and rising unemployment led the Nixon administration to create an interagency Economic Adjustment Committee, and expand a small existing office within DoD (the Office of Economic Adjustment) whose job was to help communities plan for adapting to lower defense spending. A new $28-million job development and training program was targeted to scientists, engineers, and technicians. In addition, some States and localities encouraged initiatives by large companies to change

product lines and enter civilian markets—efforts that mostly ended in failure. Recovery of the aerospace industry and the regions in which it was concentrated began with an upswing in commercial aircraft orders in the late 1970s and was bolstered by the military spending of the 1980s.

Structural Changes in the Civilian Economy

The most disruptive regional stresses of the past half century were not related to defense cutbacks, but rather to structural changes in the civilian economy. The departure of the textile industry from New England, the collapse of coal mining in Appalachia, the exodus of farm workers from the land after World War II, and the disappearance of 1.7 million manufacturing jobs from the nation's economy in the 1980s (jobs in basic steel alone dropped from 570,000 to 330,000 from 1979 to 1984, and continued to decline through the decade)—all of these structural changes caused massive dislocation of workers and some brought about deep, long lasting decline of communities. Some of the communities have never recovered. Some of those that made a comeback—e.g., New England—took a generation to recover, and owed much of the recovery to DoD spending. Indeed, declines in defense spending, coinciding with a crash in the finance and construction sectors and a downturn in the market for high-tech products, pushed much of New England into an earlier and deeper recession than the rest of the country experienced in 1990-91.

Note that these severe regional stresses, related to declines of particular industries, did not necessarily coincide with economic distress in the Nation as a whole. The decline of Appalachian coal mining, New England textiles, and farm work in the rural South all went on for decades, through good times and bad. The downfall of basic steel and decay of communities in Pennsylvania's central valleys continued throughout the prosperous mid and late 1980s. When and if defense spending drops to a permanently lower level, the story might be the same in highly defense-dependent communities—severe, long lasting local effects but only minor impacts on the national economy.

For another perspective, the potential job losses due to defense cutbacks may be compared with actual worker displacement (mostly unrelated to defense) in the late-1980s. Over the 5 years 1985-89, about 9.2 million workers lost their jobs due to plant closings or relocation, elimination of a position or shift, or slack work.[8] OTA estimates that over the 4 years 1991-95, 1.0 to 1.4 million positions could disappear in defense industries, the armed forces, and DoD civilian employment.[9] However, not so many people as that would actually lose their jobs. The armed services expect to handle at least three-quarters of their downsizing through attrition (accepting fewer new enlistees); similarly, attrition and a hiring freeze are expected to take care of at least half the decline in civilian DoD jobs. Assuming that the number of people actually losing their jobs in private defense industries would equal the positions lost in those industries,[10] the total number of displaced defense workers over the 4 years could amount to as much as 1.1 million, or an average of 275,000 a year.[11]

Compare this to the actual displacement of about 1.8 million workers per year, on average, from 1985 to 1989. Even in the good times of the late 1980s, "ordinary" displacement accounted for considerably more job loss than can be expected from defense cutbacks in the 1990s, based on a range of cutbacks that appear plausible. However, some of the late-1980s displacement came from the normal

[8]The Labor Department's Bureau of Labor Statistics (BLS) oversees a special survey every 2 years of adult workers who have lost jobs for the reasons cited above. The BLS defines as "displaced" workers who had 3 or more years tenure on jobs they lost in these ways. By this definition, some 4.3 million adult American workers were displaced in the 5 years 1985-89. In addition, 4.9 million adult workers who had held jobs for fewer than 3 years lost their jobs for the reasons cited. Public programs serving displaced workers make no distinction between workers who had longer or shorter tenure on their jobs (see ch. 3).

[9]Lower figures for positions lost (1.0 to 1.1 million) are based on the President's budget proposal for fiscal year 1992, which projected a 19 percent reduction in defense outlays from 1991 to 1995. The higher figures (1.3 to 1.4 million) are based on a trajectory that would cut defense outlays 41 percent from 1991-2001 (i.e., the Kauffman-Steinbruner projection of defense spending of $169 billion in 2001). See table 1-1. For details and an explanation of OTA's employment projections, see ch. 3.

[10]This will not necessarily be the case; some defense industries will find other customers to replace DoD sales, so job loss may be less. On the other hand, the estimates of job loss for private industry do not include jobs generated by the pay of defense industry workers; this could be a considerable factor in some defense-dependent communities. It is assumed here that these two factors cancel each other out.

[11]This estimate includes 99,000 involuntary separations from the armed forces, 52,000 civilian DoD employees reduced in force, and 920,000 people losing defense-related jobs in private industry. The estimate assumes a rapid build-down (41 percent cut by 2001), and uses the high end of the range of OTA's estimate of defense industry positions lost (see table 1-1 and the discussion in ch. 3).

churning of the U.S. economy—businesses failing and new ones starting up; not all of it represented the kind of permanent structural change, with long-term decline of certain industries, that can depress an entire region. Defense cutbacks are more akin to structural economic change; in some dependent communities they could have seriously disabling local effects over the long run. From the national point of view as well, defense-related displacement of 275,000 per year is a not inconsiderable addition to the 1.8 million otherwise displaced. The kind of jobs lost could make matters worse. By and large, defense jobs pay well, and in private industry are heavily tilted to manufacturing. For production and nonsupervisory workers, defense jobs provide substantial middle-class incomes and good benefits that are hard to find elsewhere in the American economy of the 1990s.

After the Cold War: The 1990s

Measured in constant dollars, U.S. defense spending in 1990 was extremely high by historical standards—nearly as high as at the peak of the Vietnam War (figure 1-1). Even after a sizable cut in fiscal year 1991 (10.5 percent in real terms), the regular defense budget of $286 billion was still well above the Cold War floor of about $215 billion (1991 dollars).[12] In some ways, however, the prospects for a smooth transition looked better than in other defense build-downs since World War II. As a percent of GNP, defense spending was lower, and the rates of reduction—at least as proposed through 1993—were slower. By 1990, the defense budget had already declined 13 percent from its 1985 peak (an average yearly decline of 2.7 percent) with little apparent macroeconomic effect. Another positive factor is that many States now have economic development programs to help distressed communities get back on their feet. The Federal-State assistance program for helping displaced workers find or retrain for new jobs has several years' experience, and has scored worthwhile achievements in the States with the best programs.

Negative factors could offset some of these more favorable elements. First is the current state of the economy. Relatively small job losses that can be comfortably tolerated in a prospering economy are not so easily swallowed when growth is flat, still less during a recession. Assuming a job loss from defense cutbacks in the early 1990s of 275,000 per year,[13] that figure amounts to only 0.2 percent of U.S. employment as of mid-1991. But recession puts the number in a different light. Total U.S. employment declined 1.4 million from June 1990 to October 1991, while the number of unemployed climbed 2.1 million, to 8.6 million. In such circumstances, an additional loss of as much as 275,000 jobs in a single year could be stressful on the national scale.

There is no guarantee either that the rate of decline in defense-related employment will be gradual and fairly evenly paced. Estimates of yearly job loss usually assume a rough correspondence between reductions in national defense outlays and contraction in employment. This will not necessarily be the case. Major defense firms that become convinced of the reality of a steep continuing slide in contract money, with no prospect of new programs coming down the road, may decide to downsize quite radically and suddenly. Share prices of companies that shed employees often improve, so some firms may adopt this as an effective strategy for raising funds and beating out the competition. The result might be much higher job losses in a single year than the estimated annual average of as much as 275,000 over the 4 years 1991-95.

Another way of looking at the projected job losses is to compare them not with total employment, but with net job creation over a number of years. In the 1970s, the U.S. economy added some 20.1 million jobs and in the 1980s (when growth of the labor force slowed), 18.6 million. The loss over a decade of some 2.5 million positions in the defense sector looks larger in this perspective. Given intelligent handling of government fiscal policy, providing economic stimuli that produce jobs in other sectors, the transition should be manageable. But with a huge and increasing Federal debt, it is now more difficult to use fiscal policy to provide appropriate stimuli than in the past. Eventually, of course, one way or another, national economic growth will create new jobs to supplant the ones that go with defense spending; no one expects a permanent decline in the

[12]The costs of Desert Shield and Desert Storm are not included in the national defense budget, but have been estimated at $52 billion for fiscal years 1990 and 1991. Some of the cost, however, represented a drawdown of inventories (e.g., ordnance) that will not be replaced, and much of the rest was reimbursed by contributions from allied nations.

[13]Based on a cutback of DoD spending to $218 billion in 1995 and to $169 billion in 2001.

U.S. economy. However, the options of increasing government spending in other sectors, or lowering taxes, or both, that have eased some postwar adjustments in the past, are narrower now.

In several ways, in fact, important conditions that smoothed earlier transitions do not exist today. Unlike the situation after World War II (on the face of it, the largest transition), many defense companies and divisions of companies have no civilian business to go back to and no real abilities or interest in converting to civilian production. Even if they wanted to do so, many would lack the means. Major defense firms have loaded on debt to an exceptional degree in the past few years. In the economy as a whole sources for investment are thin. U.S. personal savings rates reached historic lows in the 1980s. Government dissaving (the huge deficits of the 1980s and 1990s) kept the steam up under interest rates.[14] And the need to get the deficit under control leaves less room than in former times for expansionary fiscal policies, should the government wish to use them to counteract recession, or for selected tax incentives to foster a more hospitable environment for investing in new technologies, new equipment, and new products.

The other, more optimistic, side of the coin is that the relative size of the adjustment is simply not as big as it was in past defense build-downs. Consider the reduction after the Vietnam War, up to now the most recent and the most similar in size and pace. From the peak year of the war, 1968 to the postwar trough in 1976, defense-related employment dropped from 8.1 to 4.8 million, plunging 1.8 million in just 2 years, 1969 to 1971. In 1987, at the height of the 1980s buildup, defense employment was 6.7 million. Assuming a large decline in defense spending (to an eventual total of $169 billion in 2001), defense-related jobs are estimated at 4.5 to 4.7 million in 1995, 8 years after the peak, with a maximum drop in defense-related employment of 1.5 million in the 4 years 1991-95.[15] Employment would eventually drop to 3.6 million in 2001, 14 years after the peak (figure 1-4). Considering that total U.S. employment is much larger in the 1990s than 20 years earlier (119 million in the recession year of 1991, compared to 81 million in 1971, when unemployment was also relatively high), it is clear that the present adjustment is smaller.

Another source of optimism is that there exist choices for government policies that could both ease the adjustment and build a stronger foundation for an expanding economy and rising incomes. There are possibilities for new public investments, in areas ranging from environmental protection to advanced transportation and communication systems, that could spur new technologies, support new businesses, and create new jobs. This report only touches on the possibilities; more will be said on the subject on the second and final report of this assessment.

LOCAL AND SECTORAL EFFECTS

Vulnerability to cutbacks of defense spending and jobs is concentrated in particular places and sectors. The best way to anticipate local impacts would be to pinpoint the effects of cancellations or steep cutbacks in big weapons programs or of military base closings on the people and communities where the weapons are produced or the bases located. For example, if production of the B-2 Stealth bomber stops at a handful, as now seems likely, Northrop, prime contractor for the B-2, may well have to close down an entire plant in Palmdale, CA and let thousands of workers go; Boeing, a major subcontractor for the B-2, could lose more thousands of jobs in its military division in Seattle.

For military base closings, there is likely to be enough advance warning that the communities and workers involved can plan ahead for ways to adjust to the losses. (The round of base closings that Congress agreed to in 1989 provided as much as 5 years' notice.) But planning for adjustment to cutbacks in weapons programs is less certain. First, the data needed are scattered and inadequate—not least because DoD does not collect data on defense subcontracts and because information on DoD's "black" programs, such as the B-2, is not made public. Second, which major weapons programs will be cut or canceled is speculative. As of late 1991, neither the administration nor Congress had undertaken the kind of comprehensive review of post-Cold War defense needs that could define the shape

[14]During the 1990-91 recession, the Federal Reserve Bank repeatedly lowered interest rates to stimulate recovery of a stagnant economy. However, as the economy recovers, pressures to raise interest rates will again increase.

[15]Note that 1.5 million is the projected loss in defense-related employment from 1991 to 1995. The number of job losers, or displaced defense workers, is expected to be less (about 1.1 million) because attrition will take care of some of the decline in employment.

of long-term reductions in the overall defense budget.

Other ways of estimating the vulnerability of particular workers, communities, and companies to defense cutbacks are more approximate, but still useful. A major risk factor is the degree of defense dependence. Communities like Lima, OH, whose economic livelihood is tied to production of Army tanks, are in some jeopardy.[16] The U.S. shipbuilding industry, which now sells virtually all of its output to the DoD, is maximally exposed.

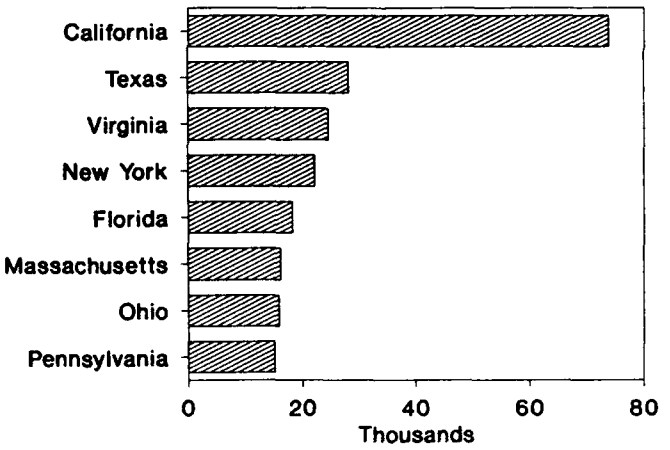
The severity of impacts also depends on what else is happening in the local economy. Size and diversity help, but even a large, diverse economic community can be substantially hurt by defense cutbacks if it is already suffering from weakness in other sectors. For example, the unemployment rate in Los Angeles-Long Beach was 8.5 percent in June 1991, well above the national average of 6.9 percent; the rate had risen from 4.6 percent a year earlier, reflecting a combination of layoffs in finance, banking, construction, and aerospace, the last largely defense.

States and Localities

U.S. defense activities and employment are quite heavily concentrated in certain regions, States, and localities. In 1991, over half of all defense spending was in eight States (figure 1-5).[17] Defense spending amounted to more than 5.8 percent of total purchases in 10 States (figure 1-6). The national average was 4.1 percent; 32 States fell below that level.[18]

In some States military bases account for most defense-related spending while in others defense spending flows primarily to industries that produce goods and services for military use. Insofar as defense spending is reduced through troop cuts, States and communities where military bases are closed are hit hardest, whereas cancellation of big, expensive weapons systems is felt more in the places that rely on those defense industries.

Figure 1-5—Eight States Totaling One-Half of U.S. Defense Spending, 1991



SOURCE: Department of Defense, *Projected Defense Purchases Detail by Industry and State, 1991 to 1997* (Washington, DC: November 1991).

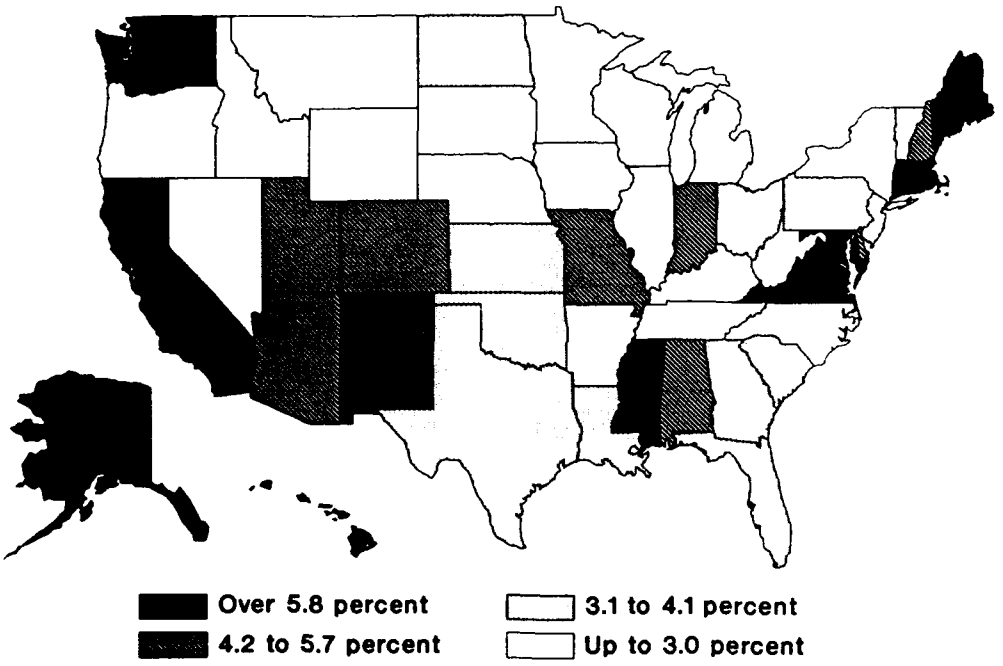
Virginia's high rank in dependence on defense spending is due largely to the huge military establishment at the Pentagon and its dependent consulting firms, and to military bases throughout the State; but the building of Navy ships at Tenneco's big Newport News yard and defense production of telecommunication equipment contribute a large share as well. Mississippi's defense dependence rests almost entirely, and nearly equally, on military bases and the Ingalls shipyard at Pascagoula. The active duty military dominates defense spending in Alaska and Hawaii. The picture is more mixed in the State of Washington, which has important production of ordnance and aircraft as well as a big Navy yard and military bases, and in Maryland, which has a telecommunications industry as well as high DoD employment. Connecticut and Massachusetts, on the other hand, owe most of their defense spending to industry—aircraft engines and submarines in Connecticut, telecommunications in Massachusetts. California, which has far and away the highest defense spending of any State in dollar amounts, has some of everything: military bases; industrial production of ordnance, electronic and communication equipment,

[16]Ch. 6 discusses the effects on different kinds of communities of the defense build-down, and economic development programs to cope with the effects.

[17]"Defense spending" includes purchases of defense-related goods and services, both direct purchases (from prime contractors) and indirect purchases (from subcontractors and suppliers); military pay; and the salaries of DoD civilian employees. "State purchases" differ from State gross product, since they include purchases of intermediate goods and services by producers of end products. State gross product and gross national product figures count only the value of final products, eliminating the double counting involved in adding up intermediate purchases. Data on State defense spending is developed by DoD, using the Defense Employment Impact Modeling System (DEIMS) based on input-output tables for the U.S. economy.

[18]The figure for DoD spending as a share of all U.S. purchases (4.1 percent in 1991) is not comparable with the figure of defense outlays as a share of U.S. Gross National Product (5.5 percent) because of differences in definitions.

Figure 1-6—Defense Spending as a Percent of State Purchases, 1991



SOURCE: Department of Defense, *Projected Defense Purchases Detail by State and Industry, 1991 to 1997* (Washington, DC: November 1991).

and aircraft; and a plethora of defense-related business services.[19]

About one-half of defense-related jobs within the United States are in eight States. Again, California is far in the lead (figure 1-7). In 1991, 5 million people within the United States had jobs linked to U.S. defense spending, including employees of prime contractors to DoD and the primes' subcontractors and suppliers, men and women in active duty military service, and civilian DoD employees. This amounted to 4.2 percent of U.S. employment. (This figure is used for purposes of analyzing defense-related employment State by State. However, the hundreds of thousands of defense-related jobs, mostly military, outside the United States should be taken into account when the whole Nation's dependency on defense jobs is considered. In 1991, 5.1 percent of all U.S. jobs were defense-related.)

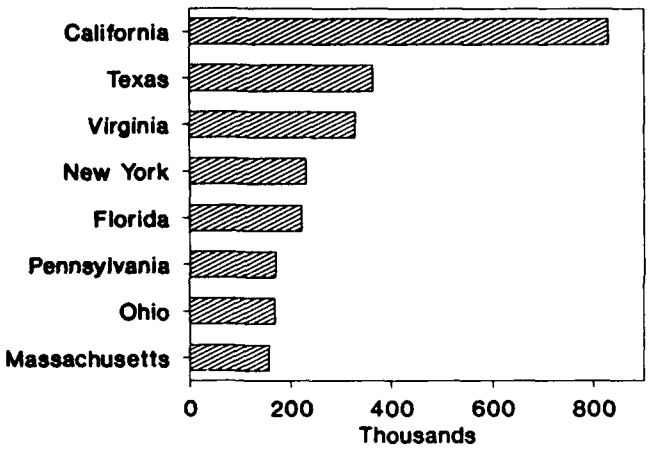
Defense dependency in employment—the percentage of all jobs within a geographic area that are defense-related—is likewise concentrated. Three States, Alaska, Hawaii, and Virginia, plus the District of Columbia, were far above the average in defense-dependent employment (figure 1-8); most of these defense jobs were in active duty military service and DoD civilian employment, although Virginia also had a much higher than average share of defense industry jobs. In eight States defense-related jobs were 5.8 percent or more of total employment. Twenty-seven States fell below the national average of 4.2 percent.

As in the Nation as a whole, defense dependence has steadily declined even in States that are most involved with defense industries and military bases. In California, the top-ranking State in amount of defense spending and numbers of jobs, defense spending dropped from 15.6 percent of gross State product in 1964 to 7.8 percent in 1990. Although California's defense spending in constant dollars was much greater in the 1980s than at the height of the Vietnam War, the still greater rise in the State's gross product lessened defense dependency (figure 1-9).

Statewide averages of defense dependence can obscure local vulnerabilities. For example, 2.2

[19]Department of Defense, Directorate for Information Operations and Reports, *Projected Defense Purchases Detail by Industry and State: Calendar Years 1991 through 1997* (Washington, DC: November 1989).

Figure 1-7—Eight States Totaling One-Half of U.S. Defense-Related Employment, 1991



SOURCE: Department of Defense, *Projected Defense Purchases, Detail by State and Industry, 1991 to 1997* (Washington, DC: November 1991); Department of Defense, Office of the Comptroller, *National Defense Budget Estimate for FY 1992* (Washington, DC: 1991); Department of Defense, Washington Headquarters Services, *Selected Manpower Statistics, FY 1990* (Washington, DC: 1991).

percent of jobs in Maine were in private defense industries in 1991—below the national average of 2.5 percent for defense industry employment. Yet Maine's largest employer is Bath Iron Works, located in a little coastal town with a population of no more than 11,000, but employing 11,700 workers drawn from a 30-mile strip on the State's southern coast. Bath Iron Works gets 85 percent of its business from ships it builds for the Navy. Its managers would like to diversify into merchant ships, but that business is in total collapse in the United States: one U.S. merchant ship is currently in production, compared with about 400 in Japan, Korea, and Europe. In 1990, the president of Bath Iron Works expected the defense backlog to keep the company going for another 2 or 3 years; but without major new business, a reduction of at least 3,000 jobs could be expected over that time.[20]

Of course, some defense-dependent communities will continue to do well, if the military programs they rely on survive. Connecticut, for example, ranks near the top among all the States in dependence on defense spending, but its unemployment rate was slightly below average in the 1991 recession year, and future prospects looked good—at least for the western part of the State. The Pratt and Whitney aircraft engine company, located in Hartford, won the hotly contested decision to make the jet engine for DoD's one big new military aircraft program, the F-22, or Advanced Tactical Fighter; the company and its local subcontractors are also doing well in the commercial aircraft business. At the same time, the aforementioned Norwich-New London-Groton area of southeast Connecticut, whose livelihood is submarines, is in trouble. Here, United Nuclear Corp., which made nuclear engines for submarines, is already closing, and General Dynamics' big Electric Boat outfit, assembler of submarines, has lost business, is laying off workers, and has announced that it will close down altogether if it does not win all the Navy's dwindling contracts (down to one a year) for the Seawolf attack submarine.[21]

Though it is not possible to pinpoint which or even how many communities are at serious risk in the defense build-down, data on DoD prime contract awards by county provide some rough approximations. In 1989, 93 of the Nation's 3,137 counties got awards worth over three times the national average, per employed person. Those counties encompassed 8.5 million workers, or 7 percent of the employed labor force. Another way to measure vulnerability is to combine concentration of prime contract awards with the county's unemployment rate, compared to the national rate at the time. Using these measures, 138 are most at risk with either high unemployment (over 6 percent; the national rate was then 5.4 percent) and moderate to high defense dependency (greater than the national average), or moderate unemployment (4.5 to 6 percent) and high defense dependency. These counties were home to 4.9 million workers, or 4 percent of employed people.

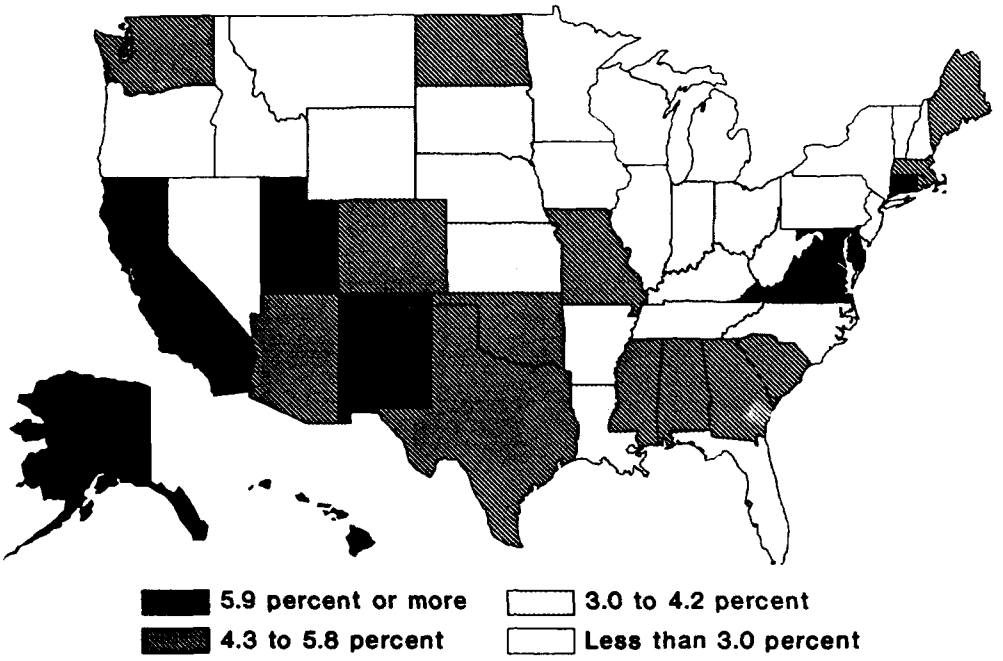
Industries

The big buildup in defense spending in the early 1980s mostly went to development and purchase of hardware, not to higher troop strength. Defense industry business, especially in aircraft and electronics, expanded enormously. As shown in figure 1-10, aircraft and communications equipment were the

[20]William E. Haggett, Chairman, Bath Iron Works, testimony before the Subcommittee on Defense Industry and Technology, Committee on Armed Services, U.S. Senate, May 4, 1990; and personal communication, cited in Linda Kravitz, "Wages of Peace: Community and Industry Experience with Military Cutbacks," contractor report prepared for the Office of Technology Assessment, July 1990.

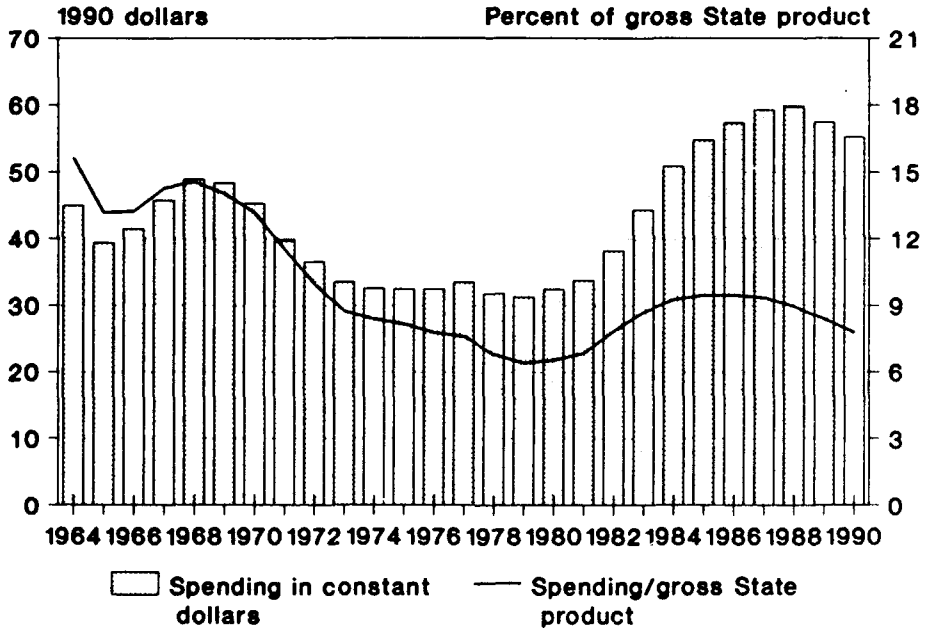
[21]Robert Holzer, "Navy's Seawolf Sub Award Threatens Future of Losing Shipyard," *Defense News*, Mar. 25, 1991.

Figure 1-8—Percent of State Employment in Defense, 1991



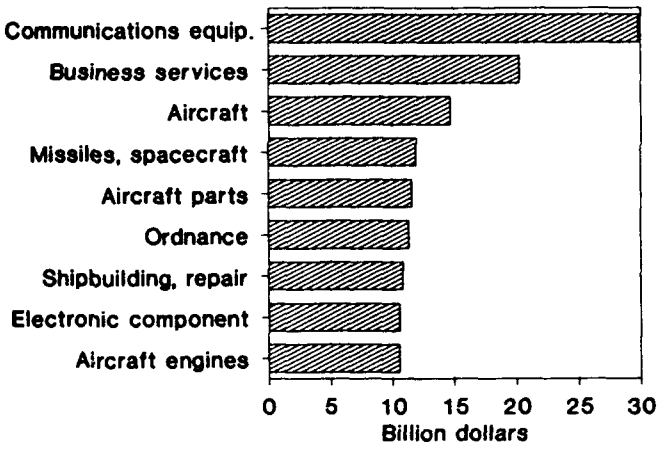
SOURCES: Department of Defense, *Projected Defense Purchasesm, Detail by State and Industry, 1991 to 1997* (Washington, DC: November 1991); Department of Defense, Office of the Comptroller, *National Defense Budget Estimate for FY 1992* (Washington, DC: 1991); Department of Defense, Washington Headquarters Services, *Selected Manpower Statistics, FY 1990*, (Washington, DC: Department of Defense, 1991); Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, October 1991).

Figure 1-9—Direct Defense Spending in California, 1964-90



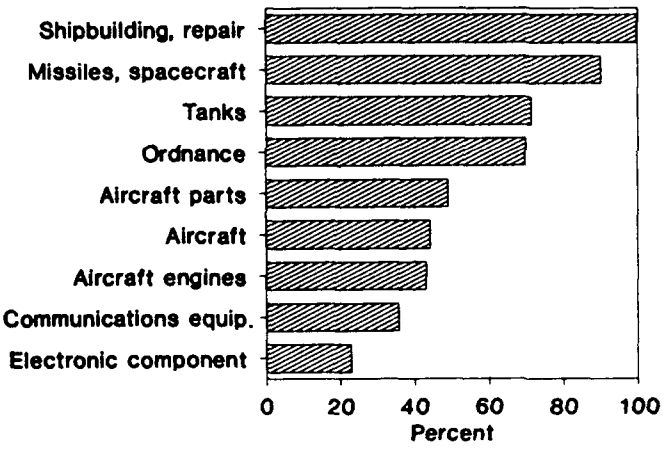
SOURCE: California Commission on State Finance, *Defense Spending in the 1990s: Impact on California* (Sacramento, CA: California Commission on State Finance, summer 1990).

Figure 1-10—Top 10 Defense Industries by Value of Defense Output, 1990



SOURCE: Department of Commerce, Office of Business Analysis, unpublished data.

Figure 1-11—Top 15 Defense Industries by Defense Share of Industry Output, 1988



SOURCE: Department of Commerce, Bureau of Economic Analysis, unpublished data.

largest defense industries in 1990, and both were highly dependent on defense dollars. Though they did not approach the near-100 percent defense dependency of shipbuilding, they did sell between 40 to 60 percent of their output to military purchasers (figure 1-11).

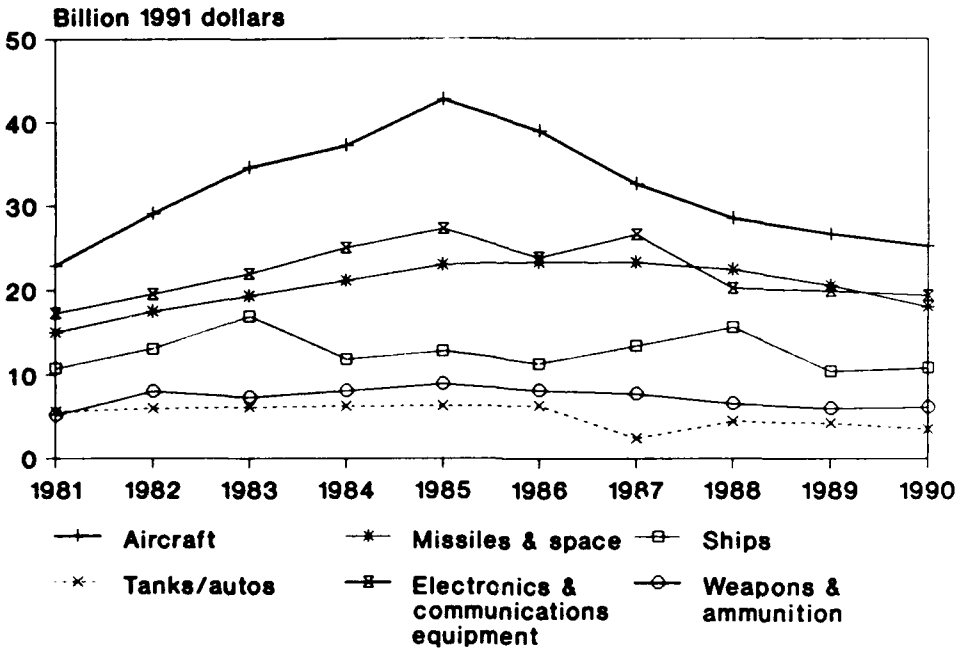
Of the major military systems—aircraft, missiles, ships, tanks and other land vehicles, ammunition—aircraft got the lion's share of procurement dollars in the defense buildup (figure 1-12).[22] Similarly, as defense budgets have declined, aircraft has also taken the biggest hit, although it is still the leader among the major military systems. Effects of defense reductions were clearly visible in the aircraft industry by 1990, and there was every expectation of still deeper cuts in coming years. Three of the four tactical aircraft programs of the 1970s and 1980s are slated to end soon, with only the Navy's F/A-18 lasting past 1993. Also, in January 1991, Secretary of Defense Richard B. Cheney canceled the Navy's A-12 attack aircraft program because of excessive cost overruns, resulting in immediate layoffs of 5,000 people from the McDonnell Aircraft Co. in St. Louis and another 2,000 from General Dynamics in Fort Worth. Although impacts of defense cutbacks might be relatively greater in industries that are more exclusively military, such as ordnance or tanks, the aircraft industry is the big one, and the size of the cuts will be greatest there.

The aircraft industry as a whole was not in a tailspin in 1991. While defense orders were being slashed and the military airframe companies faced trouble, the commercial aircraft market was holding up. Even the Gulf War and the recession did not greatly dampen the demand of many airlines for new equipment, and the commercial companies' huge backlog of orders stayed relatively intact. Nevertheless, employment in the aircraft and aircraft parts industry was down by 64,000 (from 708,000 to 644,000) from July 1990 to July 1991, and another 20,000 jobs disappeared in missiles and space equipment. McDonnell Douglas, for example, abolished over 17,000 jobs in 1990, many in the commercial business in Long Beach, CA, but about 4,000 on the military side in St. Louis; another 5,000 went with the A-12 decision. Long Island has been losing aircraft industry jobs since 1987 when the Fairchild-Republic plant closed up shop, with the loss of 3,300 jobs, after DoD canceled the T-46 Navy jet trainer. Grumman, the biggest defense employer on the Island, reduced its work force from 34,000 to 25,000 in the following 3 years, and in 1991 announced additional cuts of 1,900. Other leading military contractors on Long Island, such as Eaton AIL and Hazeltine, abolished many more jobs.[23]

[22]Much of research, development, and testing was also concentrated in aircraft, although in that category spending is not separately reported by major military systems.

[23]The figures given here are illustrative. No satisfactory totals exist of layoffs in defense industries in 1990-91.

Figure 1-12—Prime Contracts for Hard Goods



SOURCE: Department of Defense, Washington Headquarters Services, *Prime Contracts Awards, FY 1990*, P03 (Washington, DC: Department of Defense, 1991).

In many cases, the prospect of fewer and smaller defense contracts is driving layoffs in the aircraft industry, as much as the cancellation or early cutoff of current programs. For example, the 1990 layoffs at McDonnell Douglas in St. Louis (before the A-12 decision) reflected the fact that no new defense programs could be seen coming down the pike. Many of the 4,000 jobs abolished were in engineering, computer programming, clerical work, and management—relatively few in production work, since actual output had not yet declined. Aside from Boeing, the industry giant, and McDonnell Douglas,[24] the other airframe companies have very little commercial business except for some subcontract work. Some of these military airframers face "dire prospects," according to financial analysts. Too many defense companies are chasing too few programs, these analysts say, and the "moderate" work force reductions that have taken place so far are only the beginning.[25]

As defense spending winds down, public concerns about effects on the civilian side of the economy center on two issues: jobs and technology. Reductions in defense spending will always involve job losses, with some disruption and hardship even if other economic activities eventually replace the jobs. Concentrated job losses in a local labor market can force many of the job losers into long spells of unemployment or acceptance of ill-paid dead-end jobs. If the losses are great enough, the whole community can suffer. Obviously, defense spending should not be either a jobs program or an economic development program, but there is a justified public concern about the aftermath of government decisions that deprive people of their livelihood. The concern is not only for hardships to individual job losers, but also for the costs to society as a whole—directly in payment of unemployment benefits and loss of tax receipts, and indirectly in the waste of human abilities.

Another concern is the possible dissipation of valuable technological resources in the transition to an economy less devoted to defense. Mainly, this means people. The thousands of engineers and

[24]The future of McDonnell Douglas as a commercial aircraft manufacturer is in some doubt. In November 1991 the company announced its intention to form a partnership with Taiwanese interests (including the government of Taiwan) to gain enough financial backing for production of the MD-12, which is planned as a competitor to Boeing's 747.

[25]Anthony Velocci, Jr., "Third-Quarter Results Mask Defense Industry Weakness," *Aviation Week and Space Technology*, Nov. 12, 1990, pp. 20-22.

computer specialists being laid off by the military aircraft industry are technological assets. So are the managers and productions workers—in small defense companies as well as large ones—with years of experience in meeting technically demanding requirements in military contracts. When teams of people break up, labs close down, and divisions or whole companies disappear, the technological know-how those teams and institutions possess can disappear with them.

DISPLACED DEFENSE WORKERS

The Dimensions of Displacement

In 1991, national defense employed about 6 million people in the private defense industry, DoD civilian ranks, and the active duty military services. Based on projections of defense spending in the President's 1992 budget, as many as 1.1 million of those positions could disappear by 1995. If defense spending is cut deeper and faster (to $169 billion, or 41 percent, by 2001), the defense jobs lost in the 4 years 1991-95 could add up to as much as 1.4 million, and in the 10 years ending in 2001, to 2.5 million (table 1-1).

Nearly 4 million of the defense-related jobs in 1991 were civilian jobs, about 1 million in DoD and 2.9 million in the industries that produce goods and services for DoD. From 1991 to 1995, as many as 1 million of those positions could vanish as defense spending dwindles, and by 2001, 1.7 million.

These figures may overstate the number of jobs that will actually be lost. As noted, it is likely that at least half of the loss of civilian jobs in DoD can be taken care of by attrition without the need for layoffs. Many private defense jobs are in industries that provide goods and services not specifically and uniquely military. Assuming healthy economic growth, some defense jobs in those industries will never disappear at all, because commercial customers will take the place of defense procurement. This could be the case, for example, in such diverse sectors as banking, textile manufacture, and steelmaking. Defense companies that also make commercial products—especially in aircraft and electronics—might expand that side of the business and move some employees over from the military side. In addition, normal attrition—people moving to new jobs, retiring, or otherwise voluntarily leaving the work force—could moderate the impact of some of the job loss. On the other hand, these numbers do not count jobs generated by the pay of defense workers—anything from grocery store clerk to school psychologist. In communities hit hard by defense cutbacks such jobs could disappear without much hope of early replacement.

Prospects for Displaced Defense Workers

In some ways, displaced defense workers are better off than displaced workers generally. Defense industries have higher concentrations of professionals and skilled workers than the overall economy; engineers, scientists, and technicians represent more than 10 percent of the work force in defense industries, but only 4 percent of the U.S. work force, and precision production workers are nearly 7 percent of defense industry workers, but 3 percent of workers in general. Such highly skilled people are usually in demand in the labor market.

On the other hand, 57 percent of defense employment is manufacturing, compared with only 17 percent in the economy at large. Manufacturing workers, especially semiskilled blue-collar workers, have a harder time than other displaced workers in finding new jobs. The continuing decline in manufacturing employment generally does not bode well for the less skilled manufacturing worker displaced from the defense sector. Also, lower and midlevel managers may be caught in the squeeze of streamlining production and the automation of many of their tasks.

A positive factor is that public and private efforts to help displaced workers find or retrain for new jobs are better developed than in the past. First, the Worker Adjustment and Retraining Notification Act (WARN) that took effect in 1989 means that many displaced defense workers will get at least 60 days' notice of layoff (though some will not, because of exceptions and loopholes in the law). Lead time of at least 60 days is crucial in providing effective adjustment services. Second, public adjustment services are more experienced and better funded than in times past, and most large defense companies now provide some services for their displaced workers.

These positive factors must also be qualified. The major assistance program for displaced workers is the federally supported Economic Dislocation and Worker Adjustment Assistance (EDWAA) program

Table 1-1—Projected Defense Spending and Employment Levels

Year	Total defense outlays (051) (billions)	Active duty military (thousands)	DoD civilians (thousands)	Defense industry employment (thousands)	Defense employment (thousands)
1991 DoD estimate	$287.5	2,049	1,044	2,900	5,993
1995 DoD estimate	$235.7	1,653	940	2,280 to 2,370	4,873 to 4,963
Loss from 1991	$ 51.8	396	104	530 to 620	1,030 to 1,120
Percent loss	18%	19%	10%	18 to 21%	17 to 19%
1995 faster paced reduction	$218.0	1,653	940	1,980 to 2,080	4,573 to 4,673
Loss from 1991	$ 69.5	396	104	820 to 920	1,320 to 1,420
Percent loss	24%	19%	10%	28 to 32%	22 to 24%
2001 faster paced reduction	$168.6	1,340	697	1,500 to 1,620	3,537 to 3,657
Loss from 1991	$118.9	709	347	1,280 to 1,400	2,336 to 2,456
Percent loss	41%	35%	33%	44 to 48%	39 to 41%
Loss from 1995	$ 49.4	313	243	360 to 580	916 to 1,136
Percent loss	23%	19%	26%	18 to 28%	20 to 24%

NOTES: All dollars are constant 1991 dollars. Total employment in this table includes DoD civilian and military personnel stationed overseas.

SOURCES: DoD estimates from the Office of the Assistant Secretary of Defense (Public Affairs), "FY 1992-93 Department of Defense Budget Request," News Release No. 52-91, Feb. 4, 1991; except defense industry employment, which is estimated by OTA based on DoD projection of defense purchases. Faster pace alternative budget estimates from William Kauffman, *Glasnost, Perestroika and U.S. Defense Spending* (Washington, DC: Brookings Institution, 1990; and William Kauffman and John Steinbruner, *Decisions for Defense* (Washington, DC: Brookings Institution, 1991). The 2001 alternative uses projections of troop and civilian personnel levels given by Kauffman in *Glasnost, Perestroika and U.S. Defense Spending* (Kauffman's scenario D). Industry employment levels estimated by OTA from budget estimates given by Kauffman. The 1995 budget estimates are from Kauffman and Steinbruner, *Decisions for Defense*, and reflect savings through reductions in procurement of new systems and a reduction in nuclear forces, assuming no additional reduction in the estimates of manpower given by DoD. Industry employment for 1995 was estimated by OTA based on level of defense purchases.

(originally created by Congress in 1982 as Title III of the Job Training Partnership Act (JTPA) and amended and renamed EDWAA in 1988). EDWAA programs are operated at the State and local levels, and they are uneven in quality. The best have benefited from nearly a decade of experience and are doing an excellent job, but the majority fall below that level—some far below. As discussed below, some problems in the design and administration of EDWAA hinder even the top programs from doing their best. As for large private firms, most are more generous with services for salaried workers (managers, professionals, and other white-collar workers) than for their blue-collar production workers; however, a few make no such distinctions, providing top quality services for all.

An important negative influence in 1991 was the recession and weak recovery, which made job prospects for many displaced workers bleak and put adjustment programs under strain. EDWAA funding has recently been higher than ever before, at $527 million in fiscal year 1991 and $577 million in 1992. Even so, by fall 1991 many States were in danger of running short of money in the 1991-92 program year because the recession had greatly increased demand for services. Congress has supplemented the regular EDWAA appropriation with an extra $150 million in DoD funds earmarked for services to displaced defense workers from 1991 to 1993, but there are problems in getting this money quickly to where it is needed.

The recession hit especially hard in some defense-dependent areas. In Los Angeles-Long Beach, the unemployment rate was 9.3 percent in September 1991, and in the mid-Massachusetts industrial belt, 10 to 12 percent, compared to a national unemployment rate of 6.6 percent. Worker adjustment programs that work quite well in good times are of less use when job openings scarcely exist. The fact that only about 30 percent of unemployed workers were receiving unemployment insurance benefits in 1990, compared to 50 percent in previous recessions, added to the negative outlook for workers displaced from defense jobs.

Adjustment Assistance for Displaced Defense Workers

Many studies and years of experience have shown that well-run adjustment assistance projects are a genuine help to displaced workers. On average, workers who take part in adjustment projects find jobs sooner, stay employed more steadily, and earn

more than they would without such help.[26] The elements that make for success in a displaced worker program are also well established. Key factors are:

- early action—offering adjustment services before layoffs begin if possible,
- cooperative efforts by management, worker representatives, and public service agencies,
- a full range of services, and
- training that is carefully matched to workers' background and abilities.[27]

Projects supported by EDWAA can offer an array of services, including counseling, skills assessment, job search skill training, job development, relocation assistance, and retraining (including training in basic skills of reading and math when needed). As noted, FY91 and FY92 appropriations for EDWAA were relatively generous, and were supplemented by funds to be transferred from DoD.[28]

In its first few years, the Title III program was moderately successful in getting jobs for participants, achieving placement rates of 65 to 70 percent, but it was reaching only about 5 to 7 percent of eligible workers. Related problems were that many States did not have active programs, were failing to spend their allocated funds, and were carrying over large and increasing unspent funds every year. Few States were getting services to workers quickly after layoff—or still better, before layoff—which was one reason the program reached so few workers; participation rates are much higher and outcomes better if services are available early.[29] Further, many projects were giving scant attention to training.

The 1988 EDWAA amendments were designed to put more emphasis on rapid response, give more attention to training, and set up incentives for spending appropriated funds to serve the needs of more displaced workers. Two years after the amendments took effect, one visible positive change is that the proportion of eligible workers served had risen to about 9 percent. Participation will never be, and should not be, 100 percent; many displaced workers are well able to find new jobs on their own. Judging by experience in Canada (which has long had a small but effective rapid response program run by the government),[30] an overall participation rate between two and three times the current one—say 20 to 25 percent—might be expected as the program improves.[31]

The biggest continuing shortcoming in the EDWAA program is that rapid response is far from universal and often nonexistent. The responsibility for rapid response lies mainly with States, some of which (e.g., Colorado, Massachusetts) are doing an excellent job. But for every State where rapid response is working, there are probably two more where it is not. One recent study for the U.S. Department of Labor (DOL) found that of 15 States examined, five had rapid response procedures that were well established and working well, six had problems, and four had a "low commitment" to rapid response.[32]

The way EDWAA funds are divided up, both among the States and within the States, puts further obstacles in the way of quick response. The money is distributed in advance, and may not be where the displaced workers turn out to be. By law, 80 percent of EDWAA funds are allocated to the States; the

[26]For a summary of studies evaluating such projects, see U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Adults*, OTA-ITE-250 (Springfield, VA: National Technical Information Service, February 1986), ch. 6, especially pp. 231-233.

[27]Ibid., especially pp. 233-42.

[28]The full amount may not be made available to displaced defense workers. In 1990, Congress appropriated $200 million in DoD funds to assist workers and communities affected by the defense build-down, $150 million for workers and $50 million for communities, in fiscal years 1991-93. The defense authorization and appropriations acts passed by Congress in November 1991 provided that up to $30 million of the $200 million could be transferred to the Small Business Administration for loans to small businesses that suffered "severe economic injury" as a result of the emergency deployment of troops to the Persian Gulf after July 31, 1990. Three-quarters of the $30 million would come from the fund for workers, the other one-quarter from the fund for communities. The full $30 million may not be granted; the seriously injured small businesses may turn out to be rather few.

[29]Ibid; also, U.S. Congress, Office of Technology Assessment, *Plant Closing: Advance Notice and Rapid Response*, OTA-ITE-321 (Springfield, VA: National Technical Information Service, September 1986), pp. 13-18.

[30]For discussion of Canada's Industrial Adjustment Service, see U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Adults*, OTA-ITE-250 (Springfield, VA: National Technical Information Service, February 1986).

[31]Participation is often much higher—up to 70 or 80 percent—in mass layoffs and plant closings when projects provide a good range of services early, at least by the time of the layoff. Ibid.

[32]SRI International, *Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act*, report prepared for the U.S. Department of Labor, Employment and Training Administration (Washington, DC: October 1990), p. VI-19.

allocation occurs at the beginning of the fiscal year, 9 months before the program year begins. (The reason is to give States and localities time to plan for their next year's programs.) At least half of the State allotment must be further allocated in advance to substate areas. The law takes some account of the unpredictability of displacement, allowing States to reserve 10 percent of their allocation to be spent as the need arises in substate areas, and keeping 20 percent of the whole EDWAA appropriation in a national reserve fund, to be dispensed to States and localities as needed by the Secretary of Labor. However, the emergency reserve system does not work well; delays at both the Federal and State levels mean that the money is often not available until weeks or months after the layoffs for which they are intended.

Staff at DOL have tried to hasten the process, but there are still bureaucratic roadblocks that could be removed, especially requirements for exacting detail in proposals for grants from the fund. Also, virtually every State EDWAA official interviewed by OTA said that delays in services are aggravated by the DOL rule that prevents State and local agencies from paying for services up front with their own money and then getting reimbursed for their share if and when the national reserve fund comes through. If they respond to the present need with their own funds, they risk not being able to respond to layoffs later in the year.

The 1990-91 recession highlighted the problems of getting the Federal discretionary funds to where they are needed. It was already evident in October 1991, barely into the second quarter of EDWAA's 1991 program year,[33] that demands for services were so exceptionally high that several States could run out of funds before the year was over. Some State managers were practicing a form of triage, giving only minimal services to workers they thought had the best chance of finding jobs on their own. Yet at the same time, requests for grants from the $105 million in the national reserve fund were running behind the rate that would exhaust the fund by the end of the year. A major reason, according to one DOL official, is that many State EDWAA managers simply can't handle the complexities of applying for the grants; the few that can are too swamped with work to write more than a limited number of proposals. The same reasons may explain why requests for grants from the $150-million fund earmarked for displaced defense workers have been few so far.

Some problems are apparent in the quality and mix of services, especially when provided by organizations whose primary purpose and experience is in employment and training services for low-income and disadvantaged people, not displaced workers. The 1988 amendments required States to establish substate areas with at least 200,000 population and allocate 60 percent of the States' EDWAA funds to them. Within the substate areas, the grantee responsible for providing services is often the Service Delivery Area agency (SDA), which also provides services in the much bigger JTPA program for low-income people. The law does not require that States designate SDAs as the local agencies to serve displaced workers, but more often than not they do—partly because many of the SDAs have powerful political patrons. Some SDAs do a good job serving displaced workers, but many do not, because their outlook is shaped by their experience with low-income people.

Problems sometimes arise from the law's requirement that half of EDWAA funds be spent on training, not for other adjustment services. (In particular projects, State Governors may reduce the requirement to 30 percent). The requirement can have perverse effects, leading service providers to choose expensive training or ignore other programs that might provide training funds. And it can reduce flexibility in projects trying to serve a large number of displaced professionals, whose needs may not include training. Another problem is that DOL policy generally rules out EDWAA training for displaced workers who are already skilled but want to refresh or upgrade their skills in the same occupation. This limitation is at cross purposes with the goal of providing a more adept and highly skilled work force to U.S. industry and thereby improving competitiveness.

Finally, DOL's information sharing and technical assistance to States and localities is scanty, reflecting in part a small budget and bare bones staff at headquarters. This is one reason for the big gap

[33]The EDWAA program year runs from July 1 to the following June 30, and is funded by appropriations made 9 months before for the fiscal year ending September 30, or the end of the first quarter of the EDWAA program year. Thus, the $527 million appropriation for fiscal year 1991 (October 1, 1990 to September 30, 1991) was to be spent in the program year July 1, 1991 to June 30, 1992.

between best practice in a few States and typical practice.

DoD civilian employees are in a less exposed position than defense industry workers. First, it is not likely that many will be laid off or RIFed (reduced in force), because a DoD hiring freeze and attrition will take care of much of the downsizing. However, individuals in some positions and some locations will still face displacement. For example, all eight Navy shipyards are scheduled for RIFs in 1991, and further cuts are expected in future years. Furthermore, DoD estimates of civilian positions to be eliminated do not include those that will disappear in the second round of military base closings. Most of these closings and associated job losses will not occur until 1995 and thereafter.

DoD civilian workers who are laid off are eligible for EDWAA, but the department has also set up several other programs to help its displaced workers. The cornerstone program is the Priority Placement Program (PPP). Under the program, RIFed employees must be hired to fill DoD openings for which they are qualified. DoD employees receiving RIFs are automatically signed up for PPP, but may specify locations where they are willing to work and are not expected to take more than minor reductions in pay or status.[34] Once they are offered a job under PPP, they must decide within 24 hours whether to accept it; refusal is usually grounds for revocation of DoD's generous severance pay (though exceptions can be made). While PPP has worked well in the past, there is some question whether it can take care of the large number of people threatened with RIFs in the defense build-down. However, the rate of natural attrition from DoD, plus the fact that PPP registrants can be hired under the hiring freeze, make it likely that PPP will continue to place a moderate proportion of registrants (say one-quarter, compared to more than one-third in the past). DoD also makes many of its military transition programs available to civilian workers; among them is the Transition Assistance Program, a 3-day workshop that provides skills assessment, job search skills training, and other outplacement services. However, the quality of this program varies from one DoD facility to another, and links to the EDWAA program, which provides more complete, longer term services, are not well established.

Most large private companies provide some reemployment assistance. However, the quality and extent of services varies greatly among firms, from outstanding to virtually nonexistent. For example, both Texas Instruments and General Electric provide not only outplacement services but also training money for displaced workers. At the other extreme, at least one large defense company provided almost no services itself, and refused to allow local EDWAA providers into the plant to acquaint workers with what was publicly available. Some companies give more advance warning than the 60 days required by law, but others have scheduled layoffs in ways that escape WARN requirements.

Although company-provided services for salaried workers are often superior to those for blue-collar workers, some companies (e.g., GE Aerospace in Burlington and Pittsfield, MA) offer high quality services to all displaced employees in one physical location.[35] Many of the best company programs are developed and operated by labor-management committees, or at least with the cooperation of labor. Company participation at the early stages of a layoff can be especially valuable, because company managers are the first to know of layoff plans and can promptly provide space and staff to kick off provision of services early.

The displaced defense workers likely to be hardest to reach are those who are laid off from small firms that lack the resources to provide assistance, and who don't get WARN notices because the layoff is too small to trigger the requirements or even to get much public attention. The other group of defense workers likely to fare badly are those living in defense-dependent communities where prospects for alternative sources of economic growth are poor. For some displaced workers in such communities, the best recourse is to move, as professionals and managers often do. For example, when 4,900 workers were laid off between 1986 and 1991 in Pittsfield, MA (population of about 50,000), virtually all professionals and top managers moved away. Very few of the blue-collar workers moved. Many had roots in the community going back several generations; moreover, relocation is a high risk choice for workers without the distinctive resumes that managers and professionals usually have. Also, for families that depend on income from two wage

[34]Employees also receive counseling so that they understand their choices under PPP.

[35]The Burlington project is partially funded by EDWAA.

earners, moving is risky for the working spouse who has not been laid off. A valuable service displaced worker projects can perform is to collect information about work opportunities in other areas for blue-collar workers or lower level managers, to help them in a realistic evaluation of their options.[36]

ENGINEERS: A SPECIAL CASE

Engineers form a higher proportion of the defense work force than of U.S. industry at large. With the scaling down of the defense industry, many of these highly qualified employees will be let go. As many as 127,000 of the estimated 342,000 defense engineering positions in 1990 may evaporate by 1995.[37] As a group, these engineers embody the kind of technical know-how that the United States needs to improve commercial competitiveness. It is in the national interest to integrate these workers into the civilian sector as quickly and fully as possible.

In the long term, for the Nation as a whole, displacement of engineers is not likely to present major problems. In 1970-73, the civilian aerospace industry declined at the same time the Vietnam War was winding down, and the combination triggered an intense bout of unemployment among defense industry engineers. Today, the civilian aircraft industry, a major alternative employer, has plenty of orders. At the same time, the supply of engineers is falling. The number of new graduates has been decreasing and is likely to continue doing so, as the college age population falls and fewer students choose engineering. Experienced engineers displaced from defense industry jobs might be able to fill the gap left by a smaller supply of young engineers entering the work force.

Despite the generally positive long-term outlook, engineers losing their jobs in the current cutbacks will need help in finding new employment. During the defense buildup of the 1980s, if there were layoffs at one defense company another one was hiring. Most laid-off defense engineers simply moved on to the next contractor. In layoffs since 1989, many engineers have also moved to other defense firms. However, this source of jobs is drying up in some previously rich areas, such as southern California. And those who took new jobs in defense may find themselves laid off again as military spending continues to shrink.

Defense contractors, the government, and the engineers themselves have all taken steps to cope with the loss of defense engineering jobs. Many of the services displaced engineers need are the same as for any displaced worker: skills assessment, counseling, job search skills coaching, and job development, including company-sponsored job fairs. However, engineers and blue-collar workers may require a different mix and duration of services, since the engineer's job search is likely to take longer and range more widely across the country.[38]

The most important of the relevant Federal Government programs for displaced engineers are the mandate for early notification of layoffs (WARN) and the program for reemployment assistance (JTPA/EDWAA). However, State and local EDWAA programs tend to focus more on the needs of blue-collar workers than of engineers and other white-collar workers, often from the belief that those with superior academic and professional qualifications are better able to fend for themselves—but sometimes simply from inexperience in dealing with professionals. State agencies vary widely in what they are prepared to do for engineers. In the 1991 recession year, when demands for services outran available EDWAA funds in a number of States, some State managers decided they had to sacrifice services for engineers and other professionals and save resources for needier workers.

On the other hand, most large defense companies are providing quite substantial outplacement services for their displaced engineers, managers, and other salaried workers—better services as a rule than are offered to blue-collar workers. State agencies

[36]Note that relocation assistance, while helpful to the workers involved, may have some ill effects on the community left behind, if it removes the more highly skilled, educated, or motivated people.

[37]Total defense engineering work force estimated by OTA on the basis of BLS figures for total engineering employment (1.862 million in 1990) and National Science Foundation survey data on defense-related employment of engineers; National Science Foundation, *U.S. Scientists and Engineers: 1986*, NSF 87-322 (Washington, DC: 1987). Loss estimate is based on an assumption that engineering positions are cut in the same proportions as positions in the private defense industry and in DoD civilian employment. However, if spending cuts for research, development, testing, and evaluation (RDT&E) are relatively smaller than for other parts of the defense budget, engineering jobs could be affected less than other kinds of work and the number of positions lost smaller.

[38]It is common for highly paid managers and professionals to take a longer time than production workers to find new jobs after layoff. One provider of services for displaced workers estimated that for every $10,000 in pay it takes a month to find a new job.

that do provide assistance tailored to the needs of professionals often do so, initially at least, through projects set up by the companies, which can often act more quickly than the local government. The government provides funds and technical assistance, and often takes over service delivery after the initial company response.

The median cost of the outplacement services provided by 11 aerospace firms in 1989-90 was $1,000 per employee. Services typically included job search training, counseling, and the use of facilities to prepare resumes and reach potential new employers. Few companies provide grants for retraining, usually the most costly of services; GE Aerospace, with generous education and training grants for displaced employees, is an exception. Most company projects rely on government programs for training funds. However, few engineers are actually getting retraining or continuing education through EDWAA. Many displaced engineers have so far been able to find new jobs, and have not asked for retraining, but if they do the EDWAA project may not be able to comply. Meaningful training for engineers is likely to be longer term than the typical 4-month EDWAA training course; training for even a few engineers could use up all of a project's training funds. If EDWAA funds are available for an engineer's training, the DOL policy that discourages upgrade training could be an obstacle.

Not many firms have attempted large-scale retraining of engineers for new positions within the company. One of the few examples is a program at the Wichita Division of Boeing's Commercial Airplane Group that is training mechanical, civil, and aeronautical engineers from the military side of the firm in structural engineering. A few employers have supported programs to train engineers and scientists who are about to be laid off or retire to become high school math or science teachers. This is a more attractive option for retirees than for most younger engineers, since school teacher pay usually does not equal that for engineers, but it can be a highly beneficial option for society.

A stereotypical view of defense industry engineers is that they expect higher salaries than their civilian counterparts, are narrowly specialized in skills peculiar to defense and, in the case of those losing their jobs in the present cuts, are too old and set in their ways to adapt to a different environment. This reputation, which could handicap engineers seeking civilian jobs, appears to be unwarranted. Although much of the data is anecdotal, statistical evidence suggests that salary levels for engineers with comparable experience and academic qualifications are not clearly higher inside defense than outside. There is also evidence that a large number of engineers did in fact move from military to civilian jobs in the 1980s.

Some groups of engineers are having difficulty finding jobs during the current cutbacks: older engineers, those without bachelor's degrees (who therefore lack the broad foundation of technical knowledge that allows easy acquisition of new skills), middle-aged midlevel managers, and those who have spent a long time in narrow military fields.[39]

Typically, engineers have been willing to relocate to find new jobs; this is probably getting to be more difficult with the increasing prevalence of two-earner families, but it remains an important factor in displaced engineers' success in finding new jobs. What emerges as the most important factor, however, is whether the engineer has remained flexible by keeping technical skills up-to-date. Career-long education—a responsibility of both the engineer and the company, achieved through postgraduate courses and job rotation—is paramount.

VETERANS' ADJUSTMENT

By 1995, the U.S. active duty military forces will, according to congressional mandate, be 23 percent smaller than in 1990, shrinking from 2.1 to 1.6 million. This will make it the smallest military force the United States has had since 1950. The Army and the Air Force are facing the largest reductions both in absolute numbers and percentages.

To meet the reduced manpower levels Congress has mandated, some military personnel will have to be separated, or laid off, involuntarily. However, because of the high rate of turnover, especially in the

[39]A substantial number of displaced engineers could be in these categories. In 1986, 23 percent of employed engineers were over 55 years old, and 11 percent were recorded as lacking a bachelor's or advanced degree. (There may be some overlap in these categories.) Data are not available on numbers of engineers in midlevel managerial positions or in narrow military fields. Source of the data is National Science Foundation, *U.S. Scientists and Engineers: 1986*, NSF-87-322 (Washington, DC: 1987), tables B-12 and B-14.

enlisted ranks, most of the reduction in manpower is likely to be accomplished through normal attrition combined with reduced levels of accession (enlistment). Involuntary separations are not expected to exceed 100,000 or about 20 percent of the total reduction. The officer ranks will be thinned by more involuntary separations, but these will probably still account for less than half of the reductions.

The numbers of dislocated military personnel are thus likely to be small compared to workers losing jobs in defense industries, but there are special problems involved. A top drawing card for the military services during the era of All Volunteer Force (AVF) has been job security. Involuntary separation of soldiers can have a negative effect on the morale of those who remain and may discourage others from enlisting. For these reasons, as well as equitable treatment of the Nation's service men and women, it is important that military separatees make a smooth transition to the civilian economy.

In general, today's ex-service people should be better able to move into the civilian economy than their predecessors in the Vietnam and early AVF eras. The occupational distribution within the military is now more like that of the private sector; therefore, more soldiers should have transferable job skills. Perhaps more important, the education and aptitude levels of today's soldiers are higher than they have been at any point in the last 25 years, and are at least comparable to the levels of their civilian age cohort. Nearly all enlisted personnel today have high school diplomas.

Despite the relatively manageable overall impact of reduction in the military forces, it could have a bigger adverse effect on minorities, especially blacks. African Americans are several times more dependent on the military for employment than whites. Of all employed black men between the ages of 18 and 29, 10.6 percent are in military service, compared to 5.4 percent of white males. Not only are African Americans overrepresented in the military, they may again be overrepresented among those involuntarily separated. Because the military services have been integrated so successfully and have given unusual opportunities to minorities, the impact of the drawdown on young black people is of special concern.

In response to the planned reduction in forces, DoD, in cooperation with the Department of Veterans' Affairs and DOL, has developed several programs to provide transitional assistance to service people. Every departing service member will receive job search skills training in the Transition Assistance Program (TAP), a 3-day seminar that covers the basics of resume writing, interviewing, and looking for job leads. In addition, each of the military services has also developed its own program of transition assistance. The most advanced of these is the Army's. The Army also faces the largest cut (50 percent of all reductions).

Benefits available to service people will include generous severance pay for those serving more than 6 years; like civilians, veterans will also be eligible for up to 26 weeks of unemployment compensation. In addition, more than 70 percent of service men and women have Montgomery GI Bill educational benefits. The GI Bill can provide up to $25,000 of tuition assistance. Many service members will also receive transitional health care and relocation benefits. Military personnel, unlike most defense industry workers, will have about 180 days of notice before being separated from the services.

While it is too soon to assess the success of the transition services offered by the military, the basic programs appear to be more accessible and complete than adjustment programs for displaced defense industry workers. The larger cost of the drawdown may be borne by those who will not be able to join up in the future—a genuine loss of opportunity for minorities and disadvantaged young people. This is also a loss to society, unless comparable training/education/upward mobility opportunities are created in other ways.

DEFENSE-DEPENDENT COMMUNITIES

The number of State and local economies that are highly dependent on defense spending is not very large. Assuming that the national economy resumes growth at a healthy pace, most U.S. communities will not be seriously affected by spending cuts. However, places like Groton, CT, Bath, ME, and Newport News, VA, where defense has been the community's livelihood, are at risk. Closure of military bases or sharp drops in defense orders could cause real distress, especially in smaller defense-dependent communities. A few larger cities such as St. Louis, where the local economy depends considerably on defense dollars, will also be affected, though probably not to the degree of the smaller

places. Defense cuts could also add to the distress of some cities, such as Boston, that have already lost other sources of economic support.

Without detailed local analysis, it is not possible to pinpoint all the States or communities likely to suffer most from defense cuts. However, it is possible to identify factors that put communities at risk and suggest how economic development programs might mitigate the damage.

A major risk factor is defense dependence: the higher the share of the local economy that rests on military spending, the greater the vulnerability. As discussed above, the less-than-robust competitive condition of the U.S. economy adds vulnerability at the national level and may make recovery more difficult for affected communities now than in the post-Vietnam era. Factors that reduce vulnerability are a large, prosperous, and diverse local economy, as well as a growing national economy. Gradual reductions in defense spending over several years, as well as plenty of advance notice to affected communities, make the impacts more manageable.

Because per-capita defense spending is three times greater in metropolitan than in rural areas, larger cities are likely to bear most of the brunt of the cuts, and that is a hopeful sign. To the extent that defense cuts occur in crowded, expensive metropolitan areas such as Long Island, Los Angeles, and Washington, DC, and not in rural areas or slow growing cities, overall adjustment will be easier. In fact, lower defense spending in congested metropolitan places can have some offsetting effects by reducing the pressure in an overheated economy, stemming immigration, and possibly encouraging some outmigration. It can reduce relative business costs (e.g., rents, wages) and improve local quality of life (e.g., lower housing costs), which in turn can make recovery easier.

While any defense spending cuts can cause dislocation, fears of disruption from military base closings are often exaggerated. In fact, military base closings are likely to be easier for communities to tolerate than equivalent cuts in defense production or R&D. Military bases are usually less interconnected with local economies than defense manufacturing firms or R&D facilities, because they tend to buy less from local suppliers. The impacts on the local employment rate are less since most military people (and some civilians) from closed bases are transferred to other facilities and do not add to the rolls of the jobless locally. Finally, while the closure of a few bases could cause significant local impacts, the effects will be minor in most cases. The majority of closures in the first round will involve virtually no job loss. In fact, 52 of 91 facilities to be closed are stand-alone housing units. There are 3,800 DoD installations in the United States; 173 are slated to be closed or cut back in the two rounds. About 55 communities can expect more than minimal impacts from the closures. In 24 of these, jobs at risk at the base represent more than 1 percent of local employment. In seven of the communities, 2 to 8 percent of local jobs are at risk, and in six, 11 to 21 percent. On the other hand, some metropolitan areas whose economies are strong and diversified may actually benefit from using for other purposes the land these military facilities relinquish.

Reuse of closed bases for new civilian activities can create new jobs. However, the process can take time, especially if planning and redevelopment are delayed. Certain Federal policies and practices could threaten an early start. A critical element in successful reuse is prompt disposal of land, but disposal of base property can be cumbersome. There are legal obstacles (e.g., other claimants besides the local community, including Federal agencies and representatives of the homeless, have to sign off first); also DoD may not be fully aware that prompt disposal is important to community economic health. Another potentially more serious problem is that pollution at some bases could make civilian reuse difficult. Most DoD facilities have environmental problems, some so bad that they may be beyond remediation. Current law is unclear as to whether reuse of the nonpolluted part of the property can begin before a base is completely cleaned up. Environmental difficulties are already obstructing the transfer of several bases slated for closure.

Despite mitigating factors, some communities are very likely to suffer economic distress from the defense build-down—rising unemployment and outmigration, an eroding tax base, and underused public and private investments. Federal, State, and local economic development programs can soften the blow. But weaknesses in the funding, organization, and strategic orientation of these programs limit what they can accomplish.

Federal economic development and infrastructure programs played a significant role in helping defense-dependent communities adjust to the post-Vietnam

defense build-down. Today, States and communities cannot expect more than minimal assistance from this quarter. Federal programs are simply no longer funded at levels adequate to provide much meaningful help. Depending on how it is defined, Federal funding for economic development declined by 60 to 90 percent in constant dollars from 1978 to 1991. While the $50 million appropriated by Congress in 1991 for community adjustment to defense cutbacks is a significant increase, funding is still less than it was in the 1970s. Moreover, 1 year after Congress legislated that DoD transfer $50 million to the Economic Development Administration (EDA) for community adjustment, the funds still had not been transferred. If the build-down proceeds rapidly and if national economic growth remains sluggish, the resources for community adjustment will certainly fall short of what is needed.

A bright spot for communities is DoD's Office of Economic Adjustment (OEA), whose job is to coordinate a Federal response to community disruption brought about by military cutbacks. OEA provides communities with both technical assistance and grants for economic development plans. Staffed by competent professionals, OEA usually responds quickly and flexibly. However, OEA support stops at the preparation of plans. Many communities have a harder time with the next step of implementing the plans.

The EDA's Sudden and Severe Economic Dislocation (Title IX) program is the main Federal source of financial help to communities affected by defense cuts. Delays in releasing what funds are available and administrative inflexibility compound the general insufficiency of funds. Communities often wait a long time for approval of an EDA grant and meanwhile miss the chance to get a vital early start on efforts to stimulate economic recovery. Because it is impossible to predict which communities will be most affected by reductions in defense spending, and when it will happen, rapid, flexible response is particularly important.

With the shrinkage in Federal programs, the mantle for economic development has passed to the States and localities. Many of them have put in place aggressive economic development programs and strategies, including business finance, manufacturing modernization, technology development, management assistance, and export programs. However, the increased State and local activism has not fully compensated for the decline in Federal support. Nor are all States and cities so activist; some have well-funded, well-designed, and innovative programs, but others do not. Recent budget difficulties in States and cities have made matters worse. Many of the State and local efforts, including some of the best, are being cut back or eliminated in the face of budget crises.

Two additional factors make economic development efforts less effective than they could be. First, despite widespread recognition that industrial recruitment or "smokestack chasing" is a zero-sum game, many cities and States still play it. At a time when, more than ever, States and cities need to invest in infrastructure, education, and programs for improving manufacturing competitiveness, they often find themselves caught in a self-defeating race to see who can provide the biggest subsidies to companies considering moving. Worse, economically distressed areas are not the only ones bidding for firm relocations. Communities that are quite well off also compete, making it more difficult for those hurt by defense cuts or other blows to their economy to attract needed industry.

Another serious shortcoming of some public economic development programs is too much focus on financial incentives that reduce short-term costs of business, instead of services that help manufacturing and technically oriented service firms develop new products, increase productivity and quality, and find new markets. Costly business subsidies are not aimed directly at improving competitiveness. Industrial service programs are.

Some States and cities have recognized these weaknesses and are taking steps to improve their efforts. A new model of economic development is emerging. It provides a full range of industrial services to manufacturing and technically oriented service industries, including training for workers and managers, selection and use of modern equipment, support for product innovation, marketing, financing, and promotion of cooperative industrial networks. Often the services are provided by intermediate nongovernmental organizations that have the specialized knowledge needed to work effectively with particular industries. Business organizations are often active players in designing, funding, and operating these services. An important feature is access in one place to the range of services. Too often, governments establish separate programs for

various business needs (e.g., financing, marketing, technology). Firms must then be adept at locating the right agency, whether at the Federal, State, or local government level—or perhaps in a university—to find the help they need.

Another important feature is to target economic development programs to the kinds of enterprise that are basic to the local economy, that create economic activity and jobs in other sectors (i.e., have a high multiplier effect), and that sell goods and services outside the local community. For example, a manufacturing plant or a service enterprise that sells to more than local customers would get more support than a mom-and-pop dry cleaning plant. Most public economic development programs, particularly at the Federal level, are not targeted to industries that generate added economic activity.

Given the problems and weaknesses of economic development programs, how well have they worked in the past? Are they likely to lessen distress from defense spending cuts in the future? While little systematic work has been done on their effectiveness, informed opinion and anecdotal evidence indicate that the programs do make a difference but cannot by themselves revive a stalled community economy. Local communities in serious economic trouble require other favorable factors working together—most importantly, a growing national or regional economy. However, economic development programs can surely work better if they are funded adequately and the money is spent on genuine services to industry rather than on subsidies to recruit firms or incentives to lower business costs.

DEFENSE COMPANIES

Defense companies are facing serious long-term adjustments. In constant dollars, defense outlays were higher in the 4 peak years of the 1980s than in any 4-year period of the Vietnam or Korean Wars. Although defense spending as a share of GNP never reached the heights of those earlier wartime periods, DoD sales in the 1980s were fully as significant to companies doing military business as at any time since World War II.

Declines in defense spending are now cutting deeply into programs that defense companies expected to sustain them for years to come. These cuts are threatening the stability, perhaps the existence, of some defense contractors. This raises concerns that a weakened industrial base may not be able to meet future defense needs. OTA is addressing these national security concerns in a companion assessment; this assessment is concerned with issues related to defense companies from the standpoint of the civilian side of the economy.

On the civilian side, the chief worries about the survival of defense companies include effects on jobs, communities, and technologies that could support commercial competitiveness. Effects on jobs are already evident, with tens of thousands of layoffs by defense companies in 1990-91. Some communities are feeling the pinch, especially where defense cutbacks aggravate the effects of recession.

The other major concern about defense companies is that if they shrink drastically or close down R&D facilities, valuable experience and technologies will go with them. The huge amount of defense spending in the past four decades has resulted in some remarkable advances in commercial technologies, though there is some evidence that benefits to the civilian side have slowed in recent years. Even though military R&D and production may not be efficient or reliable sources of commercially important technologies, they have had beneficial effects through sheer size. If labs close down, production lines stop, and teams of people disappear, the tacit technological knowledge those teams possess can disappear, too.

The strategies of major defense companies in the face of spending cutbacks are considered here from the perspective of jobs, communities, and technologies. A major question is the potential for conversion in both large and small defense companies—that is, replacing lost military business with commercial business in ways that use the current work force and develop commercial applications for military technologies. Some of the implications of companies' adjustment strategies are touched on only briefly here, and are reserved for a later report. The potential for redirecting technological resources—including those that defense companies possess—from military purposes to dual use or strategic commercial applications will be the subject of a second and final report in OTA's assessment of Technology and Economic Conversion.

The Outlook for Major Defense Companies

The top defense companies, in terms of the dollar amounts of DoD prime contracts they receive, vary greatly in their dependence on government sales.

Some, like General Dynamics, Grumman, and McDonnell Douglas, count on DoD for over half their sales. Another group, including Martin Marietta, Raytheon, and Lockheed, are heavily dependent on the government for their sales, but their major customers include other agencies besides DoD—notably NASA and the Federal Aviation Administration. Still others are diversified commercially, counting on the defense for less than one-third of their sales; this group includes United Technologies (the parent company of the aircraft engine manufacturer Pratt and Whitney), Boeing, and Rockwell International. A final group is made up of large firms that are fundamentally commercial but maintain defense divisions; among them are General Electric, Westinghouse, General Motors, IBM, GTE, and ITT.

From the community and workers' point of view, however, this description is misleading. Defense dependence at the corporate level gives an idea of the vulnerability of the company, its managers, and its stockholders to defense cutbacks, but it does not accurately portray the impacts on jobs in particular communities. For example, General Electric as a corporation is low in defense dependence, but its aerospace division is essentially a defense company. When GE Aerospace employment drops from 7,800 to 2,900 in a town like Pittsfield, MA, with its population of 50,000, the community effects are just as devastating as if a whole defense company had gone out of business.

Most large defense companies see two principal options: one is to stay concentrated in defense and the other is to broaden out into the civilian economy. Most companies are following more than one of the strategies outlined below, although they may single out one as their main choice.

Companies that decide to stay concentrated in defense may have to shrink substantially, laying off workers and getting down to a smaller core defense business. They may also try to increase military exports, as part of their overall plan to adjust to lower levels of U.S. defense spending. Although international competition for defense markets is intense, the superior performance of American weapons in the Persian Gulf War has increased foreign demand for them. A policy allowing increased export of U.S. weapons might help a few of the larger defense companies maintain profits in the short run, but it would also increase the risk of proliferating advanced conventional weapons and the associated military technologies.[40]

If the option chosen is greater activity in the civilian economy, one alternative is to diversify at the corporate level through purchase of going concerns that already sell commercial products. An option in the aircraft business, and perhaps a few others where military and commercial products have much in common, is to switch resources into making the commercial product. The potential for this kind of switch is probably greater with subsystems and components than with end products, though much depends on the companies' marketing abilities. Some firms, figuring they know how to deal with the government, are pursuing nondefense government agencies as customers for systems and technologies originally developed for the military. Not part of company plans, but an interesting possibility from the standpoint of technology transfer, is the startup company formed by a few entrepreneurs peeling off from R&D labs of large defense firms, to exploit technologies of military origin for commercial markets. The option that comes dead last, in the estimation of most large defense companies, is what is usually termed conversion: that is, the company itself develops a new commercial product line that makes use of plant, equipment, work force, and technological know-how formerly devoted to military products, and lines up the financing and marketing needed to make large-scale production viable.

The main reason defense companies give for reluctance to venture into commercial production is the great differences in company practice and culture between defense and commercial business. Most large defense contractors that assemble complex weapons systems or make major subsystems are geared to low-volume production of highly specialized, expensive equipment. In designing the equipment, the main emphasis is on technical performance. In contrast, many commercial products have to combine reliability and affordable cost with high-volume manufacture. The DoD practice of imposing rigid, detailed specifications and standards throughout procurement further exaggerates the differences. Still more pervasive are different management prac-

[40]For a discussion of the international arms trade, see OTA's recent assessment, *Global Arms Trade: Commerce in Advanced Military Technology and Weapons*, OTA-ISC-460 (Washington, DC: U.S. Government Printing Office, June 1991).

tices. These are, in large part, a response to close government supervision, which involves detailed recordkeeping and frequent reviews and audits—and criminal liability for failure to comply with the government requirements. The reason for requiring such detailed oversight has been the government's concern to prevent fraud and waste of the taxpayers' dollar. But it does add to the differences in commercial and defense company culture, requiring a different outlook and abilities in managers and officers. And it creates high overhead expenses that are passed along to the government, but would be a heavy burden in commercial markets. An important factor beyond all this is that commercial marketing and distribution are alien to defense companies and divisions. Finally, many defense companies are burdened with a heavy load of debt. They are not in financial condition to launch risky new enterprises.

The record of defense companies' attempts at conversion in the 1970s is not quite the unmitigated disaster that is often portrayed. There were some modest successes, especially in technological innovations. There were also some large technological failures, as aircraft companies ventured into the unfamiliar but seemingly simpler businesses of making light rail cars and buses. It proved harder than it looked. Another significant factor was the different demands on managers in a commercial versus a defense business, including both manufacturing and marketing know-how. Finally and importantly, the companies' difficulties were compounded by shifting government policy. For example, after a few years' experience, Boeing managed to correct the technical problems that originally plagued its light rail cars; Boeing-manufactured cars are still giving satisfactory service in Chicago and San Francisco. But when the Federal Government first drew back from a policy of promulgating uniform national standards for light rail cars and then, in the early 1980s, sharply reduced support for mass transit, the long-term prospects for light rail cars took a nosedive. At the same time, the government's vastly increased orders for military hardware promised greater profits in that direction.

The fact remains that many defense companies have developed technologies for military use that they recognize as possessing commercial, or at least nonmilitary, promise. The easiest move is into nondefense sales to governments. Also, it is more feasible to move into products, as well as markets, that the defense companies know best. Two kinds of products that seem promising are information management systems and monitoring systems that rely on remote-sensing devices. The latter might find application in environmental programs, as well as in security systems. In addition, defense technologies that have achieved high performance in hostile environments might find uses by commercial companies that operate under similar conditions (e.g., in the deep sea, the desert, or polar regions).

The same factor, product similarity, also makes it feasible for many companies in the aircraft business to shift from military to commercial work. None of the dedicated defense companies that do final assembly of military airplanes plan to become full-scale commercial airframers but all are doing subcontract work for the commercial companies or plan to do so. Some have gone into repair and rework of commercial aircraft on a fairly large scale. At the subsystems and components level, the opportunities to shift to the commercial side are still greater.

What major defense companies are reluctant to do is embark on large-scale production of big hardware systems with which they have no familiarity—e.g., subway cars. The transit business was frustrating to aircraft companies in the 1970s not only because of their technological and management inexperience, and consequent false starts or failures, but also because of inconsistent government policy. However, there could be a new opportunity in the 1990s for defense companies to use their technical expertise in developing some challenging new transportation technologies—electric vehicles, "smart" cars and highways. In California, the State government's strong support for developing these technologies makes the prospects more attractive.

Small Business and the Defense Industry[41]

Many large companies in the defense business can expect to survive cutbacks, though perhaps at the cost of brutal downsizing. Many smaller companies face just two choices: get more commercial business or go under. Not only the motivation but also the opportunities for switching over may be greater for small firms, which typically make parts and components, than for large prime contractors whose

[41] A small business is defined as one that is independently owned, is not dominant in its field, and has no more than a specified number of employees (500 to 1,000, depending on the product). For service companies, the criterion is dollar volume of sales.

business is assembling big ticket items such as tanks or missiles. Machine shops, for example, regularly use the same tools and processes to make metal parts for trucks as for tanks.

Although information about small defense companies is limited, it appears that they supply a significant share of DoD purchases of goods and services. Roughly one-third of the total DoD buys from private businesses, directly through prime contracts and indirectly through subcontracts, comes from small business.[42] There is also evidence that most small defense firms have both military and commercial customers. It seems reasonable to expect that these small companies are in position to increase their commercial sales. In these small firms, the managers and work force, very often the production equipment, and sometimes the product itself are the same for military and commercial customers. Unlike larger companies that have both defense and civilian business, small companies rarely have separate defense divisions. Small metalworking companies, in particular, are inherently dual use.

While it may be technically feasible for these companies to substitute commercial work for declining defense contracts, it is not necessarily easy. There may not be enough commercial work to go around. Aside from this difficulty, many small companies prefer commercial to defense business. The owner of one small metalworking shop explained that there is no loyalty in DoD contracting and little repeat business, which means there is a new learning curve on each order, which in turn lowers profits. DoD business also involves waste of time—in waiting for contracts, waiting for clarification of drawings, extra paperwork, and the incredible detail of military specifications, down to packaging. With commercial customers, the shop can develop long-term relationships and trust, take orders or ask for clarifications over the phone, and get orders for many different parts or long runs of particular parts without going through new bids and competition.

The main worry of most small to medium-size defense firms in shifting to more commercial business is in sales and marketing. Those who have succeeded have indeed made vigorous efforts to sell to new customers, including hiring a new sales force with experience in the commercial world. But efforts did not stop there. Successful companies also had to improve productivity and lower costs. In some cases, this was achieved by a new management style based on improved worker training and labor-management collaboration.

Several government programs that are designed to assist small business generally could be suitable for helping small defense firms expand their commercial business—notably, technology extension and other kinds of technical assistance.[43] The contribution technology extension can best make to small firms is not so much state-of-the-art products straight out of the R&D lab, but rather acquaintance with best practice in manufacturing. In addition, these firms can make good use of financial, marketing, and product development assistance, especially if these services are provided in a one-stop center. States are the chief providers of this kind of assistance (the Federal program of technology extension to small manufacturers is still very small and new), but few offer a broad, integrated, well-funded range of services.

POLICY ISSUES AND OPTIONS

Several Federal programs are in place to help workers and communities adjust to economic disruption, and a few exist to help companies improve their competitive performance. These programs can be extended to help workers, communities, and companies affected by defense spending cutbacks; in fact Congress has already earmarked extra funds for defense-related adjustment efforts. But the programs

[42]Small and medium-size firms ("small business") received 19 to 20 percent of DoD prime contract awards over the past decade. Complete figures on subcontracts are not available, but it appears that subcontracts bring the total for small business to about 35 to 37 percent. See ch. 7.

[43]Two recent OTA reports, *Making Things Better: Competing in Manufacturing*, OTA-ITE-443 (Washington, DC: U.S. Government Printing Office, February 1990) and *Competing Economies: America, Europe, and the Pacific Rim*, OTA-ITE-498 (Washington, DC: U.S. Government Printing Office, October 1991) discuss in some detail options for improving technology diffusion to small and medium size manufacturers. They also discuss broader options for improving competitiveness of U.S. manufacturing, including options to improve the U.S. financial environment for long-term investments in new technologies and modern production equipment; to upgrade education and training of American managers, engineers, and production workers; and to form industry-government partnerships for R&D in commercial technologies that are risky or long-term but have the potential for large public benefits. *Competing Economies* also considers options for creating a new governmental body that, in collaboration with industry representatives, could develop and supervise a strategy for raising U.S. competitiveness. A strategic approach would coordinate the financial, human resource, and technology policies mentioned above, together with trade policies where appropriate, to foster the growth and survival within the United States of industries that create well-paid jobs and advance knowledge.

need improvement in quality, reach, and resources if they are to be effective in easing the transition to a more commercially oriented economy.

State and local agencies run the day-to-day operation of federally funded programs for displaced workers. Their performance is highly uneven. A few do an excellent job, many fall considerably below that level, and some do very little at all. Strong Federal efforts are needed to help bring the performance of the average State program nearer to the level of the best. A signal weakness of many displaced worker programs is failure to respond promptly to calls for help. While current Federal funding for the displaced worker program is generous compared to levels in the past, the 1990-91 recession has increased needs for services and is straining many States' ability to react.

The main Federal economic development programs—located in the Commerce Department's Economic Development Administration (EDA)—have been starved for funds and repeatedly threatened with extinction for the past decade. They may now lack the institutional know-how to offer effective help to defense-dependent communities. They are certainly underfunded compared to the post-Vietnam era, despite recent increased appropriations from Congress.[44] In the past decade, many States and communities took over responsibility for aggressive, innovative economic development programs, but not all have done so. Today, some of the best are slashing their programs because of budget crises.

Defense companies that want to convert to more commercial production could benefit from government programs that offer technical assistance for manufacturing modernization, better marketing, improved management, and possibly financial aid to acquire up-to-date production equipment. Some government programs of this kind exist, mostly targeted to small and medium-size manufacturers. They could offer real help to defense companies in conversion efforts, as well as improving competitiveness among manufacturing firms generally, if they were widely available. They are not. Federal programs for this purpose are small and new, though Congress has shown considerable interest in expanding them. Programs at the State level are a bit more numerous and experienced but are nevertheless scattered and underfunded. Once more, States' performance is uneven.

Some of these programs can give a real boost to economic performance, growth, and prosperity. Some, however, are mainly reactive. They apply band-aids. And the band-aids have been applied repeatedly in the past decade, as American industry struggled to meet increasingly adept foreign competition. There are other, more proactive choices.

In the post-Cold War era, there are some signs that a new national purpose is taking shape, based on a redefinition of national security to include excellence in economic performance, the provision of a comfortable and rising standard of living for all Americans, and renewed leadership in a more peaceful, prosperous, democratic world. Several new national initiatives could contribute to this purpose. One might be a strong commitment to environmental protection and cleanup that would also promote an internationally competitive environment industry. Another could be rededication to top quality education and training so that our managers, engineers, and workers are equal to the world's best. A third possibility is restoration of a first-class transportation and communication infrastructure, including support of advanced technologies such as electric cars.

This report focuses mainly on adjustment programs and policies. Discussion of new national initiatives that could generate new technologies, spur the formation of new enterprises, and contribute to greater industrial competitiveness is reserved for the final report of this assessment. Adjustment programs can help displaced workers find better jobs sooner than they might on their own; they can help keep distressed communities from falling into a downward spiral; and by working with firms on adoption of best-practice technologies and new product development, they can make a real contribution to improving American industrial competitiveness. But they are not the whole story. It takes a wholehearted national effort in everything from public school education to technology partnerships between government and industry to grow the knowledge-intensive, wealth-creating industries the Nation needs to strengthen its economic security.

[44]In fiscal year 1978, total funding for EDA was $957 million (1990 dollars) and in fiscal year 1990, $216 million. EDA's principal program for economic development aid to distressed communities (Title IX) was funded at $137 million in 1978 (1990 dollars) and at $48 million in 1990. The regular Title IX appropriation for 1990 was $24 million, but Congress provided an extra $24 million to help communities damaged by Hurricane Hugo.

Displaced Defense Workers

The federally funded EDWAA program is the main source of reemployment and retraining help for workers displaced from defense industries, and is also open to displaced DoD civilian workers and ex-members of the armed forces. Building on nearly a decade of experience, the EDWAA program has inched upward in the proportion of displaced workers served and has a respectable record of placements for participants. A major failing of the program has been and continues to be uneven quality from one State to another. Federal program managers cannot solve this problem alone. The law gives much of the responsibility to States and localities. But it is up to DOL managers to make stronger efforts than they have so far to collect information from the best-run State programs, share it with the others, urge and help the average State to do better, and strive to make relationships with State EDWAA officials collaborative, not adversarial. Regular, structured meetings at the regional level could help to make Federal technical assistance effective. *Congress may wish to encourage these efforts* through oversight.

Rapid response is the problem most in need of attention. All the States need to understand that rapid response means genuine delivery of services as soon as possible in one well-located center—not a single visit by a State official telling workers where to go to apply for unemployment insurance. Congress might consider requiring States to report on how quickly they arrange for these services to be provided after notice of layoff. This would help to identify States that are doing poorly and need help or incentives to improve, and those that are doing well enough to serve as models.

Another approach is to encourage faster and more flexible responses by DOL to proposals for EDWAA discretionary funds, which the Secretary of Labor controls—especially since all the extra $150 million earmarked for displaced defense workers is in these discretionary funds. One option would be to direct that DOL allow State and local agencies to pay themselves back from these funds, if and when granted, for money they have advanced up front for rapid response. Also, Congress may wish to encourage DOL to simplify the requirements for proposals for discretionary funds.

Congress might revisit the issue of training. The 1988 amendments to EDWAA require that every project spend half its funds on training (unless, in specific cases, the State Governor reduces the requirement to 30 percent). The amendment has the laudable purpose of encouraging training, but it does reduce project flexibility and may be counterproductive in projects serving professionals and managers. (Defense industry layoffs so far have included a relatively high proportion of engineers and related professionals; many of them do not want or need retraining.) Yet while both the law and DOL insist on the primacy of training, DOL policy discourages the use of EDWAA funds to improve a worker's skill in his or her same occupation, if the worker already possesses marketable skills. This could affect both professionals and blue-collar workers who want to take advantage of EDWAA-funded retraining to improve their skills, their appeal to employers, and their earning power. It is not only hard on the individual worker involved, but could defeat the purpose of providing a more adept and highly skilled work force to U.S. industry and thereby improving competitiveness. Congress might wish to state explicitly that EDWAA funds may be used for displaced workers to upgrade their skills.

Many of the options to improve EDWAA services for displaced workers in general apply equally to engineers (e.g., rapid response). Displaced engineers' retraining needs are often special, however. As noted, many engineers have salable skills and don't want retraining. On the other hand, meaningful training for the engineers who want it could take an inordinate share of an EDWAA project's budget. Government-sponsored retraining for engineers might be designed specifically for them, especially since there is a long-recognized but often unmet need for continuing education for engineers, whether or not they are displaced. Congress might wish to consider adding other government sources besides EDWAA for engineers' training. For example, the National Science Foundation might provide grants and scholarships for continuing education for engineers; or something like the 1950s-era National Defense Education Act might be revived to pay tuition for displaced or retiring engineers who want to teach math or science in public schools.

Congress might also want to consider the option of providing Federal support for retraining workers who are currently employed in defense companies. Managers, engineers, and production workers might

all benefit from training in technologies and skills that are needed in commercial production. In general, EDWAA funds can be used only for workers who are laid off or have received notice of layoff, but a portion of the extra $150 million that is earmarked for displaced defense workers can be used in demonstration projects for training of active workers; Congress might wish to encourage DOL in such a project.

Another aspect of EDWAA as amended in 1988 might be reexamined by Congress. The law requires that 60 percent of the EDWAA funds allocated to each State be further allocated to substate areas, with substate grantees in charge of running the local programs. Very often, States appoint as substate grantees Service Delivery Areas (SDAs), which are responsible for the larger JTPA employment and training program for low-income and disadvantaged people and often have little experience dealing with displaced workers. The mandatory allocation system has had only a 2-year trial so far. Through oversight, Congress might wish to examine how it is working in several respects: 1) Does it splinter the States' EDWAA funds into such small portions that it is hard to create viable entities? 2) Does it deprive States of the flexibility needed to respond to unforeseen displacement? and 3) Are SDAs generally the right service providers for displaced workers, or should States look further for grantees?

Finally, Congress may wish to keep a close watch on EDWAA funding to see whether the present funding, even though generous by the standards of the past, is adequate. The recession has already presented many States with more demands for services than they can meet. Furthermore, as programs improve—especially if rapid response becomes more widespread—demand for services is likely to rise. The difficulty of predicting when demands stemming from defense reductions will be at their greatest underscores the importance of keeping an eye on adequacy of funding. Multiyear funding, as Congress provided in the DoD appropriations for services to displaced workers and distressed communities, are especially useful when the timing of maximum impacts is so uncertain. Equally important is streamlined program administration that will allow these funds to get out quickly to the States and localities where they are needed.

Defense-Dependent Communities

Federal funding and institutional capacity to help communities recover from economic losses is at a low level. Not only is Federal economic development funding itself cut to the bone, compared to the post-Vietnam build-down, but Federal infrastructure programs of the 1970s that had the added effect of promoting community development are gone or nearly so. The Commerce Department's Economic Development Administration, weakened by years of struggle to stay alive, has little ability to originate or carry out innovative programs, and is hampered by inflexibility and delay in responding to communities' calls for help. DoD's small Office of Economic Adjustment (OEA) is fleeter and more flexible, but its services stop with planning; also, it has more experience with military base closings than with defense plant cutbacks or shutdowns.

In October 1990, Congress appropriated an extra $50 million in DoD funds, to be transferred to EDA for economic development assistance to defense-dependent communities in fiscal years 1991-93 (the funds had not yet been transferred at this writing, 1 year later). This is a notable increase over the $12 million otherwise available to EDA's Sudden and Severe Economic Dislocation (SSED) program, but is far short of the resources available in the 1970s.[45] States and localities have put some creative and useful economic development programs in place, but many States are now running short of funds and cutting the programs.

Congress may wish, first of all, to monitor the availability of funds for economic development assistance to defense-affected communities, and consider providing more if needed. Congress may also wish to encourage faster responses to community distress and concentration of limited resources on the most effective measures and the neediest communities. Congress might opt to set deadlines for response to community proposals; or it might allow OEA to give planning grants to defense-dependent communities before plant closings are announced. OEA and EDA could focus efforts on communities with a large proportion of jobs in defense and with high unemployment and low job growth. They could encourage and assist States and communities to target their business development

[45]The SSED program is under EDA's Title IX program, which also includes assistance to communities suffering from longer term decline. The regular appropriation for all of Title IX was about $24 million in fiscal years 1990 and 1991.

assistance to industries that are basic to the local economy, that generate economic activity in other sectors, and that sell goods and services outside the local community.

Because States are now the main actors in economic development efforts directed toward growing new businesses and expanding existing ones, Congress may wish to direct some Federal funds into support of those programs (as discussed below). Also, Federal economic development agencies could be encouraged to collect and share with other States information on the best of these State programs.

Finally, Congress may wish to consider some adjustment in policies related to closure of military bases. Although the communities facing serious problems from base closings are relatively few, recovery in these communities could be difficult, especially if base reuse efforts do not begin promptly. To speed these efforts, Congress might direct or encourage base commanders to work with local communities in rapid transfer of property, possibly vacating sections piecemeal and leasing them on an interim basis. Congress might wish, in a very few cases of exceptional defense dependence, to direct that DoD transfer property to communities at below market prices, or even free. Perhaps the most important obstacle to transfer of base property is interpretation of the law to require environmental cleanup of the entire property before any part of it can be transferred. Congress may wish to allow DoD to transfer portions of bases as they are cleaned up. Also, priority for cleanup might be given to bases scheduled for closure.

Defense Companies

Although some major defense companies consider the strategies they adopt in response to defense cutbacks their business alone, there are possibilities for a constructive government role in the transition of defense companies into more commercial activities. The potential is perhaps greatest for small and medium-size companies. Many already have some commercial customers, but need to shift to more commercial production to survive. Technical, marketing, or financial assistance from government programs can help some small firms make the shift.

As a first step, Congress may wish to add resources and focus to existing programs for technology diffusion that could also help defense companies make the transition to more commercial production. At the top of the list is a Federal-State partnership. Congress might wish to expand significantly the National Institute of Standards and Technology (NIST) program of support for existing State technology extension programs (STEP). So far the STEP program has been limited in scope, with funding never more than $1.3 million a year. The defense authorization act passed by Congress in 1991 provided for a much broader program of Federal support for State technology extension efforts, to be funded at $50 million a year. However, Congress declined to fund the program for fiscal year 1992. Nevertheless, congressional interest in stronger support for technology extension programs for small and medium-size manufacturers appears to be growing. For example, Congress raised the FY92 appropriation for the Federal Manufacturing Technology Centers supervised by NIST, to $15 million from $10 million the year before.[46]

A more comprehensive option would be Federal support for State programs that offer a wide range of services to improve companies' performance, including such things as financial and marketing services, worker training, and projects to generate new technology development, as well as manufacturing modernization. Federal support might be designed to encourage States to provide an array of services in one center (e.g., Pennsylvania's Industrial Resource Centers). Defense companies might be singled out for priority in such programs. Federal funding of about $25 million per year would be enough to help States serve as many as 5,000 to 20,000 defense firms, depending on the level and kind of service.

Another option Congress might wish to consider is technology assistance to help small firms create cooperative networks for purchase of equipment, bids on large contracts, and marketing efforts. Still another would be to form a government purchase and leasing system for modern production equipment, such as computer numerically controlled machine tools or robots. The system could serve two purposes: to be a reliable purchaser of U.S.-made advanced equipment, and a supplier of the equip-

[46]The purpose of the centers is demonstration of up-to-date technologies and diffusion of the technologies to small and medium-size manufacturers; five centers have been established and a sixth will open soon.

ment at subsidized rates to U.S. manufacturing firms, especially small firms. Such a system might be particularly helpful to small defense firms wishing to convert to commercial production, but would also contribute more generally to stronger performance by American manufacturers. The cost to the government of such a program might rise from about $5 million in the first year (assuming a modest beginning) to a few tens of millions per year for a mature program.[47]

Another set of proposals might be useful for defense firms that see possible commercial applications for technologies developed for the military, but are unwilling to bear all the risks involved.[48] A small program for government-industry partnership in generating new technologies already exists (NIST's Advanced Technology Program); Congress increased funding for the program to $47 million for fiscal year 1992, up from $36 million the year before. Another idea is to found regional Critical Technology Application Centers, based around geographic concentrations of firms and supported cooperatively by industry, the Federal Government, State and local agencies, and universities, to help firms commercialize critical technologies.[49] Still another proposal is to establish companion government-industry cooperative programs in the Departments of Defense and Commerce to develop commercial applications of defense companies' military technologies.

Congress might wish to give tax breaks to defense companies converting to commercial production, possibly in the form of a tax credit for R&D to develop commercial products, or as accelerated depreciation for investments in new production equipment. There is some question about the efficacy of such tax measures, and they are certainly expensive—especially tax incentives for investments in new equipment.[50] The problem of expense is aggravated in a time of towering budget deficits. However, the relatively high capital costs paid by American manufacturers are a distinct competitive disadvantage; U.S. firms generally would benefit from lower capital costs, to stimulate long-term investments in new technologies and equipment. If Congress wishes to consider tax incentives to stimulate long-term investment, the potential benefits from making the incentives broadly applicable are clearer than the benefits from limiting the incentives to conversion by defense companies.

There is one kind of tax incentive that might usefully be targeted to defense companies. Defense companies that do not want to enter commercial production themselves might still be encouraged to help entrepreneurs do so. Congress might consider giving favorable tax treatment to investments by large companies in startup companies formed for the purpose of developing commercial applications of military technologies; for example, the large company might be allowed to deduct such investments from taxable income. Alternatively, the same tax treatment could be available to any large company that provides financial assistance to a small entrepreneurial spinoff company, whether or not the technology involved was originally military.

Finally, Congress might direct DoD to abolish its requirement that companies pay the department back for what it spent on a military technology if the company develops the technology commercially and sells the product to a non-DoD customer. Nothing in law specifically requires DoD to demand a payback under these circumstances. The requirement is inconsistent with laws that encourage granting private companies intellectual property rights to technologies developed in Federal laboratories, and is an impediment to commercialization of military technologies. DoD's insistence on control over data rights related to development of military technologies and systems could also be a barrier to commercialization. Congress may wish to encourage DoD to work with industry on a settlement of this issue in ways that protect legitimate government interests but also allow companies to keep data rights secure, so that commercialization of the technology is more appealing.

---

[47]A similar program in Japan leased or sold (on preferential installment purchase terms) $350 million of equipment in 1987. Assuming that the government paid 20 percent of that cost, in subsidies and administrative expenses, the government cost would be $70 million a year.

[48]For further discussion of this subject, see OTA, *Making Things Better*, op. cit., *Competing Economies*, op. cit..

[49]The Defense Authorization Act authorized $50 million for Critical Technology Centers, but the conference committee on appropriations declined to fund the program.

[50]OTA, *Making Things Better*, op. cit., chs. 2 and 3, and *Competing Economies*, op. cit., ch. 2, discuss the financial environment for long-term capital investments in the United States, comparing it to the more hospitable environments of Japan and Germany. Both reports discuss several options for improving the U.S. environment (including tax incentives).

Chapter 2

Policy Issues and Options

Contents

	Page
INTRODUCTION	39
DISPLACED DEFENSE WORKERS	41
DOL Supervision of, and Assistance to, State and Local Programs	42
Rapid Response	42
Training	43
Effective Allocation of EDWAA Funds	43
Unemployment Insurance	44
Retraining of Active Workers	45
Funding	45
Civilian Employees of the Department of Defense	46
Engineers	47
Veterans	48
DEFENSE-DEPENDENT COMMUNITIES	48
DEFENSE COMPANY ADJUSTMENT	51
Government Programs for Technology Diffusion	51
Government-Industry Partnership for Technology Development	53
Tax Incentives for Conversion	54
Intellectual Property Rights and Development Cost Recoupment	54

Chapter 2
Policy Issues and Options

INTRODUCTION

Several Federal programs are in place to help workers and communities adjust to economic disruption, and a few are designed to help companies improve their competitive performance. These programs can be extended to serve workers, communities, and firms hit by defense spending cutbacks; in fact Congress has already earmarked some extra funding for defense-related adjustment efforts. The major policy questions are whether existing programs are appropriate for meeting adjustment needs in the post-Cold War period, and if so, whether they are big enough and good enough.

Defense-related adjustment for workers and communities is not very different from adjustment to other disturbances and dislocations. Communities that suffer from defense cutbacks share many of the same problems as those hit by structural change in the civilian economy, and economic development efforts work in much the same ways for both. Affected defense workers differ somewhat from the general run of displaced workers, as they are more likely to be engineers or skilled technicians; existing programs for displaced workers may need some rethinking to meet their needs. For the most part, however, entire new Federal programs targeted to these new users are not necessary. What is needed is improved performance of existing programs and possibly some increased funding.

State and local agencies do most of the actual operation of federally funded programs to assist displaced workers. The Federal role is mainly to guide, help, and require these agencies to adopt best practice, but performance of the Federal role is often disappointing. Stronger efforts are needed to bring the average State program up to the level of the best. In particular, Federal managers could hammer home the importance of early action in response to calls for help.

Federal economic development programs, starved for funds and repeatedly threatened with extinction during the past decade, may now lack the institutional capacity to offer effective help to defense-dependent communities. They are certainly underfunded compared to the post-Vietnam War era, despite recent increased appropriations from Congress.[1] In the past decade, many States and communities took over responsibility for aggressive, innovative economic development programs. But today, some of the best are slashing their programs because of budget crises.

Most of the major defense companies are quite unlike the commercial companies that compete in the civilian economy. After four decades of Cold War, they have developed a different culture. Some have announced they have no plans or desire to substitute commercial production for declining military orders, and others may find it difficult to manage. Nonetheless, some of the big defense companies have taken initial steps to get into civilian markets. Many smaller companies already produce for both commercial as well as military customers and would like to do more on the commercial side. They could benefit from government programs that offer technical assistance for manufacturing modernization, better marketing (including exports), improved management, access to financing, and possibly financial aid for conversion to efficient commercial production.

Some government programs to improve the competitive performance of manufacturing firms already exist; most could be useful to defense firms wishing to convert, although these firms may need some extra, specialized assistance. As matters stand now, Federal programs to improve manufacturing performance are few, small, and inexperienced. However, congressional interest in expanding and supporting such programs is definitely on the rise. More programs exist at the State level, but they vary greatly in range and quality. A few States do an excellent job, but many do much less and some that were formerly outstanding are now cutting back their programs because of severe budget troubles. Because community economic development and technical assistance to firms are so closely linked (often they are identical), management of federally funded programs in these areas needs to be closely coordinated.

[1]Depending on how it is defined, Federal funding for community economic development dropped 60 to 90 percent in real terms from 1978 to 1991.

Altogether, adjustment assistance for workers, communities, and companies affected by the defense build-down will take the combined efforts of Federal, State, and local governments. The Federal displaced worker program is designed as a cooperative one with States and localities, and most of the existing community economic development and industrial extension programs are at the State and local level. But this does not mean that the Federal Government can abdicate responsibility for adjustment assistance, leaving it to States and local communities. National security needs are the responsibility of the whole Nation. When those needs change in ways that affect the livelihood of communities and citizens, help with the transition is also a national responsibility. The cost should be supportable. Adjustment programs for workers and communities affected by the defense build-down might cost an additional $100 million per year in Federal funds; the extra cost of including defense companies in Federal programs for technology diffusion and generation is hard to estimate but probably should be no greater.[2]

Some adjustment programs—especially those that help companies adopt improved technology or help workers better their skills—can give a real boost to economic performance, growth, and prosperity. Some, however, are mainly reactive. They apply band-aids to the nicks, cuts, and more serious injuries delivered to various parts of the economy by imports from capable and aggressive trading partners; by clean air laws that threaten high-sulfur coal users and endangered species laws that halt logging of old-growth Western forests; by agreements that open U.S. markets to lower-wage neighbors (the Caribbean countries and Mexico); and by steep cuts in big defense budgets that are outmoded in a post-Cold War world. Are there other options besides a proliferation of band-aids? Clearly, delaying defense cutbacks simply because they threaten job loss or community disruption is not one of them. Defense is not a jobs program. But there are other, more proactive choices.

For 40 years, Americans were united in an overriding national purpose of resisting communist expansion. There are some signs that a new national purpose is taking shape, based on a redefinition of national security to include excellence in economic performance, the provision of a comfortable and rising standard of living for our citizens, and the restoration of American leadership in a more peaceful, more prosperous, and newly democratic world.

Several new national initiatives might contribute to this purpose. One, for example, might be a strong commitment to environmental protection and cleanup, which would also provide support for an internationally competitive U.S. environment industry. Another could be rededication to top quality education and training, so that our managers, engineers, and workers equal those of our best competitors. A third possibility is restoration of a first-class transportation and communication infrastructure, including repair of worn-out systems, construction of up-to-date new ones, and support for the advance of new transportation technologies (e.g., electric cars).

Defense production, aside from its explicit goal of protecting U.S. military security, offers other genuine benefits to the Nation, the communities in which it resides, and the workers it employs. Compared with the U.S. economy as a whole, the defense sector is research and development (R&D) intensive, has a higher than average concentration of skilled workers, and pays better than average wages. Part of the point of new national initiatives is to foster the creation of new firms and industrial sectors with these same valuable characteristics on the civilian side of the economy.

This report focuses on adjustment problems and policies. Discussion of national initiatives that could spur new enterprises and contribute to stronger economic performance is reserved mostly for the second, and final, report of this assessment—though some of the options considered here (i.e., govern-

[2]These are very rough estimates. At present levels of service, an extra $50 million per year would be enough to serve about 25,000 displaced defense workers per year (see the discussion below). It is more difficult to judge whether an extra $50 million per year would meet the economic development needs of defense-dependent communities. That amount is a big increase in Federal economic development funds; it is about four times what has been available in recent years for *all* communities faced with sudden and severe economic distress, and it would be enough to provide 40 defense-dependent communities per year an average of $1.25 million in community adjustment assistance. Still more difficult to judge is the extra cost of including defense companies in federally funded technology programs. Several proposals in Congress (discussed below) would expand the present small Federal technology diffusion and generation programs to the level of some $200 to $300 million per year; how much of this would be available to defense companies wishing to convert to commercial production is speculative.

ment programs for technology diffusion and government partnerships for technology development) would fit well with new national peacetime initiatives.

The adjustment programs discussed in this chapter can help displaced workers find better jobs sooner than they could on their own; they can help to keep distressed communities from falling into a downward spiral; and by working with firms on adoption of best-practice technologies and new product development, they can make a real contribution to improving American industrial competitiveness. But they are not the whole story. It takes a wholehearted national effort in everything from public school education to technology partnerships between government and industry to grow the new knowledge-intensive, wealth-creating industries that the Nation needs to strengthen its economic security.[3]

DISPLACED DEFENSE WORKERS

Many studies and years of experience have shown that displaced workers benefit from well-run assistance programs, and that the good programs have several key features in common: early action—ideally, early enough to provide comprehensive services by the time layoffs begin; collaborative efforts among the company, the workers, and public agencies; a full range of services to meet differing needs; and well-planned training suited to various workers' backgrounds and abilities.[4]

Some of the State and local agencies that operate the federally funded assistance program for displaced workers do very well by all of these measures, but the majority fall short. The most obvious weakness in programs of various States and localities is that help doesn't arrive soon enough; many workers are disillusioned or dispersed by the time assistance is finally available. Those who miss out are likely to be unemployed longer or settle for worse jobs than they would have with timely, effective help. In solving this and other weaknesses in how displaced worker projects actually operate, one element is better information sharing and guidance from the U.S. Department of Labor (DOL). Some changes in administration of the law, and perhaps in the law itself, may also be desirable.

The big Federal adjustment program for displaced workers, Title III of the Job Training Partnership Act (JTPA), is open to all workers displaced in the defense build-down—people losing jobs in private defense industries, civilian employees laid off from the U.S. Department of Defense (DoD), and veterans involuntarily discharged from the armed forces. The Title III program was created in 1982, and in 1988 was amended and renamed the Economic Dislocation and Worker Adjustment Assistance (EDWAA) program (it is often still known as JTPA Title III). In fiscal years 1991 and 1992 it was funded at all-time highs of $527 and $577 million. Congress also appropriated an extra $150 million in DoD funds to be transferred to DOL and earmarked for services to displaced defense workers in fiscal years 1991-1993.[5] This kind of multiyear appropriation could prove especially useful in the defense build-down, because the consequent displacement of workers could be bunched up rather than evenly spaced over the years, and it is impossible to predict when the greatest impacts will occur.

The JTPA Title III program had some modest success in its first few years (ch. 3), but several interrelated problems became evident. The 1988 EDWAA amendments were aimed at solving them. The main problems were: 1) adjustment services were not provided soon enough after notice of layoff; 2) the program was not reaching enough

[3]Two recent OTA reports, *Making Things Better: Competing in Manufacturing* OTA-ITE-443 (Washington, DC: U.S. Government Printing Office, February 1990) and *Competing Economies: America, Europe, and the Pacific Rim* OTA-ITE-498 (Washington, DC: U.S. Government Printing Office, October 1991) discuss the kind of cooperative government-industry partnerships that promote the growth of knowledge-intensive, wealth-creating industries.

[4]U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Adults*, OTA-ITE-250 (Springfield, VA: National Technical Information Service, 1986), ch. 6, esp. pp. 231-242, and *Plant Closing: Advance Notice and Rapid Response*, OTA-ITE-321 (Springfield, VA: National Technical Information Service, 1986), pp. 12-16.

[5]The full amount may not, however, be made available to displaced defense workers. In 1990, Congress appropriated $200 million in DoD funds to assist workers and communities affected by the defense build-down, $150 million for workers and $50 million for communities, in fiscal years 1991-93. The defense authorization act passed in November 1991 provides that up to $30 million of the $200 million can be transferred to the Small Business Administration for loans to small businesses that suffered "severe economic injury" as a result of the emergency deployment of troops to the Persian Gulf after July 31, 1990. Three-quarters of the $30 million would come from the fund for workers, the other one-quarter from the fund for communities. National Defense Authorization Act for Fiscal Years 1992 and 1993, sec. 1087. The full $30 million may not be granted; the seriously injured small businesses may turn out to be rather few.

eligible workers; and, 3) many States were doing so little for displaced workers that unspent funds were piling up higher every year. Since the 1988 amendments took effect, participation has risen somewhat (from 5 to 7 percent of eligible workers to about 9 percent), and States are spending more of their allocated funds. However, thorny problems remain.

DOL Supervision of, and Assistance to, State and Local Programs

DOL cannot by itself bring up the level of all State EDWAA programs to that of the best. JTPA Title III made the States partners with the Federal Government in the displaced worker program, and the States bear much of the responsibility. However, DOL is in a better position than any one State to collect information about best-practice employment and training efforts and offer technical assistance in applying them. Through oversight, Congress might encourage DOL to operate more as a partner than as an adversary to States—perhaps by forming a Federal-State policy council, or similar regional councils, that meets regularly to share information and discuss issues on the program's operation.

Congress could also encourage DOL to help local EDWAA agencies respond appropriately to local conditions as affected by defense cutbacks. For example, if a community is in deep distress (e.g., from closure of a military base or defense plant in an isolated small town) and there are scant prospects of new jobs in the local area, DOL could make sure State and local authorities are aware of the full range of EDWAA options, including relocation assistance, long-term skills training, and contributions to local economic development. The extra funds Congress appropriated specifically for services to displaced defense workers in fiscal years 1991-93 are all to be spent when and where the Secretary of Labor decides they shall be (most EDWAA funding is allocated differently, as discussed below). Thus, DOL has a special opportunity and responsibility to see that EDWAA money is spent where it can help most in the defense build-down.

Rapid Response

Despite the emphasis on rapid response in the 1988 amendments, and despite the Worker Adjustment and Retraining Notification (WARN) law that requires 60 days' notice of major layoffs, the majority of displaced workers still do not receive adjustment services at the optimal time, which is before layoffs begin. A few States (e.g., Colorado, Massachusetts) do an outstanding job of bringing services to displaced workers quickly, but many are mediocre at best, negligent at worst. Through oversight, Congress might specifically encourage DOL to collect information from the more successful States on rapid response and share it with the others.

If more forceful action seems desirable, Congress might require States to report to DOL the average time lapse between notice of layoff and provision of certain key services (e.g., personal counseling, skills assessment and career counseling, job search skills training). This would identify the States that are doing poorly and need help or incentives to improve, and those that are doing well enough to serve as models. Possibly, Congress might wish to consider a State's record on rapid response as an indicator of EDWAA program performance, rewarding those with good records. For example, a certain percentage (perhaps 10 to 20 percent) of EDWAA funds might be allocated to States on the basis of their rapid response performance.

State EDWAA officials are virtually unanimous in reporting that the WARN law has helped them learn about layoffs earlier and respond faster than they could otherwise. Several have also noted, however, that compliance seems to be somewhat spotty. Congress may wish to consider these options:

- Investigate the extent to which employers are complying with WARN legislation, given that no agency is assigned to enforce the law.
- Consider whether the triggers for WARN (numbers of employees and percentage of work force laid off within a 30-day period) may be causing anomalous results, i.e., some larger layoffs escape triggers that apply to smaller layoffs.

Some of the problems with rapid response are related to delays in getting access to the national reserve funds controlled by DOL. Eighty percent of EDWAA funds are distributed to the States; 20 percent remain in the hands of the Secretary of Labor. These discretionary national reserve funds are distributed to States and local EDWAA agencies on the basis of need, in response to formal proposals. They are intended to meet unforeseen needs, since the whereabouts of plant closings and mass layoffs cannot be reliably predicted. Removing delays in the

distribution of DOL discretionary funds is especially important for displaced defense workers, since all the extra funds that Congress appropriated to meet the needs of this group is to be allocated and spent at the discretion of the Secretary of Labor. A particular problem for States and local agencies is that, even if they eventually receive national reserve grants, DOL rules do not allow them to recoup from the grant what they have already spent up front from their own (often limited) funds to assure quick delivery of services.

There are reasons, of course, for DOL to require that applicants for grants make a solid factual case, to guard against dangers of waste or abuse. The opposite danger, however, is that bureaucratic rules can get in the way of fast, effective action. Part of the answer is to strengthen cooperative relations and trust between DOL and the State and local agencies. Congress may also wish to consider some of the following specific changes in handling discretionary EDWAA grants:

- Direct DOL to allow States and local EDWAA agencies to be reimbursed from discretionary grants (when and if granted) for EDWAA funds they have already spent to hasten the delivery of services to displaced workers.
- Encourage DOL to respond faster to requests by States and local EDWAA agencies for grants from the national reserve and other discretionary funds; this might be done by limiting the amount of detail required in grant proposals and by giving States clearer guidance on the requirements for applications.
- Require that DOL turn around proposals for discretionary grants within 10 business days.

Training

The 1988 amendments to JTPA Title III required that 50 percent of EDWAA funds be spent for training; in specific cases, State Governors may reduce the requirement to 30 percent. This requirement was a response to findings of too little emphasis on training in EDWAA's early years, and reflected a laudable public policy goal. However, the mandated 50 percent for training does tend to interfere with project flexibility, especially when the preponderance of displaced workers in a project are professionals or highly skilled technicians, as is quite often the case in defense layoffs (see the discussion below of retraining for engineers displaced from defense industries). DOL officials sometimes insist on an even higher proportion of funds spent for training as a condition of approval for grants from the national reserve fund.

Another problem is that, even though the law places few restrictions on training, DOL policy is to limit training to displaced workers who are "most in need" or are unlikely to find work in their same occupation. This means in practice that displaced workers who are already skilled but want to improve their skills in the same occupation may be barred from getting EDWAA training. This is not only hard on the individual worker involved, but could defeat the purpose of providing a more adept and highly skilled work force to U.S. industry and thereby improving competitiveness. It could be an obstacle to using EDWAA funds for retraining of displaced managers or engineers who might want to choose that option.

Some options that Congress may wish to consider for adding flexibility, improving the quality of training, and making it available to a wider range of displaced workers are as follows:

- Direct DOL to offer retraining to displaced workers who are interested in and able to benefit from it, including workers who want to upgrade their skills; Congress might wish to clarify the language of the law so as to make it unequivocal that training may be offered to people who already have marketable skills.
- Make the present mandatory allocation of 50 percent of EDWAA funds for training a guideline rather than a requirement; any change in the 50 percent training requirement should be accompanied by redoubled efforts by DOL to offer State and local programs technical assistance so that training does not get short shrift.
- Allow projects more than 1 year in which to meet the 50 percent training requirement.

Effective Allocation of EDWAA Funds

The full EDWAA appropriation is divided up in two ways. First, 80 percent of the funds are allocated among States on the basis of unemployment in each State and how that relates to national unemployment. (The other 20 percent, as noted, goes into the national reserve fund, to be distributed at the Secretary's discretion to States or local agencies.) Before 1988, States had full control of their Title III funds, but under the amendments, the States must

distribute to substate areas half their allocation at the beginning of the program year, and distribute another 10 percent in the course of the year as the need arises. Part of the reason for requiring allocation to substate areas was that many States were not spending their money or delivering services adequately to displaced workers. Another reason was probably political; local government officials (who usually dominate in the substate areas) and longtime providers of employment and training services have considerable influence with Congress. Another change in the 1988 law is that if States carry over more than 20 percent of their year's EDWAA funding, the Secretary *must* reallocate that carryover to other States that have spent at least 80 percent of their own allocation.

It is not clear that these changes are having the intended positive effects. It is also questionable whether the formula for allocation of EDWAA funds to States is as effective as it might be in meeting the needs of displaced workers. Since the 1988 amendments have been in effect for only 2 full program years, Congress may wish to gather information through hearings and other oversight about how the amendments are working before considering changes in the law. Questions to investigate might include the following:

- Is the present allocation system splintering State EDWAA allocations into such small pots of money at the substate level that it is often hard to create a viable entity to respond to layoffs?
- Does the mandatory distribution of 60 percent of the State's allocation to substate areas deprive State programs of needed flexibility and responsiveness to unforeseen displacement?

Many States have chosen Service Delivery Areas (SDAs) to develop services for displaced workers, even though the SDAs' experience is in employment and training for low-income and disadvantaged people, not displaced workers. Although some SDAs do a good job with displaced workers, others do not. Alternatives to the SDAs, or competition from other service providers, could result in services that better meet the special needs of displaced workers (particularly among displaced defense workers, the needs of engineers and highly skilled technicians). Further questions Congress might wish to pursue include:

- Can States be educated and encouraged to look further than the SDAs for well-qualified grantees at the substate level?
- Is the mandatory reallocation of EDWAA carryovers of more than 20 percent having the desired effect of bringing services to more displaced workers? Are some local agencies using EDWAA money for other purposes simply to avoid the reallocation—for example, serving with EDWAA funds disadvantaged or low income clients, such as the homeless, who are eligible for other employment and training programs?
- Is the mandatory reallocation of carryovers leaving too little flexibility to respond to varying economic conditions? Would it make sense to allow DOL to accumulate a "rainy day" EDWAA reserve fund that it could draw down in recessions and build up in prosperous times, since the demand for services to displaced workers is greater during hard times (especially for training, the most expensive service).

Congress may also wish to consider modifying the formula that governs allocation of EDWAA funds to States, to reflect more accurately the States' experience with displacement.[6] The 1988 law mandates that data from DOL's Bureau of Labor Statistics (BLS) Mass Layoff Survey be given a weight of 25 percent in the formula, but this is not done because the survey is incomplete. An alternative might be to include BLS data on unemployment due to job loss in the formula for allocation of EDWAA money to States. Although these data include people who were fired from their jobs as well as those who were laid off, they are more closely correlated with dislocation than the aggregate unemployment data that are now used in the formula.

Unemployment Insurance

Adequate unemployment insurance (UI) is especially important for displaced workers because it is often the only form of publicly provided income support for those who want to undertake skills training. Because of various changes in eligibility rules and the virtual elimination of extended UI in

[6]See Chapter 3 for discussion of the EDWAA funding formula.

the past decade, only 32 percent of unemployed workers were drawing UI in 1990, compared to a range of 42 to 75 percent in the 1970s.[7]

Congress may wish to consider providing extra income support for displaced workers who opt for skills training—not only because of the benefits to the individual workers but also because training can provide a more capable work force for U.S. firms. Although EDWAA funds may be used as income support for workers in training, this is rarely done. Extending UI benefits for this purpose is a possibility. Another Federal program, Trade Adjustment Assistance (TAA), offers as much as 78 weeks of income support, at the level of UI benefits, to workers who are certified as having lost jobs due to imports and are enrolled in approved training courses. In 1990, some 18,400 of the 62,618 workers certified as losing their jobs due to imports enrolled in TAA-sponsored training courses.

The cost of extended income support (whether as extended UI benefits or in some other form) for displaced workers in approved training could be substantial. One way to contain costs would be to require evidence of a real commitment to training, for example, workers might be required to sign up for training no later than the mid-point of their regular 26-week eligibility for UI benefits, rather than waiting until the benefits run out. Another possibility would be to limit the program to displaced defense workers.

To get a rough idea of the possible costs of such a program, assume that workers in long-term training would, on average, receive an extra 26 weeks of income support at $160 (the estimated U.S. average benefit in 1990) so that the average extra cost per worker would be $4,160. The demand for long-term training is likely to be limited; even in EDWAA projects that emphasize training and do a good job of it, only about 20 to 30 percent of participants choose that option, and presumably fewer still would select long-term training. About 163,000 displaced workers enrolled in EDWAA projects in 1989-90; if 15 percent of them were in long-term training, the extra cost of income support for a year would be some $100 million. If the benefit were limited to displaced defense workers, the cost might be around $16 million a year. This estimate assumes that displacement of civilian defense workers would be 200,000 per year over the 4 years 1991-95. (Because most ex-service men and women who want training can use the more generous GI Bill, they are not included). It further assumes that about 12-13 percent of civilian defense workers enroll in EDWAA (which is somewhat above recent enrollment rates), and that 15 percent of those choose long-term training, meaning that 3,750 displaced defense workers per year would be receiving extended income support while in training.

Retraining of Active Workers

One possibility for encouraging firms to convert from military to commercial production, using at least some of their current work force, is to offer some government help in retraining workers. Commercial production often involves different and in some ways more demanding work than military production. The EDWAA program does not extend to active workers, but only to workers who have been laid off or have received notice of layoff. Some States have programs that help fund training of active workers—notably California's Employment Training Panel, which is funded by a small employers' payroll tax similar to the UI tax. However, there is little experience at the Federal level with public programs to help retrain active workers.[8] The extra $150 million that Congress appropriated for services to displaced defense workers is a possible source of funds for a demonstration project to retrain active workers, since demonstration projects are allowed under the legislation. DOL could be encouraged to create a pilot project for retraining active workers in a defense company converting to commercial production.

Funding

In earmarking $150 million in DoD funds, to be transferred to the EDWAA program for adjustment services to displaced defense workers, Congress chose a way to provide for this group without adding bureaucratic complications or depriving other dis-

[7]In November 1991, Congress and the administration reached agreement on extending UI benefits for periods of 4 to 20 weeks, depending on the local unemployment rate. This change will increase the coverage of UI, but not to the peak levels of the 1970s.

[8]See U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy* (Washington, DC: U.S. Government Printing Office, September 1990).

placed workers.[9] With EDWAA funding at a high of $577 million in fiscal year 1992, and with the addition of the extra $150 million, it might be expected that the funds would prove adequate to deal with the extra burden of displacement from defense cutbacks. However, both State and Federal EDWAA officials told OTA in fall 1991 that many States and localities were getting so many demands for services that, at the current pace, their regular allocations would run out before the end of the program year (June 30, 1992). The recession, frequent layoffs, and high unemployment rates seemed to be the main reason for the exceptional demands for service, though they might also reflect the effects of WARN notices and expanding knowledge about the EDWAA program among companies and workers.

However, at the same time regular allocations were running low, State and local requests for grants from the Secretary of Labor's national reserve fund were coming in so slowly that it seemed that fund of about $105 million might not be exhausted by the end of the year. DOL officials speculated that some State and local officials who were strapped for regular EDWAA funds don't really know how to apply for the grants effectively, and those who do may be too overwhelmed with work to take time for the demanding job of grant application. All this adds emphasis to the need to streamline the process for applying for DOL discretionary grants. This is especially important for displaced defense workers, since all the extra $150 million designated for services to that group is DOL discretionary funding.

Supposing DOL solves the problems of getting its discretionary grants promptly to where they are needed, the extra $150 million may be sufficient for serving displaced defense workers. If 200,000 defense workers are displaced per year over the next 3 years (a high estimate, see ch. 3), and if 12-13 percent of those workers should opt for EDWAA services (a moderate estimate, considering recent participation rates of less than 10 percent), then about 25,000 displaced defense workers per year might apply for services. If the cost of services is about $2,000 per participant (as it was in program year 1990), then an extra $150 million might prove roughly adequate.[10] The fact that it can be spent over 3 fiscal years adds flexibility. However, if the economy remains weak, demands for EDWAA services could continue at high levels and funds could run short. Also, the $150 million from DoD is all in DOL's discretionary funds and, as noted, there are serious delays and difficulties in getting those funds to the places where they are needed. Finally, if the quality of services were upgraded—for example, by providing extended income to workers in long-term training—the present level of funding could fall short. Congress may wish to monitor the rate of spending, both of the regular appropriation and the extra amount from DoD, to make sure that the funds fit the needs.

Civilian Employees of the Department of Defense

The number of civilian DoD employees displaced by defense spending reductions will be relatively few, since DoD plans to effect most of the reduction through attrition. However, some will certainly be affected (e.g., there are already substantial layoffs at several naval shipyards). In many ways, adjustment services for displaced civilian DoD employees are broader than for workers displaced from defense industries. Through oversight, Congress may wish to see whether the programs that look good on paper are working well in practice. A few additional options might be considered.

- DoD and DOL could be encouraged to make sure that all installations know about EDWAA and how to use its services, especially the training options. DoD could also encourage directors of the transition assistance programs on military bases to make sure their program services reach displaced civilian DoD employees as well as military personnel.
- DoD could be encouraged to provide information and technical assistance to base commanders and personnel officers on the value of aggressive outplacement efforts and labor-management committees to take part in or direct retraining and reemployment efforts.

[9]As noted, this fund may be diminished by as much as $22.5 million, since Congress decided to make this portion available for loans to small businesses seriously injured as a result of troop deployments in the Persian Gulf War.

[10]The DOL estimate for cost per EDWAA client is about $1,350 for program year 1990. However, DOL's method of figuring the cost involves double counting of EDWAA clients, since it counts *all* participants for the program year, including those who enrolled the previous year. OTA's cost-per-client estimate is based on the number of new enrollees in the program year. Total participants in the EDWAA program were 282,089 in 1990. New enrollees were 186,888. EDWAA spending was $380.3 million.

- DoD might be given authority to keep civilian employees eligible for employee assistance programs up to 6 months after separation.

Engineers

Among displaced defense workers, engineers are of special concern. First, they are being laid off in relatively large numbers in the defense build-down, because they are disproportionately employed in defense jobs, and also because they are first in line to go when new weapons systems are canceled or postponed. Second, it is a waste of a valuable national resource if engineers do not find new jobs that make use of their technical abilities.

So far, it appears that despite the recession, most engineers laid off from defense jobs are not having as much trouble finding new jobs as those caught in the build-down after the Vietnam War. A positive factor is the fairly prosperous condition and hefty backlogs of orders in the commercial aircraft industry. Another plus is that many engineers are willing to relocate, and have something of a national job market through their professional associations. Still another is that many of the large defense companies are offering reemployment services to their displaced engineers (often serving engineers and other salaried employees more quickly and more effectively than their displaced blue-collar workers). On the other hand, it is not always easy or automatic for an engineer to switch from defense to the commercial side even in the aircraft industry. A substantial share of displaced engineers who have found new jobs are reemployed in the defense industry and may be heading for further displacement as the build-down continues.

Many of the options that Congress might consider to improve services to all displaced workers apply equally to engineers, especially improvement in rapid response. However, some special considerations also apply, in particular with regard to training. Two factors distinguish engineers' retraining needs from those of most other displaced workers. First, many do not want or need retraining; their skills are salable. This is why the requirement that 50 percent of an EDWAA project's money be spent on training is often misplaced in projects serving engineers. A contrary consideration is that when engineers do need retraining, a meaningful course of study is likely to be longer and more expensive than the average 4-month training courses offered to EDWAA clients. When engineers are served in the same projects as other workers (often a favorable arrangement), the retraining needs of a very few engineers could soak up all the project's training budget. An answer that makes sense for retraining engineers displaced from defense work might be applied more broadly as well; there is a long-recognized but often unmet need for engineers to continue their training throughout their working lifetimes.

Funds from multiple sources could be sought to support retraining of displaced engineers and continuing education for engineers in general. It is in the national interest to make use of engineers' skills, and it makes sense to provide some public funds to meet their training needs. It also makes sense to tap other government programs, beyond EDWAA, for the purpose. Private companies and the engineers themselves also benefit from continued training and retraining, and should take some of the responsibility. For retraining of engineers, Congress might consider the following options:

- Provide through the National Science Foundation grants and scholarships specifically targeted to engineers for continuing education.
- Encourage through tax incentives company training programs for midcareer engineers,[11] such as Boeing provided for some engineers from its military aircraft division in Wichita to enable them to work in the commercial division;
- Establish a technical assistance program to collect and share information on successful company-provided training for midcareer engineers.
- Provide financial support for retiring and laid-off scientists and engineers who want to pursue second careers as junior and senior high school math and science teachers. Partial payment of tuition costs for alternative credentials programs (now becoming more widely available) might be provided through EDWAA, if DOL is directed to allow EDWAA training funds to be used for the purpose even though the displaced professional has marketable skills. An alterna-

[11]OTA's recent report, *Worker Training* (op. cit. 1990) proposed a number of policy options to encourage or induce companies to be more active in providing training for their employees. One option was to impose a payroll training levy to pay for public training programs, but to exempt employers who provide adequate training themselves.

tive is to revive a program like the 1950s-era National Defense Education Act, which provided loans for tuition and then forgave a portion of the principal and interest for each year the recipient taught.

In addition, some more general options to improve the delivery of government funded services to displaced engineers might be considered. Through oversight, Congress might direct DOL to give State and local EDWAA agencies technical assistance and encouragement to attend to the training and reemployment needs of engineers and other technically trained workers. Most EDWAA agencies have little experience with professionals and white-collar workers and some are reluctant even to offer them services, believing that highly skilled people can do well enough on their own. However, if Congress wishes to encourage provision of adjustment services to engineers and other professionals, it may also have to monitor adequacy of EDWAA funds. In late 1991, with the continuing recession and heavy demands for services, some State programs were conducting a form of triage. They saved most of their scarce resources for what they regarded as the neediest workers, and sacrificed services to engineers.

Veterans

Quite a broad range of transition services is available to members of the armed forces who may be involuntarily retired or denied the chance to reenlist. In addition, severance pay is offered to involuntary separatees who have served more than 6 years but are not eligible for retirement. Congress has recently passed several laws that improve these transition and separation services. Oversight of how they are working is probably the major option Congress will now wish to consider. It seems likely that ex-service men and women returning to civilian life will be better regarded by prospective employers and have chances at better jobs than veterans in some previous eras, both because they are better educated and trained than many civilians in their age cohort and also because the Gulf War enhanced the reputation and public perception of members of the armed services.

The group most likely to be adversely affected by the defense build-down is not veterans, perhaps not even those involuntarily separated (who probably will be relatively few), but young people deprived of the chance to enter the armed services in the first place. The services are the most color-blind large institution in the United States, and have offered unusual opportunities both for training and employment to young black men, especially those from the South. Alternative institutions offering similar opportunities (e.g., a national youth service corps) might conceivably be created, but unless they have strong goals of their own as institutions, they are not likely to command the respect and attract the same caliber of young people as the armed services.

DEFENSE-DEPENDENT COMMUNITIES

For the communities that will be seriously affected by withdrawal of defense spending, government programs for economic development assistance can contribute to recovery, though they cannot by themselves restart a stalled local economy. Federal programs for community economic development must be based on cooperation with the States and localities. And they must, by their nature, involve cooperation with and assistance to private businesses. Economic development and programs of technical assistance to business (as discussed below) are closely related.

Today, States are far more active in economic development than the Federal Government, and some (e.g., Pennsylvania) do a creative, effective job. However, performance among different States is very uneven, and in 1991, when many State governments were financially strapped, some that were formerly outstanding (e.g., Michigan) pulled back and abandoned some of their economic development programs. Even in better times, there is a limit to the funds States have to offer. There is a place for Federal action, though it is not likely to have as much effect as it did in the 1970s. Not only was direct funding for economic development much higher then than it is today, but other Federal programs that supported community development (e.g., clean water programs) were also far larger.

In 1990 Congress appropriated an extra $50 million in DoD funds to assist defense-affected communities.[12] This is a big addition to the pre-

[12]As noted, this amount may be diminished by as much as $7.5 million, since Congress has made this portion available for loans to small firms that were seriously injured as a result of troop deployments in the the Persian Gulf War.

existing Federal program to help distressed communities restart their economies; it was funded at about $12 million a year. However, if the defense build-down proceeds rapidly, this augmented Federal support probably will not be enough to meet the need, even given the increased State and local capacities. Compared to the amounts spent responding to the defense build-down of the 1970s, $50 million will not go far.[13]

DoD is supposed to funnel the $50 million in economic development funds to the Commerce Department's Economic Development Administration (EDA), which can then spend the funds through fiscal year 1993. However, as of November 1991, the transfer of funds from DoD to EDA had not yet been accomplished. EDA's Title IX program offers planning and implementation help to communities affected by sudden and severe economic disruption. DoD's own small Office of Economic Adjustment (OEA, funded at about $6 million in fiscal year 1992) helps communities plan for coping with both defense plant layoffs and military base closings, though it has much more experience with the latter.

Considering the small size of the Federal effort today, it is especially important to target the resources where they are most needed, and to provide help fast and effectively. Congress might consider several options along these lines:

- Congress may want to closely monitor the demand for the funds appropriated so far, to see whether communities hit by defense cuts are able to get what they need. If the funds are near depletion, Congress may want to consider appropriating additional funds.
- EDA's worst failing has been delay. Congress might wish to set mandatory deadlines for EDA to respond to proposals from communities for economic development grants.
- Congress may want to allow and encourage OEA to provide planning grants to defense-dependent communities before any layoffs or closures are announced. If communities begin early to organize and plan economic development, they will be in a better position to respond to defense cuts if and when they happen.
- Both EDA and OEA assistance could be focused better on the neediest communities. OEA could concentrate its responses to military base closings and defense industry layoffs on places where the jobs loss is significant in the local economy. For EDA grants, the thresholds that determine whether communities are eligible could be refined; communities with a combination of high unemployment and low employment growth could qualify for development grants ahead of others, even with smaller absolute numbers of dislocated workers.
- Federal community economic development and business assistance programs might encourage and assist state and local applicants to direct their support chiefly to the kind of enterprises that are basic to the local economy, that create economic activity and jobs in other sectors (i.e., have a high multiplier effect), and that sell goods and services outside the local community; for example, a manufacturing plant or a service enterprise that deals with more than local customers would get more support than a mom-and-pop dry cleaning plant.
- If limited funds are more focused, EDA could be encouraged to market its programs more actively, particularly to defense dependent communities; many communities find out quite belatedly that EDA development grants exist.
- Most defense-dependent states and cities are attempting to cope with the threat of defense cuts. However, they are not always aware of approaches adopted by their counterparts in other parts of the Nation. Congress could encourage EDA or OEA to fund organizations such as the National Governors' Association and the National League of Cities to operate clearinghouses of information on economic development and employment adjustment responses to the defense build-down.

There are also possibilities for better cooperation among the Federal agencies responsible for economic development, or perhaps for reassigning responsibilities:

- Relevant agencies in the Department of Commerce could be directed to coordinate their activities with EDA and help improve the Title

[13]For example, the Federal Government provided $20 million from 1971 to 1975—$53 million in 1991 dollars—in economic development assistance to Wichita, KS during the defense build-down after the Vietnam War. This compares with the total of $50 million Congress has provided for aid to *all* communities affected by the present defense build-down for the years 1991-93. (See ch. 6 for details).

IX program; for example, the National Institute of Standards and Technology, which operates the Federal Manufacturing Technology Centers, might advise EDA on how to support manufacturing modernization as part of a community economic development program.

- At present, the responsibilities of DoD's Office of Economic Adjustment mostly stop with helping defense-affected communities plan for economic development. One alternative would be to give OEA, rather than EDA, responsibility for implementing plans for defense-affected communities, using the extra $50 million in DoD funds appropriated for the purpose. OEA's advantages include a tradition of quick response to community calls for help, and long experience in planning responses to military base closures. It could be helpful to have one agency involved in both planning and implementation of responses to defense cutbacks, rather than having OEA hand off to EDA.
- Traditionally OEA's expertise and work has been focused on helping communities respond to military base closings. It is less practiced in dealing with community impacts from layoffs in defense industries, but is gaining experience. The impacts from the defense build-down in the 1990s will probably fall at least as heavily on communities dependent on defense industry as on communities dependent on military bases. OEA could be encouraged to work more actively with communities and regions dependent on defense industries.

Congress might also consider some adjustments in policies specifically related to base closings. Generally, the community impacts from base closings will be relatively moderate and the places seriously affected will be few. However, a few closings are large enough, and the communities involved are dependent enough, that recovery could be difficult, particularly if base reuse efforts do not begin promptly. For these cases, the following options might be considered.

- DoD's policy of selling bases for full market value could interfere with recovery in some communities; some success stories of the past depended on the community's receiving the property at less than market value. Congress may want to direct DoD to develop a pricing policy that takes community effects into account, transferring the base to the community at reduced or even no cost where impacts from the closing are likely to be substantial. OTA's calculations suggest that moderate to significant impacts might result from the closure of 10 to 17 bases in Rounds One and Two (ch. 6).[14]
- Prompt action is important if communities are to reuse military bases for economic development purposes. Congress might wish to encourage the military services to make base commanders aware that early action and cooperation with local communities on base reuse are high priority duties. Base commanders might be instructed to schedule transfer of base property before the base closes, if possible. This could include a schedule for vacating sections of the base and leasing them to the community on an interim basis.
- The law's requirement that DoD give other military services, other Federal agencies, and representatives of the homeless rights of first refusal before communities can bid on base property delays the disposal process. Congress may wish to put time limits on the rights of other bidders for the property, or perhaps move communities toward the front of the line.
- Current law can be interpreted to require that environmental cleanup of all the base property be completed before the property can be transferred. Because few bases will be completely cleaned up before closure, this makes prompt disposal difficult. Congress may want to allow DoD to transfer portions of bases that are clean, or perhaps allow transfer of the entire base so long as cleanup efforts have begun.[15] DoD might also be directed to give priority for cleanup to bases that are slated for closure. Measures would have to be in place to ensure that DoD remains accountable for the cleanup.

Finally, Congress may want to consider developing a Federal policy that would discourage the

[14]The Defense Authorization Act as passed by the Senate (S. 1507) contained a provision that would require DoD to transfer bases to be closed to communities at no cost, unless the community is not experiencing or will not experience a significant adverse economic impact from the closure. This provision might have covered as many as 50 or 60 bases. However, the conference committee deleted the provision.

[15]A bill in the 102d Congress, H.R. 2179, proposed to allow Federal agencies to subdivide property for transfer, thus allowing parcels of bases scheduled for closing to be transferred while other parcels await or undergo cleanup.

practice of competitive bidding by States and localities to induce firms to locate new plants or facilities within their area. From the national point of view, this is at best a zero-sum game, and it can be costly and destructive. Several approaches are possible, without infringing on States' and localities' traditional authority over land use decisions. For example, Congress might encourage the Secretary of Commerce to invite all the Directors of State Departments of Commerce to a national meeting to discuss the problems in providing inducements to firms.[16] The Secretary could work with the States on an agreement to eliminate or at least limit the incentives States provide to foreign firms. Similarly, OEA and EDA could encourage communities, especially larger ones, to focus their efforts on helping new firms start and existing ones expand, and deemphasize industrial recruitment as a solution for all defense-affected communities.

DEFENSE COMPANY ADJUSTMENT

Although some major defense companies consider their strategy in response to defense cutbacks their business alone, there are possibilities for a constructive government role in the transition of defense companies into more commercial activities. The potential is perhaps greatest for small and medium-size companies. Many of these companies already have some commercial customers, but need to shift to more commercial production to survive. Technical, marketing, or financial assistance from government programs can help small companies make the shift. Some government programs of this sort already exist to help businesses, especially manufacturing firms, improve their competitive performance. The programs are mostly at the State level, but few States have a very broad range of well-established technical assistance services to business. The few small programs at the Federal level are barely established (none is more than 3 years old). Altogether, these programs would need more resources and more focus if they are to make a substantial contribution to helping defense companies expand their commercial business—as well as helping firms in general make good use of technology to better their performance.

It is possible to envision government programs that would help to develop technologies with both military and commercial applications (dual use technologies), and to strengthen industries that could both supply defense needs efficiently and compete successfully in world commercial markets (dual use industries). The final report of this assessment will consider whether and how such programs might be developed. It will also discuss (at least in general terms) programs that would advance new, peacetime national goals while strengthening the competitiveness of U.S. firms and industries. The policy options outlined below for company adjustment are only a first installment. Further policy options for company adjustment, related to the development of dual use technologies and industries and to fulfillment of new national goals, will appear in the final report of this assessment.

Government Programs for Technology Diffusion

As a first step, Congress may wish to add resources and focus to existing programs for technology diffusion that could also help defense companies make the transition to more commercial production. At the top of the list is a Federal-State partnership. So far this is rudimentary. The National Institute of Standards and Technology (NIST) program of assistance to State technology extension programs (STEP), created in 1988, has so far been tiny, with funding that has never exceeded $1.3 million per year. In November 1991, Congress authorized the creation of a new, far more ambitious program of support for State and local technology extension efforts (the National Manufacturing Technology Extension Program), to be funded by DoD at $50 million per year.[17] However, the conference committee on appropriations declined to fund the program for fiscal year 1992. The purpose of the program would be to improve the quality, productivity, and performance of U.S. manufacturing "foundation" firms (under 500 employees); Federal grants would match funding from State and local governments and nonprofit organizations to support technology extension programs that have government and industry participation. Options along this line might include the following:

[16]Inducements to newly established foreign firms can be a special competitive problem for longer established U.S.-owned firms, which have benefited from no such inducements.

[17]This provision was included in the Defense Authorization Act.

- Broaden NIST support to State programs that provide a wide range of industrial services to improve companies' performance. The services might include consulting services to improve manufacturing processes, grants to work with universities in developing new products, and help in finding new markets. NIST might give encouragement and special consideration to State programs that provide comprehensive services to firms in a one-stop center (e.g., Pennsylvania's Industrial Resource Centers).
- Increase funding substantially for the Federal Manufacturing Technology Centers.[18]
- Extend technology and financial assistance to help small firms create cooperative networks for purchase of equipment, joint training, bids on large contracts, and marketing efforts. Some small defense firms are already forming such networks in an attempt to get into more commercial business. Congress might also consider legislation to explicitly remove antitrust restraints from cooperative networks of small firms that band together to bid on *commercial orders*.[19]

In addition to measures that may be helpful to all firms in improving their competitive performance, including defense firms that want to move into more commercial production, Congress may wish to consider some options directly targeted toward those defense firms making the transition:

- In providing Federal support for State industrial service programs, direct that priority be given to firms wishing to convert to commercial production. Federal funding on the order of $25 million per year would be enough to help States serve as many as 5,000 to 20,000 firms, depending on the level and kind of service.
- Provide additional economic development funds for defense-affected communities and direct EDA to use the funds to help defense firms expand into commercial markets; this might be done by funneling the Federal money into existing State programs, as described above.
- Allow the DoD funds already provided for defense-related worker and community adjustment to be used proactively to avoid closures and layoffs, in such activities as retraining of the active work force and technical and management assistance for defense firms wishing to move into more commercial production.
- Add to the list of purposes for NIST's Manufacturing Technology Centers technical assistance in converting from defense to commercial production.

Many of the options outlined above have the broad aim of modernizing America's manufacturing firms and strengthening U.S. commercial competitiveness. At the same time, they could ease conversion and support dual use manufacturing abilities. Another approach with the same aim might be a government purchase and leasing system for up-to-date production equipment. A public or quasi-public entity could buy from U.S. producers such items as computer numerically controlled (CNC) machine tools or robots, and lease them at subsidized rates. The system would have the dual advantages of providing U.S. equipment builders with a reliable purchaser, and promoting the use of modern machinery among U.S. manufacturing firms, especially small firms that are less likely to do so on their own than larger firms. In recent years, after the U.S. machine tool industry went into precipitous decline, the United States has limited imports of machine tools on national defense grounds. A purchase-and-leasing system could strengthen U.S. machine tool builders in a positive way, and could be especially appropriate in helping defense firms convert to commercial production with better chances of success.

- Congress may wish to establish a leasing company for modern production machinery such as CNC machine tools, buying them from U.S. companies and leasing them at subsidized rates to small firms, or to defense firms converting to more commercial production, or possibly to any U.S. firm. The cost to the government of such a program might rise from about $5 million in the first year (assuming a modest beginning) to a few tens of millions per year for a mature program.[20]

[18]The Congress authorized $15 million for the program in fiscal year 1992, up from $10 million in fiscal year 1991.

[19]Bills in the 102d Congress (H.R. 1604 and S.479) would ease antitrust restraints on cooperative production ventures, but are not explicitly directed to small firms.

[20]A similar program in Japan leased or sold (on preferential installment purchase terms) $350 million of equipment in 1987. Assuming that the government paid 20 percent of that cost, in subsidies and administrative expenses, the government cost would be $70 million a year.

Government-Industry Partnership for Technology Development

Another set of proposals might be useful for defense firms that see possible commercial applications for technologies developed for the military, but are unwilling to bear all the risks involved. The general argument for government-industry partnership in developing generic or precommercial technologies is that some of these technologies promise large benefits to society but are so risky, and the payoff to individual firms is likely to be so small, that industry will not undertake them without government help.[21]

In 1988, Congress established the Advanced Technology Program (ATP) under the direction of NIST to take part in such government-industry R&D partnerships. ATP can contribute a minority share, up to half of the project costs. ATP's first awards, amounting to $10 million, were given in 1991 to 11 grantees (consortia and single companies), chosen from 249 applicants. Congress provided ATP with $35 million for the next round of awards (of which $10 million will probably go for continued work by the first round winners), and has increased ATP funding for fiscal year 1992 to $47 million. Other proposals in Congress would set up additional government-industry partnerships for the development of critical technologies, under the aegis of various agencies including DoD, the Department of Energy, and the National Aeronautics and Space Administration.[22] Still another proposal is to create industry-led National Centers of Manufacturing and Process Technology, to focus on testing and application of process technologies within specific fields, such as advanced materials, electronics fabrication, or general manufacturing.[23]

- If Congress adopts proposals before it for substantially increased funding for government-industry partnerships for new technology development, some defense firms will undoubtedly take advantage of them in projects to convert military technologies to commercial use.[24]
- To focus more tightly on development of defense companies' military technologies for commercial uses, Congress might establish companion programs in the Departments of Commerce and Defense that would contribute government funds to industry-led ventures for this kind of technology development. Technologies selected for development could be for new or improved products or manufacturing processes, and might be developed for dual use as well as commercial applications.

Opportunities for adapting military technologies to civilian uses could arise in connection with commitment to new national goals. As noted, this subject will be further explored in the final report of this assessment, but a suggestion is offered here. Transportation in the United States is ripe for new technologies. The field of smart highways and smart cars is especially promising. A tiny Federal program to support R&D in intelligent vehicle and highway systems is in existence, and is supplemented by State programs, in particular California's. Expansion of this program might provide some exciting opportunities for defense companies, especially some of the highly sophisticated aerospace companies concentrated in Los Angeles, to adapt their military technologies to a new, important commercial use.[25] Similar opportunities exist in electric vehicle manufacture, again particularly in the Los Angeles area, where tough clean air laws effectively require that a growing proportion of the city's vehicles be electric. The Surface Transportation Act of 1991 includes a program to fund electric vehicle consortia that encourages defense and aerospace firm participation. This program could be expanded if successful.

---

[21]For further discussion of this subject, see U.S. Congress, Office of Technology Assessment, *Making Things Better*, op. cit., ch. 2; *Competing Economies*, op. cit., ch. 2.

[22]See, e.g., the Critical Technologies Act of 1991 (S. 1327) and Advanced Manufacturing Technologies Act of 1991 (S. 1328), which were rolled into the Defense Authorization Act; also, the High Performance Computing Act of 1991 (H.R. 656), and the Manufacturing Strategy Act of 1991 (S.1330).

[23]S. 1330, the Manufacturing Strategy Act of 1991. The centers would have to receive at least half their funds from sources that are not Federal, and could, if successful, be funded for up to 10 years. A similar scheme, the Critical Technology Application Centers, was authorized by the Congress in the Defense Authorization Act, but the conference committee on appropriations denied funding for the program.

[24]For example, one of the first-round ATP awards went to a project for developing flat panel display technology that was military in origin.

[25]These opportunities may be more appropriate and appealing to first and second tier subcontractors who supply components to prime aerospace contractors than to the primes themselves (see ch. 7).

Tax Incentives for Conversion

Still another approach to encouraging or easing conversion is to provide tax breaks for companies making the transition to more commercial production. Possibly, companies making investments in R&D to develop commercial products might be allowed a tax credit for the expense; or a company investing in new production equipment might be allowed rapid depreciation of the investment or a tax credit. In a previous report, *Making Things Better*, OTA discussed in some detail the pros and cons of tax expenditures for lowering the cost to business of investing in new technology or production equipment.[26] There is some question as to the efficacy of these tax measures. There is no question that they are expensive, especially investment tax incentives. And the problem of expense is aggravated at a time of towering Federal budget deficits—plus a budget agreement that requires reduced spending somewhere else, or compensating rises in taxes elsewhere, for every new spending program or tax expenditure. However, there is plenty of evidence that something is needed to lower capital costs for U.S. companies, to stimulate long-term investments in technology development and adoption. Moreover, a complex mixture of tax stimuli has been used very effectively in Japan, together with other measures to keep capital costs to business low.

Tax incentives might be focused solely on defense companies converting to commercial production on grounds of the advantages to society, first, in avoiding disruption to defense-dependent communities and loss of jobs, and second, by preserving R&D teams that may be able to adapt military technologies to valuable commercial purposes. However, the policy would give defense companies an advantage that may be unfair to competing companies that have never been in the defense business and have not needed to convert. A tax incentive policy for conversion is in any case a blunt instrument. It could be used by more or less technologically adept companies, in more or less defense-dependent communities, so that the desired social effects from conversion would be diluted. If Congress wishes to consider tax incentives to stimulate long-term investment, the potential benefits from making the incentives broadly applicable are clearer than the benefits from limiting the incentives to conversion by defense companies.

One tax incentive, however, might be specifically directed to encouraging the transfer of military technologies to commercial applications. Defense companies that do not have the interest or ability to get into commercial production themselves might still be encouraged to help. In the past, at least one major defense company (GE's Aerospace Division) helped to form small startup companies to exploit commercially military technologies the division had developed; some of the entrepreneurs involved were former GE managers and engineers. The help from GE Aerospace took the form of licensing technology on affordable terms and, in some cases, putting up a sizable chunk of equity funds for startup financing.

Congress might consider giving favorable tax treatment to investments by large companies in startup companies formed for the purpose of developing commercial applications of military technologies; for example, the large company might be allowed to deduct a portion of such investments from taxable income. Alternatively, the same tax treatment could be available to any large company that provides financial assistance to a small entrepreneurial spinoff company, whether or not the technology involved was originally military.

Considering that many large defense companies are in difficult financial straits, with heavy debt loads and declining profits, even substantial tax breaks might not induce them to invest in spinoff enterprises. However, they should be in a good position to identify military technologies they have developed that have commercial potential and may respond to tax incentives to license those technologies to others.

Intellectual Property Rights and Development Cost Recoupment

Certain DoD practices or regulations that are intended to make defense procurement cheaper or easier to manage may be a serious impediment to companies' developing commercial applications of military technologies. One of these is the DoD regulation that requires companies to pay the department back for what it spent on a military technology if the company sells a product based on that

[26]U.S. Congress, Office of Technology Assessment, *Making Things Better*, op. cit., February 1990, pp. 41-49 discusses options to improve the U.S. financial environment for long-term investment in technology development and production equipment. .

technology to a non-DoD customer. Nothing in law specifically requires DoD to demand a payback if a company sells a commercial product based on DoD-funded technology. It is inconsistent with laws that encourage granting private companies intellectual property rights to technologies developed in Federal laboratories, and forms a barrier to commercialization of military technologies. Another problem for defense companies is DoD's insistence on taking control over data rights related to military technologies for which DoD has paid all or part of the development costs. If these proprietary data are released to other companies, they could lose much of their appeal for commercial development by the originating company.

Congress may wish to consider the following options to lower or remove these barriers:

- Direct DoD to abolish its requirement for a payback on its development costs for military technologies if companies want to develop commercial products based on the technologies.
- Encourage or direct DoD to work with companies on settlement of the data rights issue in ways that protect legitimate government interests but also allow companies to keep data rights secure, so that commercialization of the technology is appealing.
- Direct DoD to license technologies developed for military purposes and paid for (partly or wholly) by DoD funds on a royalty-free basis to companies with plans to develop the technology for commercial purposes.

Chapter 3

Displaced Defense Workers

Contents

	Page
INTRODUCTION	59
THE DIMENSIONS OF DEFENSE-RELATED DISPLACEMENT	59
Displacement in Defense Industries	61
Civilian Workers at the Department of Defense	65
THE COSTS OF DISPLACEMENT	66
ASSISTANCE FOR DISPLACED WORKERS: WHAT WORKS	67
Advance Notice and Early Action	70
Cooperation Among Companies, Workers, Public Agencies	70
A Full Range of Services	71
Retraining	72
PUBLIC PROGRAMS TO HELP DISPLACED DEFENSE WORKERS	74
Unemployment Insurance and the Employment Service	74
Worker Adjustment and Retraining Notification Act (WARN)	75
Economic Dislocation and Worker Adjustment Assistance (EDWAA)	77
DEPARTMENT OF DEFENSE TRANSITION PROGRAMS FOR CIVILIAN EMPLOYEES	89
Advance Notice	89
DOD-Wide Placement Programs	90
Severance Pay and Unemployment Insurance	91
Job Search Assistance Programs	92
INDUSTRY EFFORTS	94
HOW ARE LAID-OFF DEFENSE WORKERS LIKELY TO FARE?	97

Boxes

Box	*Page*
3-A. Conversion and Retraining in the Japanese Steel Industry	68
3-B. Civilian Transition at Colorado Army Bases	72

Tables

Table	*Page*
3-1. Projected Defense Spending and Employment Levels	60
3-2. Employment in National Defense, 1966-91	61
3-3. Defense-Related Employment by Industry, 1991	62
3-4. Defense-Related Employment in Selected Non-manufacturing Industries, 1990	63
3-5. Defense-Related Employment in Selected Manufacturing Indutries, 1990	63
3-6. Occupational Distribution in Defense Industries	66
3-7. Planned Reductions in Force at Naval Shipyards as of 1991	67
3-8. Unemployment, UI Covered Unemployment, and UI Coverage	75
3-9. JTPA Title III (EDWAA) Appropriations	77
3-10. Enrollments and Outcomes in JTPA Title III (EDWAA), Program Years 1983-90	78
3-11. Provision of EDWAA Services in Selected Defense Layoffs	80
3-12. Selected Defense Layoffs: Worker Services Provided	96
3-13. Workers' Experience Following Selected Defense Layoffs, 1990-91	98

Chapter 3
Displaced Defense Workers

INTRODUCTION

Jobs are at the heart of concern over adjustment to declines in defense spending. As with adjustment problems generally, employment concerns are most acute at the regional and local levels—in particular communities that bear the brunt of cutbacks in particular defense programs or of local military base closings. At issue are not only the hardships for individual job losers, but also losses to the economy from interruptions in using the talents and resources of trained, experienced people. Moreover, from the standpoint of equity, if displacement is part of the price for having a dynamic economy, then it seems fair for society to share in paying the price by providing assistance to displaced workers.

Reemployment for workers losing defense jobs could take several forms. Companies that have commercial as well as military business (e.g., manufacturers of aircraft and major components) might switch employees to the commercial side. Defense companies might change over to commercial production and employ some of their workers in the new enterprise. Communities might devise various ways to encourage the startup or expansion of businesses that offer productive new jobs. These possibilities are considered in following chapters of this report, on adjustment of companies and communities to defense spending cutbacks. This chapter examines the situation of people who actually lose defense jobs and have no immediate prospect of reemployment. It considers the probable extent of displacement due to defense cutbacks, and discusses the effectiveness of programs to help displaced workers find or train for new jobs. It concentrates on the prospects for defense industry workers and civilian employees of the Department of Defense (DoD), leaving for the next two chapters engineers and active duty military personnel.

THE DIMENSIONS OF DEFENSE-RELATED DISPLACEMENT

About 6 million people were employed directly or indirectly in national defense in 1991. Of these, some 2 million were active duty military service men and women, over 1 million were DoD civilian employees, and 2.9 million were workers in civilian defense-related industries, employed by prime contractors, subcontractors, or suppliers of goods (e.g., steel, food, semiconductors) or services (e.g., air travel, insurance, hotels).

OTA estimates that by 1995, defense employment could fall to between 4.6 and 5.0 million, eliminating 1.0 to 1.4 million positions, or an average of 250,000 to 350,000 a year. Some 396,000 positions would be eliminated in the active duty military service, 104,000 in civilian DoD employment, and from 530,000 to 920,000 in private defense-related employment (table 3-1). The lower figures for positions lost (1.0 to 1.1 million) are based on the President's budget proposal for fiscal year 1992, which projected a 19 percent reduction in defense outlays from 1991 to 1995.[1] The higher figures (1.3 to 1.4 million) are based on a trajectory that would cut defense outlays to $169 billion (in 1991 dollars) or 41 percent, from 1991 to 2001.[2] Between 1991 and 2001, defense employment might drop from 6 million to as low as 3.5 million later.

There is no guarantee that the rate of decline in defense-related employment will be gradual and evenly paced. First, estimates of defense cuts place more employment loss at the beginning of the decade than at the end. Assuming the faster paced reduction, an average of 330,000 to 355,000 positions a year will probably be lost between 1991 and 1995, but the rate is expected to slow later in the decade, with losses of 150,000 to 190,000 positions a year. Second, if major defense firms become convinced of the reality of a steep continuing slide in contract money, with no prospect of new pro-

[1]Within the two estimates, there are two ranges of numbers for the number of positions lost in industry. The higher number assumes a linear relationship between the percentage decline in DoD purchases and the percentage decline in defense industry jobs. The lower number assumes a slower decline in jobs and is based on a regression model of the historical relationship between defense industry jobs and the value of defense purchases.

[2]William Kauffman, *Glasnost, Perestroika and U.S. Defense Spending* (Washington, DC: The Brookings Institution, 1990); William Kauffman and John Steinbruner, *Decisions for Defense* (Washington, DC: The Brookings Institution, 1991).

305-199 - 92 - 3

Table 3-1—Projected Defense Spending and Employment Levels

Year	Total defense outlays (051) (billions)	Active duty military (thousands)	DoD civilians (thousands)	Defense industry employment (thousands)	Total defense employment (thousands)
1991 DoD estimate	$287.5	2,049	1,044	2,900	5,993
1995 DoD estimate	$235.7	1,653	940	2,280 to 2,370	4,873 to 4,963
Loss from 1991	$51.8	396	104	530 to 620	1,030 to 1,120
Percent loss	18%	19%	10%	18 to 21%	17 to 19%
1995 faster paced reduction	$218.0	1,653	940	1,980 to 2,080	4,573 to 4,673
Loss from 1991	$69.5	396	104	820 to 920	1,320 to 1,420
Percent loss	24%	19%	10%	28 to 32%	22 to 24%
2001 faster paced reduction	$168.6	1,340	697	1,500 to 1,620	3,537 to 3,657
Loss from 1991	$118.9	709	347	1,280 to 1,400	2,336 to 2,456
Percent loss	41%	35%	33%	44 to 48%	39 to 41%
Loss from 1995	49.4	313	243	360 to 580	916 to 1,136
Percent loss	23%	19%	26%	18 to 28%	20 to 24%

NOTES: All dollars are constant 1991 dollars. Total employment in this table includes DoD civilian and military personnel stationed overseas.

SOURCES: DoD estimates are from the Office of the Assistant Secretary of Defense (Public Affairs), "FY 1992-93 Department of Defense Budget Request," News Release No. 52-91, Feb. 4, 1991, except defense industry employment, which is estimated by OTA based on DoD projection of defense purchases. Faster pace alternative budget estimates are from William Kauffman, *Glasnost, Perestroika and U.S. Defense Spending* (Washington, DC: Brookings Institution, 1990) and William Kauffman and John Steinbruner, *Decisions for Defense* (Washington, DC: Brookings Institution, 1991). The 2001 alternative uses projections of troop and civilian personnel levels given by Kauffman in *Glasnost, Perestroika and U.S. Defense Spending* (Kauffman's scenario D). Industry employment levels estimated by OTA from budget estimates given by Kauffman. The 1995 budget estimates are from Kauffman and Steinbruner *Decisions for Defense*, and reflect savings through reductions in procurement of new systems and a reduction in nuclear forces, assuming no additional reduction in the estimates of manpower given by DoD. Industry employment for 1995 was estimated by OTA based on level of defense purchases.

grams, they may decide to downsize quite radically and suddenly. Share prices of companies that shed employees often improve, so some firms may adopt this as an effective strategy for raising funds and beating out the competition.

The numbers of defense positions at risk appear rather moderate on a national scale. Peak year losses are not likely to exceed 400,000 positions; in 1991 that was about one-third of 1 percent of the U.S. civilian work force of 119 million. In addition, the number of defense positions eliminated will be larger than the number of defense workers who will actually be displaced. Perhaps as much as 75 percent of the decline in DoD military personnel will come from attrition as the armed forces simply accept fewer new enlistees (see ch. 5). DoD expects to handle much of the decline in its civilian personnel through natural attrition and a hiring freeze. In defense-related industry, some of the people whose positions are lost may never actually be laid off but will take up a new job in the same company, as the company replaces military with civilian customers. Some will not even see it as a "new" job because they will be doing exactly the same work (e.g., checking in customers at a hotel), but the wages and salaries that support their job will no longer come from defense. Offsetting this reduction, however, is some likely loss of pay-generated jobs in the relatively small number of communities that are hard hit by cuts.

Assuming the fast-paced reduction, it is possible that defense-related workers who will actually lose their jobs will number about 970,000 to 1.1 million in the 4 years 1991 to 1995, or 240,000 to 275,000 per year.[3] This assumes that one-half of the loss of civilian DoD positions will be actual job losses, one-quarter of military positions, and all of the

[3]This rough estimate is illustrative and should not be taken too literally. It includes an estimate of 99,000 military personnel and 52,000 civilians losing their jobs due to involuntary separations and reductions in force. It is not likely that all DoD industry position losses will translate into job losses, especially considering the fact that the model that calculates defense industry jobs includes jobs not just in large prime contractors, but in a long chain of subcontractors and suppliers. However, the OTA estimate assumes that loss of pay-generated jobs in highly defense-dependent communities will be an offsetting factor so that the number of defense industry job losers will be roughly equal to positions lost. The estimate for job loss from private defense industries is 820,000 to 920,000. The total for job loss in the three categories is about 970,000 to 1.07 million. The estimate for job loss 1991 to 2001 is 177,000 military, 173,000 DoD civilians, and 1.3 to 1.4 million for private industry, for a total of 1.65 to 1.75 million jobs.

Table 3-2—Employment in National Defense, 1966-91

Year	DoD military active duty employment (thousands)	DoD civilian employment (thousands)	Defense industry employment (thousands)	Total defense employment (thousands)
1966	3,094	1,254	2,640	6,988
1967	3,377	1,399	3,100	7,876
1968	3,548	1,406	3,174	8,128
1969	3,460	1,391	2,916	7,767
1970	3,066	1,364	2,399	6,829
1971	2,714	1,189	2,031	5,934
1972	2,323	1,159	1,985	5,467
1973	2,253	1,099	1,850	5,202
1974	2,162	1,110	1,860	5,132
1975	2,128	1,078	1,800	5,006
1976	2,083	1,046	1,690	4,819
1977	2,077	1,022	1,730	4,829
1978	2,067	1,016	1,765	4,848
1979	2,032	991	1,860	4,883
1980	2,073	991	1,990	5,054
1981	2,101	1,019	2,085	5,205
1982	2,130	1,028	2,310	5,468
1983	2,163	1,064	2,530	5,757
1984	2,184	1,085	2,785	6,054
1985	2,207	1,126	3,100	6,433
1986	2,233	1,112	3,315	6,660
1987	2,244	1,133	3,365	6,742
1988	2,209	1,105	3,310	6,624
1989	2,203	1,117	3,295	6,615
1990	2,144	1,073	3,150	6,367
1991	2,049	1,044	2,900	5,993

SOURCE: Department of Defense, Office of the Comptroller, *National Defense Budget Estimates for FY 1992* (Washington, DC: 1991).

private sector positions.[4] For these years, that would add about 12 to 14 percent to the decade-long average of 2 million workers a year losing their jobs through no fault of their own but because of plants closing or moving away, cutbacks in production, and slack work.[5] While these numbers do not appear overwhelmingly large, that many job losses could be a seriously aggravating factor in a weak or recessionary national economy. Numbers and concentration of displaced workers are a more important factor in regional or local economies. Even when the national economy is growing at a healthy pace so that defense-related displacement has little overall effect, those losses can still hurt seriously in places where many layoffs are clustered.

Displacement in Defense Industries

Some of the employment loss from the defense build-down has already happened. As shown in table 3-2, from 1987, the high point of defense industry employment in the buildup of the 1980s, to 1991, some 416,000 defense-related positions in private industry were lost.[6] The defense cutbacks called for in the President's budget would result in the

[4]It is possible that in one or two particular years displacement could surge upward, perhaps as high as 400,000, but this would mean that displacement in other years over the decade would be correspondingly less.

[5]Studies of the numbers and experiences of displaced workers rely mostly on data provided by the biennial Displaced Worker Survey conducted by the Bureau of the Census (Department of Commerce) for the Bureau of Labor Statistics (BLS) (Department of Labor). OTA reviewed findings from the January 1984 survey in U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Adults* (Springfield, VA: National Technical Information Service, 1986). Later surveys were conducted in January of 1986, 1988, and 1990; each covered experience over the previous 5 years, starting in 1979 and going through 1989. The numbers of people losing their jobs each year for the causes mentioned were greater in the earlier years of the decade, which included the deep 1981-82 recession, and fewer later (varying from 2.2 million to 1.7 million per year). In its analysis, BLS defines as "displaced" only those workers who held the job they lost for 3 years or more and were aged 20 or older. That produces a number of displaced workers about half as large.

[6]OTA's figures for employment in private defense industries in 1990 and 1991 are based on DoD estimates made in 1989. Those estimates are based on the same methodology used in earlier years. New estimates released by DOD in 1991 use a different methodology that makes comparisons with earlier years impossible. DoD now estimates that there were over 3.1 million private sector defense-related jobs in 1991. In order to maintain comparability with estimates for earlier years, OTA has used the estimates DoD produced in 1989 using the older methodology.

Table 3-3—Defense-Related Employment by Industry, 1991

Industry	Defense-related employment	Industry as percent of total defense employment
Manufacturing	1,638,000	57%
Construction	81,000	3
Mining	43,000	1.5
Transportation, communication and utilities	191,000	7
Service-producing industries		
Services	591,000	20
Wholesale and retail trade	281,000	10
Finance and insurance	52,000	2
Agriculture, forestry, and fisheries	23,000	1
Total	2,900,000	100%

SOURCES: Industrial sector shares of total defense employment are for 1985, the latest year available, and are taken from David K. Henry and Richard P. Oliver, "The Defense Buildup, 1977-1985: Effects on Production and Employment," *Monthly Labor Review*, August 1987. These shares were applied to 1991 total defense employment from Department of Defense, Office of the Comptroller, *National Defense Budget Estimates for FY 1992*, (Washington, DC: March 1991), p. 151.

elimination of another 530,000 to 640,000 positions between 1991 and 1995. A faster paced reduction could eliminate from 820,000 to 920,000 positions (table 3-1).

A closer look at these figures shows why the number of job losers is likely to be less than positions lost. Estimates of defense industry employment are derived from input-output models of the economy and thus include not just firms that sell directly to DoD but also subcontractors and a whole host of firms that provide goods or services. For example, bank workers handling transactions for a big defense contractor are counted in defense industry employment. Whether such people will lose their jobs when defense companies shrink or close down depends entirely on whether the banks can find other customers to make up the lost business. And that does not depend on the bank's venturing into a new business, but on whether the local and national economies are robust enough to support the generation of new firms that will take the place of the old defense firms in buying bank services.

Thus, when considering the fate of these 2.9 million workers, it is appropriate to view their level of risk of layoff on a continuum, with workers in some industries (e.g., missiles, submarines, tanks) as highly vulnerable from defense cuts, and workers in other industries (e.g, restaurants) as less vulnerable. For example, most of the 590,000 defense-related workers employed in mining, agriculture, wholesale and retail trade, finance and insurance, and transportation, communication, and utilities (table 3-3) are not doing jobs specific to defense production.[7] In the manufacturing sector, where 57 percent of defense-related workers are employed, some industries also make products that are relatively adaptable to either defense or civilian commerce. For example, the steel that goes into a tank might equally well be made into a truck (assuming a customer can be found). So long as other businesses arise to take the place of defense business, firms in these industries can provide the same services, and employ the same people, with very little disruption.

Without close, detailed analysis of the industries that contribute to defense production, it is not possible to make a quantitative estimate of the jobs that are not just defense-related but defense-specific. The point that can be taken from table 3-4 is that some substantial portion of these jobs are equally adaptable to the defense or civilian sides of the economy.

However, jobs in some industries are involved directly in defense work (table 3-5). For example, the tank itself has no customer other than the DoD or the defense ministry of a foreign country. Similarly, there are business services, such as engineering services for the design of weapons systems, that are tied just as tightly to defense production as anything

[7]These estimates are based on analysis done by David Henry, U.S. Department of Commerce, and Richard Oliver, U.S. Department of Labor, of defense production and employment by sector. David K. Henry and Richard P. Oliver, "The Defense Buildup, 1977-1985: Effects on Production and Employment," *Monthly Labor Review*, August 1987.

Table 3-4—Defense-Related Employment in Selected Non-manufacturing Industries, 1990

Industry	Defense-related employment	Defense as percent of total industry employment
Wholesale trade	136,000	2.2%
Educational services	107,000	6.8
Eating and drinking places	92,000	1.4
Hotels and lodging places	87,000	5.5
Motor freight	67,000	4.6
Personnel supply services	38,000	2.5
Maintenance and repair (nonresid)	37,000	5.2
Real estate	33,000	2.7
Total, all non-manufacturing	1,354,000	1.6%

SOURCES: Data on defense employment by industry is from Data Resources, Inc., cited in Linda Levine, "Defense Spending Cuts and Employment Adjustments" (Washington, DC: Congressional Research Service, June 27, 1990). DRI estimates of 1989 employment by industry were reduced by 8 percent to adjust for lower total defense employment in 1990. Data on U.S. employment by industry are 1990 annual averages from the Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* (Washington, DC: Bureau of Labor Statistics, May 1991) p. 237 and Department of Labor, Bureau of Labor Statistics, unpublished data.

Table 3-5—Defense-Related Employment in Selected Manufacturing Industries, 1990

Industry employment	Defense employment	U.S. defense share of total industry jobs[a]
Radio and TV communication equipment	194,000	46%
Aircraft	163,000	44
Shipbuilding and repairing	128,000	98
Guided missiles	120,000	90
Aircraft parts and equipment	86,000	49
Aircraft engines	64,000	43
Ammunition, excluding small arms	29,000	77
Other ordnance and accessories	16,000	68
Tanks and tank components	11,000	75
Total, all manufacturing	3,150,000	

[a]This is the share of total industry jobs dependent on DoD purchases. It does not include the share of jobs dependent on foreign military purchases. For example, 75 percent of jobs in the manufacture of tanks and tank components were dependent on DoD purchases, while the rest depended on foreign military purchases.

SOURCES: Defense share of total employment by industry are OTA estimates based on defense share of output by industry, Department of Commerce, unpublished data, February 1991, and estimates by Data Resources, Inc. cited in Linda Levine, "Defense Spending Cuts and Employment Adjustments" (Washington, DC: Congressional Research Service, June 27, 1990). Data on total U.S. employment by industry are 1990 annual averages from Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* (Washington, DC: February 1991) and unpublished Bureau of Labor Statistics Data.

in manufacturing. To avoid layoffs from defense spending cuts, these firms would have to remake themselves to serve commercial customers.

Some industries may be able to do this more easily than others, as some complete weapons systems have a good deal in common with commercial counterparts, ships and airplanes being the leading example. It seems that there would be at least some opportunity for workers displaced from these defense industries to get jobs making similar commercial products, for example, to move from building Navy destroyers to building oil tankers. However, commercial shipbuilding in the United States has almost vanished, having fallen victim to lower-cost competition in other countries, especially Japan and Korea.

The U.S. commercial aircraft industry, on the other hand, is doing well. Despite a falloff of orders during the Persian Gulf War and the 1990-91 recession, both U.S. producers of large commercial jet transports (Boeing and McDonnell Douglas) had large backlogs of orders in 1991. Even while jobs are

vanishing in the defense-related aircraft and parts industry, total output in the industry may well rise in the mid-1990s because of growth in the commercial side of the business. This is not to say that workers making military aircraft will not be displaced. Many have been already. But if total aircraft industry output rises as projected in the next few years, some defense aircraft workers may eventually find new jobs in the commercial industry, especially if they are willing to move to where the jobs are. Even so, this shift will not be as easy as the switch from one military aircraft company to another in the balmy days of the defense buildup. For example, as many as 2,000 of the 6,600 workers laid off from Rockwell in Palmdale, CA when B-1B production ended between 1986 and 1988 simply "crossed the tarmac" in the same sprawling military production complex and went to work for Northrop on the new B-2 bomber.

Workers making electronic goods and components for the military may also find new jobs in the commercial electronics industry, since its output, too, is expected to rise in the next few years. Some electronic components are in fact similar for military and commercial applications, and whether there is displacement among companies making these goods depends entirely on economic growth in the commercial side of the industry (the same situation as in services such as banking or versatile goods such as steel).[8] Even electronics companies that specialize in making final products for the military might be able to switch to commercial products, assuming demand is strong enough and assuming company managers know how to produce for, and sell to, commercial customers (see ch. 7).

The upshot is that estimates of 820,000 to 920,000 defense industry positions to be lost over the 4 years 1991-95 overstate the amount of actual displacement to be expected in those industries. However, the estimates do not take into account the ripple effects on community employment due to loss of jobs generated by the pay of displaced defense industry workers. These ripple effects could be serious in communities that are exceptionally dependent on defense and do not soon find other sources of economic growth.

Two factors that distinguish displaced defense industry workers from displaced workers in genera' affect the former's reemployment prospects. On the one hand, they could find it more than ordinarily difficult to find good new jobs because defense employment is so concentrated in manufacturing. U.S. manufacturing employment has been declining since its peak at 21 million in 1979; it was about 19.1 million in 1990 and dropped to 18.4 million in the recession year of 1991.[9] This means that, on the whole, manufacturing jobs outside defense could be scarce. It is not easy for displaced manufacturing workers, in particular blue-collar workers, to switch to comparable service sector jobs. For production and other nonsupervisory workers (i.e., blue-, pink-, and white-collar workers who are neither professional nor managerial), pay in the service sector is lower than in manufacturing jobs. Moreover, the education and skills required, the work environment, and the whole culture of many service sector jobs are different. Experience with displaced workers generally shows that those displaced from manufacturing take longer to find new jobs than those losing jobs in service industries.[10]

The loss of manufacturing jobs may aggravate the growing income inequality as family-wage manufacturing jobs are replaced by lower wage service jobs. This appears to be happening in Los Angeles, where for the last 10 years high- and low-paying jobs have increased while those in the middle have declined. Because the majority of defense jobs in Los Angeles pay middle wages, defense cuts may worsen the inequality and create a community increasingly polarized between haves and have-nots.[11] Los Angeles has a large and growing population of immigrants, many of whom begin in low-skill jobs. Without the good manufacturing jobs provided by defense (or other industries), opportuni-

[8]However, for other electronic component makers, DoD requirements regarding durability, performance, and design make transfer to commercial markets more difficult.

[9]U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, September 1991, table B-1.

[10]For example, data from the 1988 displaced worker survey show that 1 to 5 years after layoff, unemployment rates for manufacturing workers were 15.9 percent as compared to 13.8 percent overall and 11.5 percent for workers in professional services. (Diane E. Herz, "Worker Displacement in a Period of Rapid Job Expansion: 1983-87," *Monthly Lat or Review*, vol. 114, May 1990, table 3.) In 1990, 29 percent of displaced manufacturing workers were either unemployed or no longer in the labor force as compared to 21 percent of displaced service workers. (Diane E. Herz, "Worker Displacement Still Common in the Late 1980s," *Monthly Labor Review*, vol. 115, May 1991.)

[11]Los Angeles Economic Roundtable, "Attachment 8: Employment and Wage Trends in Los Angeles County," Feb. 22, 1991.

ties for the poor and immigrants to better themselves will become scarcer.

On the more positive side, there is some evidence that defense industry workers have more education and are more highly skilled than U.S. workers in general, and this bodes well for their prospects. Studies of displacement agree that professionals and skilled craftworkers find jobs sooner and take lesser pay cuts after displacement than semiskilled and unskilled blue-collar workers.[12] One study, for example, found that, on average, displaced professionals had only a 3 percent drop in reemployment earnings (adjusted for inflation) and skilled blue-collar craftworkers had a 10 percent drop, while semiskilled and unskilled blue-collar operatives had 18 to 22 percent declines. Managers, however, were an exception; despite generally high levels of education, they had a 16 percent decline in average earnings after displacement.[13]

Defense industries have greater concentrations of engineers, scientists, technicians, and other skilled workers than U.S. industry in general. Table 3-6 shows the national picture. Other evidence on the same point comes from local studies. For example, a report to the Los Angeles Economic Roundtable found that 24 percent of defense workers in the area were in professional or technical specialties, compared to 16 percent of the Los Angeles work force in general. The same study found that defense workers were much less likely than the average Los Angeles worker to be classified as low skilled (33 vs. 44 percent).[14] In five avionics defense firms on Long Island, NY, 34 percent of the workers were engineers, compared to 3 percent in the area generally.[15] And in Massachusetts, 57 percent of workers in defense-related manufacturing firms had some college, compared to 43 percent in other manufacturing firms.[16]

None of this is meant to play down the difficulties many displaced defense industry workers will face. Managers in particular, as well as less skilled blue-collar workers, could be in for some tough times. Managers and professionals are making up an increasing share of displaced workers, in large part because displacement has declined in blue-collar occupations over the decade, but also because automation and streamlining of management tasks is creating more displacement in the managerial ranks.[17] According to one report, five-sixths of the Nation's leading 1,000 corporations cut back on managerial staff in the 5 years 1986-90. As a result of the widening layoffs and recession, laid-off executives were taking more than 8 months to find a new position in 1991, compared to 3 months in 1988.[18]

Outplacement officials at GE Aerospace in Pittsfield, MA reported that low- to mid-level managers are having the most problems getting reemployed.[19] They said that displaced engineers and higher level managers have the credentials and education that allow them to move to other firms, and that their blue-collar workers have factory floor skills and lower wage demands. But their lower level managers without college degrees and with skills acquired for GE's specific needs are not easily transferred to new jobs.

Civilian Workers at the Department of Defense

DoD employed over 1 million civilian workers in 1991. Their jobs run the gamut from pipefitters in naval shipyards to secretaries and managers in the Pentagon. From 1991 to 1995, DoD plans to reduce civilian employment by about 104,000, for an annual average reduction of 26,000. About three-

[12]For a review of many studies of displacement, including results from the BLS biennial surveys, see U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment*, op. cit., ch. 3. See also Michael Podgursky and Paul Swaim, "Job Displacement and Earnings Loss: Evidence from the Displaced Worker Survey," *Industrial and Labor Relations Review*, vol. 41, no. 1, October 1987, and "Duration of Joblessness After Displacement," *Industrial Relations*, vol. 26, no. 3, 1987.

[13]Michael Podgursky and Paul Swaim, "Labor Market Adjustment and Job Displacement: Evidence from the January 1984 Displaced Worker Survey," report prepared for the U.S. Department of Labor, Bureau of International Affairs, January 1986.

[14]*Jennifer R. Wolch, Robin Law, and Lois Takahashi*, "Defense Industries, Workers and Communities in Los Angeles County," a University of Southern California research report prepared for the Los Angeles Economic Roundtable, September 1990.

[15]Pearl M. Kamer, "Maximizing the Potential of Long Island's Defense Sector in an Era of Change," Long Island Regional Planning Board, 1988.

[16]Massachusetts Department of Employment and Training, Field Research Service, "Defense Industry Profile," June 1989.

[17]From 1979 to 1983, 13 percent of the workers displaced were managers and professionals, but from 1985 to 1989 their ranks accounted for 20 percent of displaced workers. (Herz, "Worker Displacement Still Common in the Late 1980s," op. cit.)

[18]David Kirkpatrick, "The New Executive Unemployed," *Fortune*, Apr. 8, 1991.

[19]Interviews with OTA staff, March 1991.

Table 3-6—Occupational Distribution in Defense Industries

Total category	Defense employment, 1985	Total U.S. employment, 1990
Administrative support	16.9%	16.2%
Professionals, technical	15.1	17.3
Engineers, scientists, and technicians	10.3	3.9
Managers	10.9	12.8
Machine setters and operators	9.3	6.5
Services	9.0	13.6
Handworkers	8.4	1.7
Precision production	6.6	3.3
Mechanics, installers	4.6	4.2
Helpers	4.4	0.2
Transportation operators	4.3	4.2
Marketing, sales	4.0	11.9
Construction trades	2.7	4.1
All other	20.7	20.5
Total	100.0%	100.0%

SOURCES: Data on occupational distribution of defense employment are from David K. Henry and Richard P. Oliver, "The Defense Buildup, 1977-85: Effects on Production and Employment," *Monthly Labor Review*, August 1987. Data on defense engineers, scientists, and technicians are from Department of Defense, *Projected Defense Purchases Detail by State and Industry, FY 1991 to FY 1997* (Washington, DC: DoD, November 1991). Data on total U.S. employment by occupation are 1990 annual averages from U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, April, 1991.

quarters of these jobs are expected to disappear because of defense cutbacks, with the other one-quarter coming from improved management.[20] These numbers do not include the 27,800 positions to be abolished through Round Two military base closures.[21] Most of the job losses from Round Two, as well as Round One, will not occur until after 1995.

Given the significant decline in DoD employment and only limited growth in other government jobs, it might seem that DoD workers are in for a hard time. However, DoD expects natural attrition to exceed the number of positions eliminated, thus reducing the need for RIFs (reductions in force). In recent years, DoD has averaged 100,000 voluntary separations (retirements, quits, and transfers out of DoD) per year.[22] However, since the DoD hiring freeze instituted in late 1989, it appears that attrition may continue to be greater than positions lost.[23] The target for DoD civilian employment was 1,052,000 by the end of fiscal year 1991, but because of attrition the number was only 1,044,000.

While the aggregate numbers are favorable, individuals in some places and some occupations will still face displacement. For example, all eight naval shipyards are scheduled for RIFs in 1991, further significant cuts are expected throughout the 1990s (table 3-7), and at least one yard, the Philadelphia Naval Shipyard, is slated to close in the mid-1990s. Similar cuts are planned for Air Force maintenance and repair stations. Many military bases are going to be closed. In certain areas and in some kinds of jobs, attrition is not likely to keep up with staff reductions.

THE COSTS OF DISPLACEMENT

As OTA has concluded in earlier studies, worker displacement is a serious problem that calls for a coordinated public and private response.[24] Although many displaced workers get right back to work with little trouble, many others, lacking the background

[20] "Pentagon Reports Progress of Management Improvements," News Release, Office of the Assistant Secretary of Defense for Public Affairs, Apr. 25, 1991.

[21] Round Two base closures will result in losses of 50,951 positions at the closing or realigned bases. However, receiving bases are expected to gain 23,155 of these positions. (This number may be less as the Defense Management Review process eliminates more positions.) (Defense Base Closure and Realignment Commission Recommendations, *Closure and Realignment Impacts by Installation and State*, Washington, DC: July 8, 1991.)

[22] Data provided by the Assistant Secretary for Force Management and Personnel.

[23] DoD units may add two external hires for every five separations.

[24] U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment*, op. cit.; *Plant Closings: Advance Notice and Rapid Response* (Springfield, VA: National Technical Information Service, September, 1986).

Table 3-7—Planned Reductions in Force at Naval Shipyards as of 1991

Shipyard	RIFs
Mare Island	1,100
Long Beach	1,000
Norfolk	800
Pearl Harbor	1,200
Puget Sound	1,000
Portsmouth	1,400
Charleston	1,200
Philadelphia	1,000
Total	8,700

SOURCE: Department of the Navy, 1991.

or skills that are in demand, go through long spells of unemployment or have to settle for poorly paid dead-end jobs.[25] A small but significant minority of displaced workers can become discouraged and leave the labor force entirely,[26] and the longer workers are out of the labor force, the less likely they are to reenter it. Extended unemployment represents lost income for both society and the individual as national purchasing power declines. Moreover, the costs of unemployment compensation to displaced workers (and welfare payments if unemployment is lengthy) are borne indirectly by society as a whole.

The business tradition in the United States is to view employees as a variable rather than fixed cost. More than in other advanced industrial nations, U.S. firms are likely to let workers go when technology or business conditions change, rather than try to find other work for the employees within the firm. In contrast, large Japanese companies customarily take responsibility for maintaining jobs for their workers through business declines, after providing retraining for new tasks (see box 3-A). In many European countries, both law and custom encourage companies to keep their work force employed if possible. In the United States, however, legal requirements that stand in the way of flexibility in hiring and firing are seen as burdens to business and the economy. U.S. Government programs are directed instead to helping workers recover from displacement by offering reemployment and retraining assistance.

The same reasons for government to assist displaced workers in general apply equally to defense workers. High-quality adjustment services can not only improve the displaced workers' chances, they can also help move people and other resources out of shrinking defense industries into growing industries, and thus benefit the whole economy.

ASSISTANCE FOR DISPLACED WORKERS: WHAT WORKS

The elements that make up an effective displaced worker program are well known and long established.[27] The conclusions of a pioneering report on what works for displaced workers, written 25 years ago by George P. Shultz (later Secretary of State) and Arnold Weber, still hold good.[28] Their findings have been confirmed and enlarged by a decade of experience in the 1980s. The key factors are as follows:

- Early action is critical. The best time to start a displaced worker program is before layoffs begin. It is the best time for workers to get financial, personal, and job counseling, to explore options, and to find a new job without demoralizing delay.
- Cooperation among management, workers, and public service agencies is extremely helpful. No one is in a better position than employers to know when layoffs will occur and to contribute the basics—staff and space—at the beginning. Some of the best programs are those run by labor-management committees, chaired by a neutral experienced person. And public programs tailored to the needs of displaced workers offer money and experience not available anywhere else.
- Good worker adjustment programs should offer a full range of options to meet the differing needs of different people under different local conditions. The range of services should include everything from individual counseling to job search assistance to training.
- Retraining in a new skill or occupation is the best way for many displaced workers to get a

[25]Displaced workers are out of work from two to four times longer than unemployed workers not displaced. (Podgursky and Swaim, "Duration of Joblessness Following Displacement," op. cit., p. 223.)

[26]Ibid.

[27]For detailed discussion of the elements in successful displaced worker programs, see U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment*, op. cit., ch. 6.

[28]George P. Shultz and Arnold Weber, *Strategies for the Displaced Worker* (Westport, CT: Greenwood Press, 1966).

Box 3-A—Conversion and Retraining in the Japanese Steel Industry

The steel industry was a pillar of Japan's economic development for most of the 20th century. Only with the first oil crisis in 1974, and the following structural shift away from heavy industry, did steel's solid position begin to erode. The strong yen of the early 1980s handicapped Japan's steel exports, and fierce competition from newly industrializing competitors such as Korea aggravated the industry's difficulties.[1]

Japan's steel industry had to shrink. The government, the companies, and the workers participated in managing the decline, attempting to minimize displacement of steel workers and disruption of steel-dependent communities. This included efforts by the major steel companies to diversify into new lines of business, convert plants, retrain some workers and find company-sponsored jobs for others; government financial support for the companies' efforts; and employee efforts to learn new skills.

In 1987, the Ministry of Labor designated steel a depressed industry under the Special Measures Law for the Stabilization of Employment in Specific Depressed Industries. This status lasted for 1 year, from July 1, 1987 to June 30, 1988, and it allowed the government to compensate firms for some retraining costs—up to three-quarters of the wages of employees undergoing conversion training, or four-fifths in the case of small companies. The government offered similar subsidies to companies setting up retraining facilities in areas heavily affected by the industrial decline.[2]

In the face of debts and mounting losses, each of the big steel companies formed its own rationalization plan. The plans included the closure of furnaces and mills and reductions in personnel, but also the formation of new businesses that were apparently planned to serve two rather different purposes: first, to add new activities that would, if they succeeded, replace in part the declining steel business; and second, to launch (but not permanently support) new firms that could absorb company employees who were thought unlikely to succeed in the company's new activities.

The six largest Japanese steel makers set up over 500 new ventures from 1986 to 1989.[3] Those that the companies selected for diversification included high technology businesses such as videotape manufacture, semiconductor production, and software design. Not all of their choices turned out well. Fields such as videotape and semiconductor manufacture were already crowded, with plenty of competitors more experienced in marketing of these products. Kawasaki Steel tried semiconductor production and found little support from other Japanese companies.[4] Minebea, a maker of miniature ball bearings, canceled its venture in electronics in which it had invested 23.5 billion Yen.

Software design appears to have been a more successful choice, since some steel company ventures in this field were still active in late 1991 (no information was available on whether they had yet turned any profits). Nippon Steel, in particular, having some experience in the use of computer systems in its production plants, set out to retrain some of its workers as systems engineers and programmers. The company selected younger employees (under 40) for retraining on the basis of aptitude tests, and provided courses in its own facilities with company training staff for half a year. Using idle iron foundries in Muroran, Sakai, and Yawata, Nippon Steel set up professional schools to prepare candidates for the information engineer examination.[5] The schools were originally supported cooperatively by the company and outside investors or a government agency, the Ministry of Labor's Employment Promotion Projects Corporation. At Muroran, the city was a joint investor, and at the Sakai foundry a regional development group contributed.

Other steel firms also offered formal training, though often for shorter periods. But in all cases, a substantial share of the burden of acquiring new skills fell on the shoulders of the individual engineers. After the formal training,

---

[1]Most of the material for this box was drawn from a series of brief reports prepared by Takashi Mashiko for the Office of Technology Assessment. In addition, some material comes from Scott Davis and Minoru Ito, Japan Institute of Labor, OTA interview, Nov. 13, 1990.

[2]Japan has many other laws dealing with government assistance to companies and industries involved in structural change, including a series of "Temporary Measures Laws," for which the Ministry of International Trade and Industry (MITI) is the lead agency. These laws provide that the state shall take necessary measures to prevent unemployment and to stabilize employment in industries that are designated for assistance. The Ministry of Labor also has a hand in preventing unemployment due to structural change, offering government support both for retraining and for targeted job creation in designated regions and industries.

[3]"Japan's Smokestack Firesale," *The Economist*, Aug. 19, 1991, pp. 51-52.

[4]Scott Davis and Minoru Ito, Japan Institute of Labor, personal communication, Nov. 13, 1990.

[5]"Nippon Steel Produces Systems Engineers Itself," *Nihon Keizai Shimbun (Nikkei)*, July 19, 1988.

the engineers were expected to fend for themselves, buying books for study at home, and learning on the job from an experienced group leader. The adjustment proved hard for some;[6] Nippon Steel's conversion project found that it had to relocate some individuals from their new placements when the change proved too great.[7]

A popular choice in quite a different field, selected by several steel companies, was to build amusement resorts and housing; this choice took advantage of the companies' considerable real estate holdings. For example, Nippon Steel's closed mills and furnaces stood on 17,500 acres. Its best known real estate development is Space World, opened in April 1990 on the southern island of Kyushu. This ¥30 billion space travel theme park is on spare land in the Yawata steel works in the city of Kitakyushu. It was once the site of the country's largest blast furnace, whose idle hulk now stands beside the park's main attraction—a full size replica of a space shuttle on its launching pad. Employment at the steel works has fallen from its 1963 figure of 40,000 to 11,600. The city had hoped to emulate the high technology diversification successes of Pittsburgh. Kitakyushu officials feared that Space World would not benefit the city, but the company disagreed, and has closed its research center as well as production facilities. The park is attracting visitors,[8] but whether it will succeed as a profitable venture is not yet known.

By mid-1990, some 3,750 of Nippon Steel's employees—2,100 white-collar and 1,650 blue-collar—had been transferred to new businesses in electronics and communications, new materials, biotechnology, and urban development. Another 950 employees—300 white-collar and 650 blue-collar—had been placed in Nittetu Business Promote (NBP) companies.[9] The central NBP was set up as an incubator and supporter of a variety of new businesses, established as separate regional companies in fields such as textbook marketing, soft drink marketing, manufacture of work clothes, and production of health foods (including a soya bean-based articial ham).[10] Employment for Nippon Steel workers who were thought not suitable for retraining and relocation in the company's high technology ventures, and support for local economies suffering from the closure of steel plants, were evidently the main purposes of NBP. In any case, Nippon Steel closed the program in the fall of 1990, and cut off its subsidiary NBP companies. Some of the companies have continued to operate independently.[11]

Meanwhile, steel production held up better than expected, as the Japanese economy recovered quickly and strongly from the rise of the yen. Demand for steel rose to 108 million tons by 1989, rather than the 90 million predicted.[12] With the number of blast furnaces in Japan down from 54 in 1986 to 47 and the production work force down 23 percent to 114,000, the industry found itself facing a shortage of skilled workers. The profits from steel—some ¥800 billion among the big companies in 1989—compensated for losses in new businesses, estimated by some Tokyo analysts to be at least ¥90 billion and possibly as high as ¥215 billion.[13] Nonetheless, the big steel makers are maintaining their diversification programs, although failed ventures have been pruned and Nippon Steel has ended its support for the startup NBP companies.[14]

Nippon Steel's employment strategy for downsizing combined retraining and relocation to new spinoff businesses with reductions through attrition and retirement. After June 30, 1988, when the steel industry lost its status as a depressed industry and its eligibility for government support, the company continued its employment programs on its own at considerable expense. For example, Nippon Steel sent a number of managers to its new subsidiaries; they usually drew a lower salary at the new company, but Nippon Steel made up the difference until retirement age (typically age 60 in Japan).[15] Like other large Japanese steel companies, Nippon Steel honored the traditional Japanese commitment obliging the company to look after its workers, in return for workers' loyalty to the company.

---

[6]"Gruelling Work Beats No Work for Displaced Labor," *Nikon Keizai Shimbun*, July 13, 1987.

[7]Nippon Steel, Labor Planning Office representative, personal communication, October 1991.

[8]*Nihon Keizai Shimbun*, Apr. 28, 1990, p. 1.

[9]Nippon Steel, Labor Planning Office. Nittetu is a contraction of the word "Nippon" and "tetsu," the Japanese word for steel.

[10]In 1987, NBP Tohoku Corp., a subsidiary of Nippon Steel, was producing 100-120 tons of artificial ham, known as Tanpakki, every month for supply to schools, hospitals, and the Taiwanese export market. The firm employed 66 former steel workers. ("Gruelling Work Beats No Work for Displaced Labor," op. cit.)

[11]"Nippon Steel to Liquidate Subsidiary," *Nikkei Sangyo Shimbun*, Oct. 26, 1990, p. 16. According to this newspaper, 1,200 former Nippon Steel employees were by this time working in NBP companies.

[12]Masahiro Shinoda, "Industry streamlining despite demand growth," *Nihon Keizai Shimbun*, Oct. 28, 1989, p. 4.

[13]"Virtue is its own reward," *The Economist*, Apr. 28, 1990, p. 79.

[14]"Nippon Steel scans horizons for growth; Metal core, new businesses burgeon," *Nihon Keizai Shimbun*, Oct. 12, 1991.

[15]Davis and Ito, op. cit.

new job with good prospects, but it is not for everyone. The majority of displaced workers want to get back to work and make a living as soon as possible. But a good training program can attract and effectively serve a sizable minority—perhaps 20 to 35 percent.

The elements that work in helping displaced workers in general find new jobs or get training apply as well to displaced defense workers.

Advance Notice and Early Action

Early action is critical for several reasons.[29] First, displaced workers are much more likely to take part in adjustment projects that begin before a plant closing or major layoff than afterward.[30] Some useful programs have been established months or even as long as a year after the layoff, but by that time people are hard to find, and if found are likely to be skeptical or disillusioned.

The evidence is that participation has positive results.[31] Several studies have concluded that about one-third of displaced workers handle the adjustment themselves—get new jobs, retire, or whatever is their choice—independently. For the other two-thirds, an effective assistance program makes a difference. It helps them find jobs sooner at better pay, or make better choices for training, than they would on their own, and it saves public expense (e.g., in unemployment insurance). For example, in 1989, when the Fort Carson, CO, Army Base announced 9 months ahead of time that 289 jobs would be abolished, the State displaced worker agency and the Army jumped into action (see box 3-B). By the time of layoff, all but one person on the RIF list had jobs. According to Colorado State officials, this prompt action saved $700,000 in unemployment insurance benefits.

Another major advantage is time for preparation. Peak demand for help in finding or training for new jobs usually comes in the first few days after layoff. It takes time to prepare worker adjustment services—ideally several months, although experienced people can set up some worthwhile services in less time, sometimes in a few weeks. Also, the best time to arrange help from the company or cooperative efforts by a labor-management team is before the layoffs.

Finally, individual displaced workers benefit in many ways from knowing well ahead that their jobs are going to disappear. It gives them time to come to terms with the loss, and may save them from financially disastrous decisions (e.g., buying a new house, deciding that a spouse can quit a job). It also gives them time to think about the option of training for a new skill or occupation and to get into training soon, perhaps even before layoff and certainly while they still have the maximum amount of unemployment insurance for income support.

Cooperation Among Companies, Workers, Public Agencies

Management and workers each have much to contribute to displaced worker projects, especially if they work as a team. On-site space for an assistance center, which many companies provide, is convenient and attractive as a place to go for service before layoff, and afterwards gives workers a familiar "office" to use while looking for a job. Another valuable service a company can offer is to invite prospective employers into a plant while it is still operating, so they can see the workers in action. Many companies hold job fairs, both before and after layoff. After eliminating some 4,000 jobs in St. Louis in 1990, McDonnell Douglas held two job fairs, one with over 100 firms from across the Nation attending, and another with about 75 local firms. There are even more energetic and ingenious ways to approach employers. McDonnell Douglas ran an ad on broadcasts of St. Louis Cardinal baseball games, calling attention to the skills and availability of their laid-off workers.[32] When a Westinghouse plant in Maryland laid off 1,100 workers after the A-12 was canceled, the company ran full-page ads in

[29]Detailed discussion of the advantages of early action are in U.S. Congress, Office of Technology Assessment, *Plant Closings: Advance Notice and Rapid Response*, op. cit., pp. 12-17.

[30]Several displaced worker projects have reported participation rates of 50 to 80 percent before layoff; rates after layoff range downward from 29 percent (in a project with an energetic outreach campaign, which included knocking on doors) to near zero. Ibid., pp. 13-14.

[31]See U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment*, op. cit., pp. 225-233; also, Gary B. Hansen, "Layoffs, Plant Closings, and Worker Displacement in America: Serious Problems That Need a National Solution," *Journal of Social Issues*, vol. 44, No 4, winter 1988.

[32]Information provided by David Hutchins, Director of Employment, McDonnell Douglas Aircraft Corp. In the ad, the company announced a hotline number for employers to call to announce jobs or request resumes, and received calls from as far away as Tennessee and Arkansas.

the *Baltimore Sun* and the *Washington Post* promoting its workers.

A great advantage to having a labor-management team direct or participate in the assistance center is that a strong labor role contributes to workers' acceptance and trust.[33] Workers can be especially effective as staff in displaced worker assistance centers; they know the people involved and have a stake in the outcome. The Mare Island Naval Shipyard in California, for example, released a few of its own workers to spend their time calling local employers for job possibilities for the soon-to-be laid-off shipyard workers.

Despite its advantages, however, few defense firms have taken the labor-management approach to operating displaced worker services, possibly reflecting a tradition of adversarial relations between unions and aerospace industries. One firm that has embraced this approach is GE Aerospace in its Pittsfield, MA facility; a labor-management team there has operated successfully and won the confidence of displaced blue-collar workers.

No matter how dedicated and active the company and worker representatives may be, there are some services that only public agencies can provide. Few companies take on the expense of training; that is generally paid for with public funds. Government agencies, including displaced worker agencies and the Employment Service, have resources the companies lack for turning up job openings and matching them with qualified workers. Most important, State displaced worker agencies have the responsibility for organizing a rapid response to layoffs and plant closings. As we shall see, many State agencies are not yet doing a creditable job of rapid response, but that is their responsibility and no one else can entirely fulfill it.

A Full Range of Services

Projects that offer a broad range of services can best meet the needs of a diverse group of displaced workers under different economic conditions. A good program begins with one-on-one personal and financial planning and assessment of the worker's background and skills. At this stage, many workers can use help in choosing immediate job search, retraining, or, in some cases, early retirement.

Next, a full menu of job search assistance is essential. Many displaced workers, especially blue-collar workers, have been with the same company most of their working lives and have no idea how to look for a job; for example some of the workers laid off by McDonnell Douglas in Long Beach, CA were 20-year veterans at the company and had never written a resume. Most displaced worker projects offer 1- to 3-day workshops in resume-writing, interviewing (often with videotaped practice interviews), and locating jobs. The project itself can and should help with finding jobs, by employing job developers who canvas likely employers for unannounced openings; by tapping into job banks or professional job networks; and by matching qualified displaced workers with the job openings. Subsidies to employers for on-the-job training, used by many displaced worker projects, are probably more effective as a tool for job placement than for acquisition of transferable skills leading to long-term employment. Helping displaced workers who want real retraining in a new skill choose the right kind for themselves is a service of central importance, as discussed below.

Moving out of an area hit hard by defense industry cutbacks or a military base closing may be the best choice for many workers, though professionals and managers are far more likely to move than are blue-collar workers. For example, at the GE Aerospace facility in Pittsfield, MA, a town of about 50,000 people, some 4,800 positions were abolished between 1986 and 1991. Virtually all of the laid-off engineers and higher level managers moved elsewhere for work.[34] Very few blue-collar production workers moved, even though jobs are very hard to find in and around Pittsfield. Many of these people have roots in the area that go back several generations; moreover, moving is a high risk choice for workers who do not have distinctive resumes to present to prospective employers elsewhere, as professionals and managers often do. For many two-wage-earner families, moving entails considerable risk and uncertainty for the working spouse who hasn't been laid off. Finally, while relocation may help the displaced worker, it can weaken the

[33]Ruth H. Fedrau and Kevin P. Balfe, "Cooperative Labor-Management Worker Adjustment Programs," *Labor Law Journal*, vol. 40, March 1989, p. 143.

[34]Information provided by Ed Carty, director of the GE Professional Assistance Center, Pittsfield, MA.

Box 3-B—Civilian Transition at Colorado Army Bases

In 1988, the Fort Carson (CO) Army base announced that it intended to lay off 289 employees in the next 9 months. In addition, at the end of that year, the first Base Closing Commission announced that the Pueblo Army Depot, in Pueblo, CO, was among the 86 installations slated for realignment or closure. Some 750 jobs would eventually be eliminated at Pueblo, with about 300 disappearing by 1992. In response, the Colorado Governor's Office of Job Training initiated an effort to help civilian employees at these two facilities make a successful transition to other jobs. The effort was named CETAP, the Civilian Employees Training and Assistance Program. Because the two DoD layoffs were announced in advance—the one at Pueblo had a warning time of more than 2 years—State and Army employment and training officials had unusual opportunities to intervene well before the layoffs.[1]

On hearing about the coming RIF at Fort Carson, Colorado's Rapid Response unit (the State unit responsible for implementing the Federal dislocated worker program) suggested to the Fort's Commander that they cooperate in providing services to the dislocated workers. Working together, State and Army officials set up an outplacement center and held two workshops, one to describe services available to the workers and the other to train the workers in job search skills. While there was not enough time for extensive retraining in new occupational skills before the RIF, some workers were trained for typing positions that were opening up at the Fort.

The results at Fort Carson were highly favorable. Of the 289 workers affected, all but one had a job by the time of the layoff. About one-third were placed in other DoD jobs, through a computerized job placement program, and the rest got non-DoD jobs through the center's efforts. Because nearly everyone had jobs before the layoff, no one drew unemployment insurance benefits. According to Colorado officials, that saved the State $700,000, while a total of $28,000 of the State's dislocated worker assistance funds for the outplacement center were spent. Thomas R. Kalter, Director of Civilian Personnel at the Fort, praised the outplacement center as "one of the best tools I've ever used in effecting personnel drawdowns." He said it represented management's commitment to actively support adjustment services for workers and a commitment by labor and management to work together.

The effort at Pueblo was similar but more extensive. After the December 1988 announcement of the Depot's intended closure, the State worked with the Depot commander in setting up a labor management committee to

[1]Information about the Fort Carson and Pueblo outplacement programs was provided by officials of Colorado's dislocated worker program and Army officials at Fort Carson and Pueblo.

community, particularly if those who leave are the more skilled and more educated, and are likely to be community leaders. Even so, displaced worker projects can collect information about out-of-area job opportunities and help people make realistic assessments of relocation as an option.

Retraining

The last 10 years of experience with displaced worker programs have taught that training is a centrally important feature of displaced worker programs, but it has to be well designed, with a careful matching of trainees' skills and background to the courses offered. Even the best of training programs cannot be expected to attract more than about one-third of displaced workers.[35] However, a displaced worker program that neglects training in the interests of getting the clients back to work quickly and cheaply is depriving many people of their best chance for a job with a future. It is especially important to have good training available in an economic slowdown or recession. When the national and local economies are thriving, most displaced workers will want to look for new jobs right away, and a large number will find something satisfactory. Training looks like a better option when times are bad. Many workers would prefer to improve their skills instead of sitting idle.

Training is also important from the standpoint of producing the skilled workers that U.S. industry needs to keep up in a highly competitive world. But effective retraining of displaced workers can do only a minor part of that job. It depends much more on providing a good public school education for all our

[35]See U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment*, op. cit., pp. 250-60 for descriptions of some unusually successful training programs in displaced worker projects, as well as some that failed dismally.

oversee the outplacement activities. State Representative Bill Thiebout, Jr. was appointed the neutral chairperson. An outplacement center began operations on the base in August 1989, and several workers were trained as peer counselors to work with their fellows.

By mid-1991, some 140 positions at the Depot had been eliminated, but no one had been laid off. Some workers retired, some found private jobs, and some were placed in other military facilities in the region. About half of the workers found interim employment by transferring to other positions in the depot. According to Mike Guagliardo of the Colorado AFL-CIO Division of Employment and Training, the agency that oversees outplacement and training at the Pueblo center, the approach so far has succeeded so well that he hopes to avoid all involuntary layoffs throughout the process of closure. Some of the Depot's workers have taken advantage of job search skills training and other outplacement services, but many have seized the opportunity to improve their occupational skills. The long lead time before closure is a major benefit in this regard. The State set up an extensive training program in which workers contribute half the time and get the other half in leave. (For example, in a 2-hour session, workers put in an hour of their own time and get the other half in release time). Over 400 workers have been trained at the center in computer use, including DOS, Lotus, D-Base, and WordPerfect. Pueblo has a large Hispanic work force, many of whom needed training in English as a Second Language, especially the written language. There were also some who needed to brush up on reading and math. English and remedial courses were offered to all employees who needed them; after a year in the program many have gone on to occupationsl skills training. One worker who completed the remedial education course said: "I have more self-confidence within myself and I am challenging and proving to the supervisors or bosses around that I can do the job. I'm not afraid to tackle what's given to me."

Some workers took training programs off the base. For example, one enrolled in a 22-week fast-track course in machining technology at the local community college and then got a machining job with a local firm. Another worker, who wanted to own a truck driving firm, took entrepreneurial training.

When first approached by State officials about setting up the program, Depot managers were dubious. They were afraid that it might send a message to workers that the management had given up on them and wanted to let them go. Now, Depot managers are 100 percent positive toward the program. Chet Tutor, Civilian Executive Assistant at Pueblo, says that they "haven't made a better decision." Productivity at the base has never been higher, even counting the "lost time" spent in training. The last three Army inspections of the Depot have given compliments to the Depot on the high state of morale despite the scheduled closure. One reason for the high morale, according to State officials, is that the workers themselves have been involved in the design and operation of the entire outplacement program.

children; creating productive school-to-work transition programs for the "forgotten half"—our young people who are not college-bound; and promoting better training of adults in the active work force, starting with their first jobs and continuing throughout their work lives.[36]

Many of the people losing their jobs in the first wave of defense-related layoffs are managers, engineers, software programmers, and other professionals who do not want or need retraining. Or if they do, the training that would interest them may be much more extensive and costly than the typical 4-month training courses offered in displaced worker projects.

When production runs end for the last orders of certain military airplanes, missiles, and tanks, and are not replaced by other orders, more blue-collar workers will be laid off from defense industries. These workers will probably seek retraining in about the same proportions as other displaced workers. Again, the success of retraining will depend on suiting the training to the particular skills and background of the workers. A successful example comes from the United Nuclear Corp. of Mountville, CT, which in 1990 began closing down a plant that made nuclear engines for submarines and started laying off its 1,100 workers. Many of the workers at UNC were trained in dealing with nuclear materials and could potentially help fill the large demand for cleanup technicians at Department of Energy facilities around the country. To provide them with the special additional skills needed, the UNC displaced worker project joined with the local technical

[36]For consideration of what this country lacks and what it needs to do in training of workers, see U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy*, OTA-ITE-457 (Washington, DC: U.S. Government Printing Office, 1990).

college to create a 1-year associate degree program in environmental cleanup, with a certificate at the end of the year, for UNC employees.

Remedial training in basic reading and math skills is another essential piece of complete services for displaced workers. Studies in the 1980s showed that while as many as 20 to 25 percent of displaced workers needed this training, most displaced worker projects neglected it, although such projects could be an excellent place to provide it. Because the first wave of defense layoffs has hit many managers, professionals, and other white-collar workers, the need for remedial basic skills training has been less evident. At least one example, however, of an outstanding basic skills program for defense-related displaced workers is at the Pueblo Army Depot in Colorado (described in box 3-B).

Much more could be said about the elements that make up a good displaced worker program. Only the briefest of summaries has been offered here. It is worth emphasizing, however, that two great virtues are early action, before people get dispersed, discouraged, and disillusioned; and enough flexibility to meet the needs of different people and respond to different circumstances.

PUBLIC PROGRAMS TO HELP DISPLACED DEFENSE WORKERS

Most of the public programs to help displaced defense workers find or train for new jobs are available more broadly either to all displaced workers or to the public generally. The following discussion briefly covers some of the more important government programs that are open to anyone but provide essential help to displaced workers. It then concentrates more closely on the Federal program that is designed for displaced workers in particular, the Economic Dislocation and Worker Adjustment Assistance (EDWAA) program in Title III of the Job Training Partnership Act (JTPA) of 1982, as amended in 1988.

Unemployment Insurance and the Employment Service

The U.S. unemployment insurance (UI) system is a Federal-State program, with Federal law applying a tax on employers that is largely offset if States provide some UI coverage through payroll taxes on employers. States manage their own tax rates, trust funds for payment of benefits, and rules of eligibility. The Federal Government has a backup trust fund account from which States may borrow. The system has three reasons for existence: first, to tide workers over temporary layoffs and keep them from penury; second, by maintaining some spending power even among the unemployed, to help an economy in recession recover; and third, to help businesses retain their trained workers during temporary layoffs. The UI system in the United States was never very generous compared to that of many other developed nations, and in the 1980s its value as a safety net declined further.

Only a portion of unemployed workers are eligible for UI. New entrants or re-entrants to the labor force are not eligible. Workers who voluntarily quit their jobs may have to wait for many weeks to qualify, or may not be eligible at all. Generally speaking, workers out of work more than 6 months do not qualify for additional UI benefits.

The share of unemployed workers covered by UI was close to or over 50 percent through much of the 1970s (and climbed above 70 percent, with Federal help, in 1978). In 1990, the percentage of unemployed workers covered was 32 percent (see table 3-8). The reason for the decline was twofold. First, States ran through their UI trust funds in the 1981-82 recession. They then passed laws to make UI eligibility stricter; in the anti-tax environment of the 1980s and early 1990s, they declined to raise employers' payroll taxes sufficiently to loosen eligibility rules once the fiscal crisis was over. Second, under laws Congress passed in 1981, the U.S. Government became much less supportive of UI benefits than before.[37] One of the changes allowed the Federal Government to charge States high interest rates (up to 10 percent) for borrowing from the Federal UI trust—which discouraged States' borrowing and was a factor in tightening eligibility.

Another change almost brought to an end the once-important program of extended benefits (EB), which allow an extra 13 weeks of UI in times of high unemployment, and the costs of which are shared equally by the Federal Government and the States. EB were rarely triggered in the 1990-91 recession. In June 1991, despite a total unemployment rate of 6.9

[37]Gary Burtless, "The Tattered Safety Net," *The Brookings Review*, spring 1991.

Table 3-8—Unemployment, UI Covered Unemployment, and UI Coverage

Year	Unemployment rate	UI covered unemployment rate	Percent of unemployed covered by UI
1970	4.9%	3.4%	48%
1971	5.9	4.1	42
1972	5.6	3.0	41
1973	4.9	2.5	48
1974	5.6	3.4	52
1975	8.6	6.1	45
1976	7.7	4.4	41
1977	7.1	3.7	50
1978	6.1	2.8	75
1979	5.8	2.8	67
1980	7.1	3.9	56
1981	7.6	3.5	43
1982	9.7	4.7	42
1983	9.6	3.9	50
1984	7.5	2.7	41
1985	7.2	2.8	45
1986	7.0	2.8	44
1987	6.2	2.3	34
1988	5.5	2.1	34
1989	5.3	2.0	33
1990	5.5	2.4	32

SOURCE: Department of Labor, Unemployment Insurance Service.

percent, only 6 states qualified for EB; in the 1980 recession, with an unemployment rate of 7.0 percent (annual average), all 50 states offered EB.[38] In November 1991, after two attempts by Congress that were nullified by President Bush (on grounds that Congress had failed to provide funding), Congress and the President agreed on an amendment to the UI law that eased the terms for EB, making the program available to millions of workers who had been unemployed for more than 26 weeks.[39]

Still, the tighter eligibility for UI remains in effect in many States. Also, the benefits are less generous. UI benefits became fully taxable in the 1986 tax reform law, but nominal amounts were not raised in compensation, so their value has declined about 20 percent.[40] What all this means for displaced defense workers is that UI benefits are a declining source of support for a prolonged job search or, perhaps more importantly, for training. This makes it less likely that the workers will opt for training, especially longer-term training in higher level skills. However, some states, such as California, extend UI benefits for an additional 26 weeks for displaced workers enrolled in approved training courses. Massachusetts extends benefits for some kinds of training, but not for degree programs.

The Employment Service (ES) manages the UI system at the State level. Its other job is to help match people seeking jobs with employers offering them. State governments have the primary responsibility for design and operation of ES. While the ES can provide necessary services to displaced workers, the charge is much broader, extending to any worker looking for a job. With this responsibility, the ES system has so much to do and so many people to serve—and its budgets have been in such long-term decline—that it is hard-pressed to offer help tailored to the needs of displaced workers. In establishing JTPA Title III (also called EDWAA), Congress created a program that would focus specifically on displaced workers and thereby ease structural changes in the economy.

Worker Adjustment and Retraining Notification Act (WARN)

Since the WARN legislation took effect in February 1989, any company with 100 or more full-time employees has been required to give at least 60 days' notice to workers in plants that are closing or planning "mass layoffs." The WARN requirement is triggered when, during any 30-day period, a closing causes a loss of at least 50 jobs, or a layoff causes a loss of 500 or more jobs, or 50 to 499 jobs if they comprise at least 33 percent of the employer's work force. In these situations, the employer is also required to notify the State "dislocated worker unit" and the chief elected official of the local government. Employers who violate the advance notice requirement are liable for back pay and benefits for each day of violation up to 60 days.

[38]The reason for the difference lay in the 1981 law, which raised the State triggers for extended benefits (EB) and eliminated the national trigger that could activate EB in all states. In addition, the "insured unemployment" rate, which is the percent of workers who are collecting benefits, was the trigger for EB and in recent years it has been much lower than the total unemployment rate, reflecting the fact that a declining share of workers get UI (table 3-8). Using the insured unemployment rate as the trigger for EB not only continuously raised the trigger throughout the 1980s (as UI coverage declined) but also led to some anomalous results. Because the rate leaves out all the people who are not eligible for UI, including those who have exhausted their benefits, some States with high total unemployment did not qualify, while other states with much lower rates did. For example, in May 1991, Oregon, which had a total unemployment rate of 5.8 percent, qualified for EB while Massachusetts and Michigan, with a rates of 9.2 percent and 9.0 percent (highest and second highest in the nation) did not.

[39]Under the amended law, the total unemployment rate, not the insured rate, triggers EB.

[40]Burtless, *op. cit.*

The WARN law includes several exemptions besides the ones for small business and relatively small layoffs. These include cases in which a temporary facility is closed, or a particular project that employed people specifically for that project is completed, or where there is a strike or lockout that is not simply intended to evade the early warning requirement. The notification period may be reduced if the closing or mass layoff is due to natural disaster or business circumstances that were not foreseeable, or if the employer has been actively seeking capital or business that could reasonably be expected to postpone the shutdown or layoff.

Dislocated worker officials interviewed by OTA were unanimous in their praise of WARN.[41] They say that early warning has benefited both the assistance programs and workers individually. In some cases it has helped the company, too. In 1988-89, when Lockheed of Marietta, GA laid off over 8,000 military aircraft workers, EDWAA and WARN combined were an aid to the company in managing the layoffs without disrupting production requirements.[42] Union rules of seniority still operated, but they also permitted merging of labor units as assembly functions were finished.

WARN's main value to service providers, of course, is in helping to identify closures and layoffs that are about to happen. In Los Angeles, local employment and training officials used to rely on informal means, such as newspaper accounts and reports from individual workers. Since WARN, they get from the State fax notices of impending layoffs and can move into action. The Missouri Department of Labor credits the WARN-mandated 60-day notice that McDonnell Douglas provided in its 1990 round of layoffs with reducing the number of unemployment insurance recipients from an expected 80 to 90 percent to about 70 percent. Some of the displaced workers found new jobs before the layoff or very soon after. Others moved away. In contrast, after the January 1991 A-12 cancellation, 85 percent of the 5,000 workers laid off from McDonnell Douglas with less than 2 weeks notice applied for unemployment insurance.[43]

While WARN is a big improvement over the past, it has some problems. The requirement that at least one-third of the work force must be laid off to trigger WARN means there can be sizable layoffs (up to 499 workers) at large plants that do not trigger WARN, while the same size layoff in smaller plants would. In a 1990 report prepared for the U.S. Department of Labor, SRI International found that one large corporation was able to lay off nearly 500 workers without giving a WARN notice because less than one-third of the work force was affected.[44] SRI also found that several employers phased down their work force without triggering WARN by repeatedly laying off just under 50 workers in each 30-day period. Further confirmation of this practice came from the human resources director of one large defense company, who told OTA quite frankly that it was his company's policy to manage layoffs in this way; the company opposes the whole idea of advance notice but does give laid-off workers severance pay depending on length of service (though not necessarily in compensation for 60 days' notice).

Overall, in the 15 States examined in the SRI report, displaced worker officials in 3 States reported widespread noncompliance with WARN, and in several others officials reported that many employers were giving less than 60 days' notice.[45] On the other hand, EDWAA officials in a few States told OTA that the WARN legislation seems to have brought home to some employers the value of early warning, and that some have voluntarily provided notice of layoffs when the law did not require it.

Another problem with WARN is that no agency is assigned to enforce it. Eligible workers who have not been given notice, their representatives, and units of local governments can take the company to court, but it is unclear how effective this provision is in encouraging companies to comply.

---

[41]This section is drawn largely from OTA interviews with directors and staff of 21 assistance projects serving workers displaced by defense industry cutbacks and military base closings, and from Linda Kravitz, "The Wages of Peace: Community and Industry Experience with Military Cutbacks," contractor report prepared for the Office of Technology Assessment, July 1990.

[42]Interviews with Hugh Gordon, former Director of Personnel at Lockheed, and Edward Van Stedum, Director, Derson Group, Ltd., the private firm that managed outplacement services, ibid.

[43]E. Terrence Jones, "The Layoffs at McDonnell Douglas: A Survey Analysis," prepared for the St. Louis County Economic Council, October 1991.

[44]SRI International, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act," report to the U.S. Department of Labor, Employment and Training Administration, October 1990.

[45]Ibid., p. VI-20.

Economic Dislocation and Worker Adjustment Assistance (EDWAA)

A Federal program of assistance to displaced workers was created in 1982 in Title III of the Job Training Partnership Act.[46] Amended in 1988 and now referred to as EDWAA, this is the main Federal program offering assistance to displaced defense workers. The program is funded and supervised at the Federal level, but operated by States and local agencies.

In its earlier years the program was usually funded at about $200 million a year, but was given more generous funding after the EDWAA amendments (table 3-9). Regular appropriations rose to an all-time high of $577 million in fiscal year 1992; in addition, Congress has directed DoD to transfer an extra $150 million to the Department of Labor (DOL) for EDWAA services earmarked for dislocated defense workers in fiscal years 1991-93. After several months' delay, the funds were transferred in June 1991. In program year 1990 (July 1, 1990 to June 30, 1991), the first year under EDWAA, a record number of displaced workers were served; there were 282,089 participants, including 186,888 new enrollments and 95,201 holdovers from the year before (table 3-10).

In its first few years, the original Title III program had some modest accomplishments, placing participants at rates of about 65 to 70 percent. However, the program was reaching only around 5 to 7 percent of eligible workers.[47] Several other shortcomings also surfaced: most State Title III programs were slow in responding to layoffs, which was one reason for the low participation rates; some States were carrying over large amounts of unexpended funds from one year to the next; and many projects were not giving enough attention to training, possibly reflecting overemphasis on low cost per worker served. Congress amended the Title III program in 1988, renaming it the Economic Dislocation and Worker Adjustment Assistance Act (EDWAA) and redesigning it to put more emphasis on rapid response to layoffs, give more attention to training, and set up incentives for spending appropriated funds, thus serving the needs of more displaced workers.

Table 3-9—JTPA Title III (EDWAA) Appropriations

Fiscal year	Appropriations (million dollars)
1984	216.5
1985	222.2
1986	95.5
1987	195.6
1988	286.6
1989	278.6
1990	463.6
1991	527.0
1992	577.0

SOURCE: Department of Labor, Office of Work Based Learning.

At this writing, only 2 1/2 years have passed since the Title III program started to operate under the EDWAA amendments, so it is still too early to judge their full effect. One visible, positive change is that the proportion of eligible workers served has risen (and was rising even before EDWAA), partly because fewer workers were displaced in the prosperous 1985-89 period than previously, but also because absolute numbers of new enrollees rose in program years 1988 and 1989. The proportion of eligible workers served was nearly 9 percent in program year 1989 (July 1989 through June 1990).[48]

However, in quality of service provided, there remains a wide disparity among the States. A few States provide excellent services to displaced workers, but most fall considerably below that level and some do very little at all. A major, persistent

[46]Title IIA and IIB of JTPA is directed to the employment and training needs of disadvantaged and low-income workers and youth. It is a much bigger program than Title III, typically funded at about $2.5 billion per year.

[47]OTA put the percentage served at about 5 percent of eligible workers as of 1985 (U.S. Congress, Office of Technology Assessment *Technology and Structural Unemployment*, op. cit.), and the General Accounting Office (GAO) estimated it at 7 percent as of mid-1986 (U.S. Congress, General Accounting Office, *Dislocated Workers: Local Programs and Outcomes Under the Job Training Partnership Act*, GAO/HRD-87-41 (Washington, DC: March 1987). Both OTA and GAO compared the number of workers enrolled in the program each year with the total number of workers losing jobs per year due to plant closings or relocation, cutbacks in production, and slack work, as reported in the biennial BLS/Census survey of displacement. GAO compared the 145,000 new enrollees served in the JTPA Title III program from July 1, 1985 to June 30, 1986 with the BLS estimate of 2.16 million workers losing their jobs each year from January 1981 to January 1986 for the reasons described above. Note that BLS defines as "displaced" only those workers who had held the jobs they lost for 3 or more years; however, eligibility for Title III or EDWAA services is not limited to displaced workers with 3 years tenure on the job.

[48]According to the BLS/Census survey, 9.2 million workers were displaced from their jobs in the 5 years 1985-89 because of plant closings or relocations, production cutbacks, or slack work. New enrollees in EDWAA were 162,834 in program year 1989, or 8.8 percent of the average of 1.85 million workers displaced annually in the 5-year period ending in 1989. These are the latest available figures on numbers of displaced workers.

Table 3-10—Enrollments and Outcomes in JTPA Title III (EDWAA), Program Years (PY) 1983-90

	PY 1983[a]	PY 1984	PY 1985	PY 1986	PY 1987	PY 1988	PY 1989	PY 1990[b]
New enrollments	96,100	132,000	145,773	143,335	116,142	151,507	162,834	186,888
Terminations	50,500	113,600	149,692	149,692	129,984	135,566	139,642	164,856
On board at end of period	45,600	64,100	76,287	69,910	56,068	72,009	95,201	117,233
Entered employment								
Number	36,500	72,200	92,287	102,111	91,591	93,929	91,999	115,721
Percent of terminations	72%	65%	69%	68%	70%	69%	66%	70%
Wage at placement	na	na	na	$6.93	$7.11	$7.54	$7.58	$7.73

[a]Program years cover July through June, except 1983, which covers October 1983 through June 1984, the first period of the program.
[b]Preliminary.

SOURCES: U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Adults*, OTA-ITE-250 (Washington, DC: U.S. Government Printing Office, 1986), p.174; and Department of Labor, Office of Work Based Learning, unpublished data.

shortcoming is that rapid response is far from universal and often is nonexistent. Problems are apparent in the quality and mix of services, especially those provided by organizations whose primary purpose and experience is in employment and training services for disadvantaged people, not displaced workers. Requirements for training under the law and DOL policy have sometimes had perverse effects. DOL's information sharing and technical assistance to States and localities is still scanty, resulting in part from a small budget and a bare bones staff at headquarters. The lack of Federal guidance is a principal reason for the continuing gap between best practice and typical practice among the States.

The following discussion concentrates on aspects of the EDWAA program that could be improved, especially on changes in the law made in 1988, some of which are not working out exactly as hoped. However, the fact that over 1.1 million displaced workers entered this program from October 1983 through June 1991, and that over two-thirds of those leaving it had jobs, is a respectable record for a big public employment and training program, bettered by the fact that the last few years have seen a rise in participation, both in numbers and in share of eligible people served. EDWAA is not a giveaway program. It requires effort from its participants. If more people participate, it is reasonable to conclude that they are getting something out of it.

Changes in EDWAA

Congress left major features of the previous JTPA Title III program unchanged in EDWAA. It remains an employment and training program especially designed for and targeted to displaced workers. It authorizes a range of services, including job or career counseling, testing and assessment, job search skills training and placement assistance, support services, and many forms of training (including remedial education, on-the-job training, entrepreneurial training, and even out-of-area job search and relocation, as well as occupational skills training). The criteria for eligibility are quite broad, extending to all workers who have been laid off or received notice of layoff in permanent closures or substantial layoffs of any facility or enterprise; workers who have been laid off or received notice of layoff, are eligible for or have exhausted UI benefits, and are unlikely to return to their previous industry or occupation; and workers who are long-term unemployed and have limited chances of reemployment in a similar occupation, including older workers for whom age may be a barrier. EDWAA added to the list self-employed people (specifically including farmers and ranchers) who are unemployed because of general or local economic conditions, and displaced homemakers.[49]

As noted, a significant change in EDWAA is its emphasis on rapid response. Under the 1988 law, each State must establish a Dislocated Worker Unit with the duty of providing rapid response after a closure or layoff announcement. The rapid response team is supposed to reach employers and employee representatives, usually within 48 hours, to offer comprehensive information on what public programs are available to help the workers; encourage the prompt formation of labor-management committees under the direction of a neutral, experienced chairman; coordinate a broad array of services; or otherwise help line up comprehensive services quickly, to be offered in one convenient place.

[49]Displaced homemakers, defined as "additional dislocated workers," can be served as long as doing so would not reduce services for other dislocated workers.

A second major change in EDWAA introduces new incentives to bring services to more displaced workers and avoid carrying over unspent funds. This change addressed a situation in which only a small percentage of displaced workers were receiving services, yet on a nationwide basis unspent funds grew every year except 1986, when Congress cut the Title III appropriation in half because of the carryovers. The problem was an uneven one; some States were spending all their allocated funds (with a prudent amount for carryover), but many were not. States may now carry over 20 percent of their allocated funds at the end of each program year,[50] but the Secretary of Labor must reallocate to other States the surplus from any State that failed to spend at least 80 percent of its EDWAA allocation from the immediate previous program year, plus all unexpended funds from any prior year.

EDWAA also removed the predominant authority over the displaced worker program originally given to the States under Title III, and split it between States and local authorities. Of the total EDWAA funding, 80 percent is allocated among States under a formula based on unemployment rates. The States may reserve up to 40 percent of the funds for their own activities, including rapid response, coordination, technical assistance, and administration. At least 50 percent of the States' share is distributed up front, by formula, to substate areas with populations of at least 200,000, and the States must distribute up to 10 percent to substate areas during the first 9 months of the program year on the basis of need. The State selects a grantee in each substate area to provide services to displaced workers, either directly or through contracts. The law allows a wide choice of substate grantees; possibilities include nonprofit organizations, educational institutions, labor organizations, local or State government agencies, and private industry councils. In most cases, however, the grantee is the Service Delivery Area (SDA), which also administers the much larger JTPA program for low-income and disadvantaged workers under Title IIA.

As under the previous Title III, some discretionary funding remains in the hands of the Secretary of Labor—20 percent of the total EDWAA appropriation. Known as the "national reserve fund," this discretionary money can go for services to workers caught in mass layoffs (including those caused by Federal actions or by natural disasters), for industry-wide and multistate projects, and for supplements to the 80 percent of EDWAA money allocated to the States.

Rapid Response

Despite the emphasis Congress placed on rapid response in the 1988 EDWAA amendments, it is still more an ideal than a reality. SRI International and Berkeley Planning Associates, in a recently completed study of EDWAA for DOL found that of the 15 States examined, 5 had rapid response procedures that "were well established and working well," 6 were "experiencing some problems," and 4 had a "low commitment to rapid response."[51] Further, SRI reported that 19 of 30 substate areas investigated "narrowly viewed the purpose of rapid response as providing information on the availability of services . . . and did little, however, to ensure that such individuals eventually applied for or received EDWAA services."[52] SRI recommended that DOL and States stress the importance of using rapid response activities to practical effect, making sure that displaced workers receive appropriate EDWAA services.

A report by the National Governors' Association, the National Association of Counties, and the United States Conference of Mayors presented similar conclusions. These organizations found in every case examined a lag of at least 2 months between layoff and provision of services.[53] OTA's investigation of 21 defense-related layoffs, although based on a small number of cases, supports these findings. In only 7 of the 21 cases were adequate EDWAA funds (sufficient for complete, continuing services) available before layoff. All seven had advance notice of at least 3 months, and four of the seven had 1 year or more (see table 3-11).

[50]In each fiscal year (October 1 through September 30), Congress appropriates EDWAA funds to be spent in the following program year (July 1 through June 30). The delay is intended to give State and local agencies time to plan the next year's EDWAA program.

[51]SRI International, op. cit., p. VI-19.

[52]Ibid.

[53]The National Governors' Association, The National Association of Counties, and The United States Conference of Mayors, *EDWAA Financial Resource Management: Issues and Strategies* (Washington, DC: February 1991), p. 20.

Table 3-11—Provision of EDWAA Services in Selected Defense Layoffs

Firm or installation	Months of notice before layoff	Months before or after (–) the layoff EDWAA services provided
Rockwell (CA)	3	–10
Mac-Douglas, Hughes, Northrup (CA)[a]	na	–7
Grumman (NY) (1989)	0	–7
Lockheed (GA)	3	–6
GD Electric Boat (CT)	2	–6
General Dynamics (TX, A-12)	0	–5
Lockheed (CA)	7	–4
Fairchild-Republic (NY)	0	–4
Mare Island Naval Shipyard (CA)	5	–3
UNC Naval Products (CT)	3	–3
General Dynamics (TX, 1990)	3	–2
McDonnell Douglas (MO, A-12)	0	–1.5
GE Aerospace (MA)	4	–1
McDonnell Douglas (MO)	2	0
Portsmouth Naval Shipyard (NH)	9	0
Grumman (NY) (1991)	4	2
Fort Carson (CO)	3	2
Kelly AFB (TX)	4	2
GE Guidance Systems (MA)	12	6
GE Jet Engines (MA)	24	12
Pueblo Depot (CO)	20	12
Chanute AFB (IL)	53	34

[a]Southern California SDAs applied for National Reserve Funds to serve multiple layoffs in defense aerospace.

SOURCE: Office of Technology Assessment, 1991.

Advance notice does not guarantee rapid response by EDWAA agencies, however. In 10 of the other 14 cases, there was at least 2 months' advance notice, usually more. For example, in 1990, the Portsmouth, NH Naval Shipyard gave 9 months' notice that 890 positions would be abolished, but an EDWAA-funded displaced worker center did not open until the week the workers were laid off. Meanwhile, the Navy had provided several kinds of reemployment services, including four job fairs and extensive offers of relocation to other Navy facilities, but not retraining, an option with considerable appeal to the shipyard's work force. The only training offered was a 3-week course in welding for 40 workers, paid for by the union. As for EDWAA, SDAs from two States (Maine and New Hampshire) were involved. Because the project resulted from a Federal action and was multistate, and because the States and SDAs had little money on hand to serve the workers, they applied for a national reserve fund grant. It took 6 months for the SDAs in the two States to get the application written. (One reason is that EDWAA services cannot be provided until workers get notice of layoff, and notices in this case were delayed.) There was a further, although briefer, delay at DOL.

State agencies have the primary responsibility for rapid response, and while some do a good job, others are not as committed to or adept at providing it. In 1990, 22 States made fewer on-site visits (the first step in rapid response) than the number of WARN notices they received, while 22 made more. The variation is substantial: one State responded to only 30 percent of their WARN notices, while another responded to over four times as many sites as the WARN notices they received.[54]

Several causes for the spotty and still unsatisfactory record of rapid response under EDWAA are discussed below, in connection with other aspects of the program. It is worth emphasizing, however, that most State and local EDWAA agencies still need a firmer understanding of the pivotal role of rapid response, and there is an important Federal responsibility in supervision and guidance to further this understanding.

Discretionary Funds

One hindrance to rapid response arises from the way EDWAA funds are distributed, both among States and between States and substate areas. Because most of the money is allocated by formula

[54]Data provided by the Employment and Training Administration, U.S. Department of Labor.

before the program year starts, and because displacement is hard to predict in advance, the money simply may not be where the displaced workers are. Under an ideal system, places with a rash of large layoffs would get generous funds for adjustment services right away, while places with trivial layoffs would get little or no money.

Recognizing that it is impossible to predict where displacement will occur, EDWAA provides for reserve funds at both the national and State levels. Throughout the year, States and local EDWAA agencies in need of additional funding can apply to the Secretary of Labor for grants from the national reserve. The trouble is that it takes time to write applications and get approvals at both the State and Federal levels for these discretionary funds—often so much time that response to the workers' need is long delayed.

The Secretary of Labor attempts to rule on proposals for grants from the national reserve within 45 days. Although longer delays were reported in 1990, DOL stated in mid-1991 that it was turning proposals around in an average of 38 days. However, 38 days added to the time it takes to prepare the application is still too long to allow rapid response.

Several factors contribute to delays. DOL requires detailed information about the layoff in the grant application; this takes time to review and even more time to collect. Service providers must state, for example, in which occupations displaced workers are likely to be trained and what jobs they are likely to take. Getting accurate and useful information on questions such as these is a formidable, not to say impossible, task. States often simply guess. After the States spend weeks collecting such detailed information, DOL may return the application for more specifics. As one State EDWAA official commented, only somewhat facetiously, "If the idea is rapid response, we can't know everybody's shoe size up front."

If rules for applying to the fund are unclear, that further delays the process. While DOL does publish rather voluminous and detailed reserve grant application guidelines each year in the *Federal Register*, many States, according to the National Governors' Association, have a hard time determining DOL's criteria for judging proposals.[55] For example, a Washington State official reported applying for a discretionary grant only to be told that 60 percent of the workers must be enrolled in retraining. Since this requirement was in neither the law nor DOL regulations, the official was puzzled as to how it could be known ahead of time. Another State official compared the DOL grant process to "shooting into a dark room—you might hit something but you're not sure why, or if you could do it again." DOL's view is that it strictly adheres to the guidelines in evaluating proposals for possible funding, but State managers are less sure of what is expected and many doubt their ability to comply. A number of States were in danger of running out of EDWAA funds in 1991 because the recession greatly increased displacement and demands for services, yet most States were choosing not to apply for reserve funds, because the process is simply too obstacle ridden. According to one DOL official, many State EDWAA managers cannot handle the complexities of the grant application, and those that do know how are too busy responding to client's urgent needs to write demanding, detailed grant proposals.

In many cases, the longest delays in the application process are not at the Federal level, but elsewhere along the way. As mentioned, in the Portsmouth Naval Shipyard layoff, it took half a year for the two SDAs from two different States to complete an application for a DOL grant. SDAs within States can delay applications, too. For example, when Secretary of Defense Richard Cheney canceled the Navy's A-12 fighter aircraft because of delays and cost overruns, 3,400 General Dynamics employees at Fort Worth were laid off without notice (legal under the WARN law, since the cancellation was unanticipated). DOL has a special set of emergency procedures for streamlining approval of national reserve fund grant applications in certain crisis situations, and this was one of them. Yet, mainly because of delays at the local level, Federal money was not received for 4 months.

An example of delay at the State as well as the Federal level comes from California, where local agencies waited more than 7 months in 1990-91 for funding to deal with mass layoffs in the timber, electronics, and defense aerospace industries. The State first sent in a proposal that DOL rejected on grounds that it did not contain adequate detail. The State took 2 months to amend the proposal; according to State officials, the application was more than

[55]Interview with John Lederer, Senior Policy Analyst, Human Resources Policy Studies, National Governors' Association, March, 1991.

3 inches thick—the volume necessary to respond to DOL's requirements. It then took nearly 3 months more for DOL to approve the proposal. Another 2 months went by before the State made the DOL funds available to the local agencies. The agencies received the funds in mid-March 1991. The terms of the grant, ironically, precluded service to workers laid off after March 31, 1991.

There are also problems in getting discretionary State money to localities that need funds for rapid response. Some States distribute most of their EDWAA allocation to substate areas at the outset, leaving little for emergencies.[56] With those that do have a reserve, there are often delays. Many States use formal Requests for Proposals to distribute the reserve funds, which delays the process significantly.[57] Others simply fail to get the money out to the substate areas quickly. Some States have streamlined their review process and are approving funds within 10 days. Still others provide startup grants out of their reserve funds so the local service provider can get in early and begin to offer the first, most basic adjustment services. For example, in Massachusetts, substate areas can get up to $10,000 from the State within 48 hours. Not all States have such policies.

This leads to another major sticking point in tapping into the national reserve fund. Virtually every State EDWAA official interviewed by OTA said that delays in services are aggravated by the DOL rule that prevents States and substate areas from paying for services up front with their own money and then getting reimbursed for their share if and when the national reserve fund comes through. Some DOL officials defend the rule on the grounds that if States (or substate areas) have the money to spend in the first place, then they don't need Federal reserve funds, and therefore should not be reimbursed. While this may make a certain amount of bureaucratic sense, the practical effect is to delay provision of services to displaced workers. States that respond rapidly by spending their own money up front risk not being able to respond to layoffs later in the year. If subsequent reimbursement from Federal discretionary money were allowed, that would decrease the risk.

These delays and restrictions mean that if services for displaced workers depend on discretionary funding, chances are that the services will not be ready until after workers are already laid off and collecting unemployment insurance.[58] It might be reasonable to decide that if States are trusted to administer 80 percent of the EDWAA funds, they could be given more leeway in using the reserve funds. There is a choice to be made: either require detailed time-consuming applications and prohibit reimbursement, or contribute to rapid response, but don't expect to have it both ways.

Quality of Services

One reason for uneven quality of service in EDWAA programs is that, very often, the substate area grantees are more accustomed to and interested in serving disadvantaged workers than displaced workers. JTPA includes two distinct programs serving two quite different populations: Title IIA for low-income and disadvantaged people and Title III for displaced workers. In many substate areas, the local EDWAA authority is the Service Delivery Area (SDA), which also has responsibility for serving disadvantaged clients under JTPA Title IIA.

In some cases where the SDA is the grantee, programs for displaced workers take second place. For example, one employment and training official in St. Louis commented that many of his colleagues resent the attention paid to laid-off McDonnell Douglas workers. Their attitude was that those workers do not need help. In Connecticut, when the United Nuclear Corp. approached the local SDA about its impending layoff, it got no response for more than 2 weeks because the staff was busy on Title IIA matters.

Some SDAs seem content to let workers be laid off before they begin to provide services. According

[56]OTA's discussions with State EDWAA officials support SRI's findings that States with considerable rapid response experience predating EDWAA devote a large share of their 40 percent funds to responses to specific closings that the substate areas' formula funds do not adequately cover. In contrast, States with little previous rapid response experience are giving more of those funds, which they could reserve for distribution as needed, directly to the substate areas by formula. SRI International and Berkeley Planning Associates, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Review of State EDWAA Plans and First Quarter Expenditures," February 1990, pp. II-8.

[57]Texas Association of Private Industry Councils, *Laid Off: The Texas Response to Plant Closings and Layoffs* (Austin, TX: 1990), p. 18.

[58]National Governors' Association, National Association of Counties, United States Conference of Mayors, *EDWAA Financial Resource Management Issues and Strategies* (February 1991), p. 20. An example of the paperwork involved was California's 3-inch thick application for reserve funds for three different industry-wide grants.

to one State official, a lot of SDAs in his State "still wait for people to come out the door with their pink slip before providing them services."[59] Some deliberately postpone action until just before the layoff date because they believe that workers do not benefit from services provided earlier; one waited 4 months after advance notice of a layoff for this reason.[60] Some State agencies share in this misconception. SRI reported that one State deliberately holds orientation meetings at plant closings near the actual time of the layoff.[61]

Another problem, according to SRI, is that reliance on SDAs for running displaced worker projects usually means less use of labor-management committees. Although some SDAs rely on labor-management committees, more traditional approaches are the norm.[62]

The needs of disadvantaged workers and displaced workers often differ significantly. Displaced workers usually have stronger work histories and often higher skill levels; some need little more than adjustment assistance administered promptly and effectively. An SDA that has specialized in serving disadvantaged workers may have trouble serving displaced workers, especially the professional, managerial, and other white-collar workers being laid off in defense industries.

Thus it is not surprising that the Title IIA service system may be ill-suited to displaced workers. SRI found that of 15 State displaced worker programs studied, only 8 gave higher priority to recently laid-off workers than to long-term unemployed. (The law defines long-term unemployed workers as eligible for EDWAA services, but emphasizes the factor of displacement in all other categories of eligible workers.) In fact, one State, with few large scale layoffs, targeted its EDWAA activities to long-term unemployed. Similarly, of the 30 substate areas SRI examined, only 13 gave priority to recently dislocated workers, while 9 gave long-term unemployed the top priority.[63] Apparently, some SDAs saw the EDWAA program as an opportunity to supplement Title IIA services. Given their orientation, many SDAs see no need for specialized readjustment services for displaced workers. In 20 SDAs studied by SRI International, 8 provided no stand-alone basic readjustment services beyond initial assessment, while the remaining 12 provided the same readjustment services that Title IIA clients received.[64]

Some of the problems with SDAs might be solved if State agencies were to do a better job of educating them on the needs of displaced workers, the value of early action, and the usefulness of labor-management committees. However, this is not simply a job of education. Several State officials told OTA that it is politically difficult to deal with the SDAs; they have their own longstanding, well-established power bases.

The quality of services for displaced workers might be improved if States were to pursue more aggressively options to use service providers other than SDAs. Nonprofit organizations are another choice. For example, in 3 of Massachusetts' 15 substate areas, educational institutions have been designated as service providers. Many of the State's dislocated workers in other substate areas are served in on-site centers, run either by labor-management committees or by experienced service providers who specialize in assisting displaced workers. Massachusetts officials find that services involving the company and work force in centers designed specifically for dislocated workers function well.[65] One of the best projects OTA staff visited was at GE Aerospace's Burlington, MA facility, where GE is now providing the services after receiving startup help from the State. (GE is using a State nonprofit organization as a financial administrator.)

[59]SRI International, "Study of the Implementation of Economic Dislocation and Worker Adjustment Assistance Act, Draft Final Report," 1990, p. VI-15.

[60]Ibid., p. VI-15.

[61]Ibid.

[62]SRI International and Berkeley Planning Associates, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Issues in Promoting Labor Management Cooperation," 1990, p. V-3; Texas Association of Private Industry Councils, *Laid Off*, op. cit., pp. 37-38.

[63]SRI International, "Study of the Implementation of Economic Dislocation and Worker Adjustment Assistance Act, Draft Final Report," op. cit., III-5 and IV-9.

[64]Ibid., , p. VIIi-12.

[65]Interviews with Suzanne Teegarden, Director, Industrial Services Program, State of Massachusetts, and Barbara Baran, Director of Employment Services, Industrial Service Program State of Massachusetts.

An advantage of the Massachusetts approach is that it introduces competition into the system. Giving SDAs money automatically on a formula basis creates a monopoly and inhibits this quality-enhancing public sector competition.

As noted, EDWAA does allow State Governors and local leaders to designate many kinds of organizations as substate grantees, but in most States Title IIA SDAs are chosen,[66] either because of inertia at the State level, or because of the considerable political clout that many SDAs possess.

Division of Funds and Responsibilities Between States and Substate Areas

The mandatory division of funds between States and substate areas adopted in EDWAA has, in some cases, resulted in underfunding and understaffing of local EDWAA agencies. Substate areas are numerous and becoming more so. In 1990, there were 638 substate areas, up from 605 in 1989. In some States, EDWAA funds are spread so thinly that individual substate areas can hardly marshal enough resources to exist.[67] For example, in program year 1989, 12 of Florida's 24 substate areas shared EDWAA funds of less than $155,000 (an average of $13,000 apiece), while in North Carolina, one substate area received $11,771.[68] Such limited funds make it virtually impossible for smaller substate areas to mount a program targeted to displaced workers, including fast response to layoffs. In the words of one State EDWAA director, there may be little choice in these cases but to "just lump it into the Title IIA program and serve any long term unemployed worker who comes wandering in the door."

One State found a creative solution to the problem of reconciling the formula allocation to substate areas with targeting EDWAA resources to displaced workers. Nothing in the law says that States must fund all substate areas equally. In Program Year 1989 (before the recession caused high levels of displacement in nearly all parts of the State) Massachusetts funded only 7 of its 15 substate areas, directing the funds to those that appeared likely to have the most displacement. Most States, however, fund all their substate areas.

Another drawback to giving substate areas equal control with the State over EDWAA programs is that it adds a layer of bureaucracy. Before EDWAA, only one agency and one set of officials were needed to serve displaced workers. Now service delivery contractors must not only deal with the State, but also with the local substate area—in a big metropolitan area, often with more than one. An experienced contractor involved in a layoff that crossed lines of three substate areas commented that dealing with several bureaucratic layers "saps your energy."

Some States, especially big ones like California, probably need to rely on established public sector organizations at the substate level to share in the tasks of administration. Los Angeles alone has more defense-related worker displacement than many entire States. A permanent professional staff assigned to this area can establish procedures for responding promptly to the layoffs. In fact, some of Los Angeles County's SDAs, as well as those in neighboring Long Beach, do specialize in services to displaced workers. However, many smaller States are well able to manage EDWAA themselves, offering services through the State dislocated worker unit and through grantees that specialize in helping displaced workers.

Training

EDWAA requires that at least 50 percent of a project's funds must be spent on training; individual projects may get a waiver from the Governor to reduce this to 30 percent, but few do it. The law's training requirement was a response to weaknesses in the Title III program in the early years, when many service providers focused most of their resources on relatively cheap and simple adjustment services, such as job search skills workshops. While the change in the law reflects laudable goals, it does rob some projects of the flexibility needed to serve various kinds of clients. It can be difficult to meet the requirement in layoffs of highly skilled defense industry workers with few needs for retraining. Most

[66]SRI International and Berkeley Planning Associates, Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Review of State EDWAA Plans and First Quarter Expenditures, op. cit., p. II-3.

[67]SRI International and Berkeley Planning Associates, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Substate Issues," April, 1990, p. 37; also interview with Barbara Baran, Director of Employment Services, Massachusetts Industrial Services Program, March, 1991; also, Hansen, op.cit.

[68]Data supplied by the Employment and Training Administration, U.S. Department of Labor (May 13, 1991).

of the engineers, computer programmers, and middle managers losing jobs in the big aerospace layoffs of 1990-91 did not want training; but if they had, the training was likely to be so expensive that a project would find it hard to justify spending so much on a handful of clients.

More generally, not all displaced workers need or want training. Some need little more than information about resources available to them; others need job search skills training and job leads. These cost-effective adjustment services can help displaced workers find jobs quickly, reducing unemployment and its costs to the government. However, in programs that offer a good selection of training choices and careful matching of candidates with the available courses, a sizable minority of displaced workers will make the commitment to retraining.

Adjustment services are critical in helping people choose whether they need training and if so, what kind. When workers are not counseled about the kinds of training they may need, they may choose courses that are inappropriate and unproductive.[69] One State EDWAA director gave the example of tractor trailer driving. "Hundreds of guys want it," she said, "but the course is expensive and there are no jobs." Before it learned better, one center trained 20 people in tractor trailer driving, but only 1 found employment. "With that money," she said, "we could have owned a tractor trailer."

Prior to EDWAA, service providers could count expenditures on training-related counseling as training, but no longer. The law itemizes many activities as training, including some that are fairly far afield (relocation expenses), but not counseling. Unless it is specifically and narrowly defined as training-related counseling, DOL has ruled it out as a training expense.

Sometimes, the 50 percent training requirement has unintended consequences. SRI found that the rule can create a perverse incentive for service providers to seek out higher cost training, or to avoid using sources of training funds outside EDWAA (including Trade Adjustment Assistance training funds and vocational education resources).[70]

There are other difficulties with EDWAA training, some of them longstanding and with no obvious solution. One is the fact that few displaced workers can afford to take off much time for training. Up to 25 percent of EDWAA funds may be spent on income support ("need-related payments") and other supportive services for workers in training, but only rarely do projects provide such payments.[71] Nationwide, spending for this purpose has ranged between 5 and 7 percent of total funds; it was 6 percent in program year 1989. Income support for displaced workers in training is limited mostly to UI, which typically covers no more than 26 weeks (and not even that if the worker fails to start training at the time of layoff). This means that most EDWAA training courses are short, usually 12 to 16 weeks—only enough for narrow, specific courses such as word-processing for clerical workers. A complicating factor is that skills training courses are often open only twice a year, which may not match the time slot available to displaced workers. Some community colleges have begun to offer courses with open enrollment, beginning every week or two. For example, Jackson Community College in Jackson, MI has an open-entry 6-month course in manufacturing technology that is designed specifically for displaced workers.

Another hindrance to productive training is that DOL policy and regulation discourage the use of EDWAA funds to train workers for advanced skills in their same occupation. The reason DOL officials give for opposing such training is that limited EDWAA funds should be focused on workers most in need. Since laid-off electricians, for example, already have a marketable skill, they are not the clients most in need—even if they could benefit greatly from further specialized training in electronics. The law itself does not demand distinctions between training in a new skill and upgrading existing skills, particularly for workers laid off as a result of plant closings or mass layoffs—nor does DOL regulation state the distinction explicitly. However, DOL policy does not, in general, support upgrade training. When this policy is applied, it may not only lessen a displaced worker's chances of getting a good replacement job but may also defeat

[69]National Governors' Association et al., op. cit., p. 11; also Interview with Barbara Baran, Massachusetts Industrial Services Program, October, 1990.

[70]SRI International and Berkeley Planning Associates, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Substate Issues in the Implementation of EDWAA," p. 24; also National Governor's Association et al., op. cit., p. 12.

[71]To be eligible for these payments, displaced workers need to be enrolled in training by the end of their 13th week of unemployment and have exhausted their UI benefits. Workers are sometimes not made aware of this requirement and do not get into training in time to qualify for income support.

the purpose of improving the skills of the American work force and thus contributing to better competitive performance.

The DOL policy on training in the same occupation and the reasoning behind it arise from a certain vision of the EDWAA program. DOL officials responsible for EDWAA say they see the program as one of three legs: financial support provided by the UI system; adjustment services (e.g., job search skills training, job development) provided by the Employment Service; and training, particularly for lower-skilled workers, provided by EDWAA. There are problems with this view, not the least of which is that Title III was designed as the primary adjustment program for dislocated workers. The language of the law is explicit on this point, listing not only training but also many "basic adjustment services" among those to be provided, although funds for such services are limited by required levels of expenditures for retraining.[72] To expect the Employment Service to offer all adjustment services other than training to displaced workers is unrealistic; as discussed above, it is already hard-pressed to serve unemployed workers in general and is in no position to offer help tailored to the needs of displaced workers.[73] Moreover, it lacks the resources for rapid response to layoffs. If EDWAA does its job and provides service very shortly after notification of layoff, many workers will not even need UI, services from the Employment Service, or even training, because they will be employed.

Federal Responsibilities

A central challenge to a decentralized system such as EDWAA is to see that best practice becomes common practice. At present, best practice is not always emulated; worse, it is often not even known.[74] Some States respond rapidly, provide pre-layoff services, and see that service providers do a good job of offering training and services. Many others—probably the majority—do not. As steward for the system, DOL is responsible for systematically helping States advance to a more consistent high level of service. States are not now getting adequate policy leadership and technical assistance to help them advance.[75]

Better information sharing is the first essential. Many service providers are simply not aware of the latest developments in the field and find themselves floundering or duplicating the efforts of others.[76] For example, the manager of a dislocated worker center for laid-off blue-collar defense workers in California told OTA visitors that the center was a real breakthrough and a one-of-a-kind experiment. The manager seemed unaware that many similar centers have been set up around the nation over the past 10 years (and that models from as long as 25 years ago are still useful). This manager was learning from scratch what has become common knowledge elsewhere. The frequent turnover of personnel in State EDWAA agencies leaves little institutional memory of how to deal with displaced workers and thereby compounds the problem.

A rather simple way of getting more information on variation in program quality among the States might be to require reports on rapid response. Reporting requirements for EDWAA are minimal; very little data that might form the basis for indicators of program performance is required from EDWAA managers. One of the few reporting requirements is for placement rates (percentage of workers leaving the program with jobs), but that is a crude measure, subject to creaming (selecting only the most job-ready applicants) and misleading reporting (enrolling people only when there is a job ready for them). Variation in local conditions also creates difficulties in comparing service providers by such measures as placement rates or wage rates at placement. A better measure of program quality that is less subject to misinterpretation or manipulation might be the average time it takes to provide a set of key adjustment services (e.g., personal counseling, skills assessment and career counseling, job search skills training) after the announcement of a plant closing or mass layoff. This measure could help identify both States that are doing poorly and need help to improve and those that are doing well enough to serve as models.

[72]Public Law 100-418, Subtitle D-Employment and Training for Dislocated Workers, sec. 314 (c).

[73]As long ago as 1966, Shultz and Weber (op. cit) concluded that placement efforts for displaced workers should be on a special project basis; routine Employment Service procedures are inadequate to handle the problems of mass layoffs.

[74]See Hansen, op. cit.

[75]Ibid.

[76]Ibid.

Some consideration might be given to using incentives, in addition to technical assistance and information sharing, to raise the level of States' practice. The EDWAA funding allocation system gives the same amount of formula funds to a State regardless of the kind of job it does.[77] States might perform better if there were some link between funding and performance.[78] For example, States with a good record of rapid response might be rewarded with a modest increase in funding.

DOL efforts to help States improve their programs have included demonstration programs of rapid response and labor-management committee operation of services for displaced workers, modeled on Canada's Industrial Adjustment Service; planning for a second round of rapid response training; development of an EDWAA financial management guidebook for substate areas; and occasional roundtables convened by DOL regional offices. However, many State officials have suggested a need for more constant and systematic sharing of information about what is working where.[79]

Insufficient funding and staff is the first reason why DOL has not done more. The Office of Work Based Learning, which is responsible for EDWAA, simply does not have the resources to do much more than send out money and minimally monitor what happens to it. The staff comprises just 12 people, too few to manage a decentralized nationwide dislocated worker system effectively and also keep in close touch with State and local program staff. Another reason for weakness in leadership is that DOL's relations with the States and local service providers tend to be more adversarial than enabling. DOL does monitor State performance, but more for rule compliance than for service quality. Moreover, some DOL officials treat the States as an interest group rather than as a policy-making partner.

Systematic, frequent contacts between DOL and the States and localities could help to promote the active, continuing adjustments that any public program needs for success. Some of this does occur. At the initiative of the National Governors' Association State JTPA Liaisons Group, DOL participates in focus groups with selected State JTPA providers to discuss specific issues in detail. More of these interactions could be helpful.

Formulas for Allocating EDWAA Funds

Any system that allocates funds by formula to anticipate future events is bound to overfund some places and underfund others. Beyond this, however, the formula for allocating EDWAA funds to States does not adequately recognize the past record of displacement. EDWAA requires that DOL use three different unemployment measures in the allocation formula.[80] Because dislocation is not necessarily strongly correlated with unemployment, the EDWAA formula system awards too little money to some States and too much to others.[81]

States with very similar rates of displacement get widely varying amounts of funds per capita. For example, in 1991 the State getting the most EDWAA funds per capita, West Virginia, received $10.23 per employed person while the lowest-funded, Hawaii, received 92 cents.[82] Yet, according to data collected by the Bureau of Labor Statistics (BLS) on mass layoffs in 1989, 4 workers per 1,000 were laid off in Hawaii while West Virginia had only slightly more,

[77]The Secretary of Labor does set a performance standard for substate areas, based on entered employment rate (64 percent employed), but the measure is not used to allocate funds to States. If a substate area fails to meet the performance standard, the State Governor is required to provide technical assistance to the service provider. After 2 years of failure to meet the standard, the Governor may designate another service provider. Because the standard is fairly recent and relatively easy to meet, this seldom happens in practice. Governors are also allowed to use a portion of the State's 40 percent funds to reward substate area performance.

[78]The effectiveness of raising or lowering funding as an incentive to improve program performance is uncertain. Past attempts to use such a reward system for the State Employment Services were not carried through far enough to allow a fair evaluation of the results; devising a reasonable measure of performance is difficult for the Employment Services. EDWAA's rule limiting carryover of funds greater than 20 percent has apparently motivated more spending by nearly all States, including the former laggards, but it is probably easier simply to spend money than to improve program quality.

[79]Hansen, op. cit.; OTA interviews with State EDWAA officials.

[80]One-third of the 80 percent of EDWAA allocations is allotted among the States on the basis of the relative number of unemployed individuals in the State compared to unemployed in the U.S., one-third on the basis of number of unemployed in excess of 4.5 percent, and one-third on the basis of relative number who are unemployed more than 15 weeks.

[81]See James F. Ragan, Jr. and Daniel J. Slottje, "Alternatives to Unemployment-Based Funding Formulas in the Allocation of Federal Grants," *Growth and Change*, winter, 1989, pp. 17-33.

[82]Data supplied by the Employment and Training Administration, U.S. Department of Labor.

5 per 1,000.[83] In one of its evaluation reports on EDWAA, SRI found that States with low unemployment rates (and hence low EDWAA funds) were spending their limited funds faster than States with high unemployment rates and higher EDWAA allocations.[84] This indicates that despite their low unemployment rates, these States had moderate to high dislocation rates.

This problem was anticipated in EDWAA. The law mandates that as soon as mass layoff data being developed by BLS are satisfactory, they shall be used in the formula. It is not clear, however, when or even whether these data will ever be satisfactory. Although BLS has developed mass layoff data for most States, several, including California, have resisted adapting their UI systems to collect the data.[85] Because of their reluctance, the system is on hold and cannot be used. Another problem is that although many States, particularly the smaller ones, have very few mass layoffs, they have many smaller layoffs that the BLS system does not count. Finally, it is unclear just how accurate the system is in reporting mass layoffs. Several States commented to OTA that they had serious doubts about the validity of the numbers for their States.

The distribution of EDWAA funds within States is also troublesome. EDWAA requires that in allocating half the funds by formula to substate areas, States must use at least six factors, including data on unemployment, plant closings and mass layoffs, and declining industries, but the States can weight the factors in any way they choose. According to SRI, many States repeat the mistake of the national formula, giving too much weight to unemployment rates.[86] Most States, SRI found, either do not have good information about declining industries and plant closures, or do not use it in their formulas. Among States that did not use dislocated worker data in their allocation formula, only 16 percent of the substate areas had appropriate funding, while among States that used the data, 55 percent of the substate areas had appropriate funding.[87]

Spending Rules

There was good reason for the change Congress made in Title III spending rules when EDWAA was enacted in 1988. This was the fact that States had continuing, and mounting, carryovers of unspent Title III funds under the old regime. The first attempt to fix the problem, urged by the Reagan administration and adopted by Congress in fiscal year 1986, was simply to cut the Title III appropriation in half. But this penalized the States that had created vigorous, functioning displaced worker programs more than those that had done little or nothing and were the very ones carrying over most of the excess funds. Carryovers began to rise again the next year, after the Title III funding level was restored.

Under the original Title III, the Secretary of Labor could, at his or her discretion, reallocate obligated funds from one State to another, but this never actually occurred. Under EDWAA, the reallocation became mandatory. It is difficult to evaluate the full effects of the new spending rule. It certainly has cut the carryovers. According to DOL officials, there was virtually no carryover of more than allowable 20 percent of formula funds allocated to States in 1990 or 1991.[88] The fact that participation, both in numbers and percent of eligibles, reached an all-time high in program year 1989 reflects not only the increased program funding, but also the pressure to spend more of the allocated funds. Whether this pressure is all to the good is hard to say until local programs are better evaluated. States and substate areas under pressure to spend may find creative ways to do so. Some States and substate areas have spent

[83]Calculated on the basis of data in the 1989 Mass Layoff Survey, U.S. Department of Labor, Bureau of Labor Statistics, *Mass Layoffs in 1988* (Washington, DC: Government Printing Office, 1990).

[84]SRI International and Berkeley Planning Associates, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Review of State EDWAA Plans and First Quarter Expenditures," op. cit., pp. II-4.

[85]Some States have resisted because of the increased cost in adapting their systems to collect this information. In addition, some view the use of UI data narrowly and oppose using it for the purposes discussed here.

[86]SRI International and Berkeley Planning Associates, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Substate Issues in the Implementation of EDWAA," op. cit., 37.

[87]SRI International, "Study of the Implementation of Economic Dislocation and Worker Adjustment Assistance Act, Draft Final Report," op. cit.

[88]Total carryovers reached a high of $209 million and 94 percent of allocations to States in mid-1986 (the end of the 1985 program year); in mid-1990 carryovers were down to $114 million and 34 percent of the year's allocation to States. However, these amounts include carryovers of funds from discretionary grants from the national reserve fund, which are often made very near the end of the program year. Carryovers of the States' own allocations were not more than 20 percent.

EDWAA funds on projects for drug addicts, the homeless, or welfare mothers, defining them as long-term unemployed.[89] While employment and training projects may be valuable for these clients, they can be served by the much larger JTPA Title IIA program. Another drawback to the spending rule is that it encourages substate areas to spend their money quickly early in the program year so they are sure not to have to give any back. If layoffs occur late in the year, many substate areas have already spent their money, and the only recourse is to apply for discretionary funds, which usually means delay.

Where the spending rule might create a serious problem for some States is in giving too little cushion for higher spending in recession years. Demands for EDWAA services rise in recessions, when layoffs are increasing and job openings are few. Moreover, when no jobs are available, displaced workers are more inclined to choose training in order to make constructive use of their time, and training is the most expensive of EDWAA services. EDWAA funding is not countercyclical. Congress appropriates the annual funding for EDWAA long in advance. Appropriations bills are timed with the fiscal year, which begins October 1, and EDWAA's program year, in which those funds are spent, begins 9 months later, on July 1 of the following calendar year. The level of funding thus has little to do with business conditions at the time States and substate areas start spending the money.

Although EDWAA funding rose from $283 million in fiscal year 1988 to $527 million in 1991 and $577 million in 1992, these increases were for growth in the program, not for meeting greater demands due to recession. With the 1990 recession and persistent high unemployment in 1991, many States found themselves running short of funds. In 1990, some States told their substate areas to "put on the brakes" and not enroll too many people, so as not to run out of money halfway through the program year. In October 1991, only 3 months into the 1992 program year, DOL officials reported that many States were spending their formula allocations at such a rapid pace that their funds would not last out the year. However, as noted above, in 1991 requests were coming in slowly for grants from the national reserve fund and for the special $150 million fund earmarked for displaced defense workers. The problems of getting access to these discretionary funds are apparently deterring States from using them for their intended purposes.

DOL cannot set aside unexpended funds for tough times, and the carryover rule means that States and substate areas cannot set aside more than 20 percent of their formula allocation each year. Lacking the ability to save for a "rainy day" reserve, the program may fall short of meeting needs during recessions.

DEPARTMENT OF DEFENSE TRANSITION PROGRAMS FOR CIVILIAN EMPLOYEES

All displaced DoD civilians are eligible for EDWAA services, but DoD provides extra services as well. The Department itself has developed programs, as have the individual services and some individual facilities and bases. Many of these efforts to help civilians are less than 1 year old, and some are still being established.

As with most other matters related to the armed services, civilian transition policies are handled in a somewhat decentralized and uncoordinated manner. The Secretary of Defense sets overall policy but leaves each service to manage its own layoffs. As a result, the services differ considerably in their progress toward handling civilian layoffs. Within each branch, there is still more variation. Some commands are quite active, while others have done little. Similarly, some bases slated for closure are at the forefront, while others lag. Although this allows a certain amount of flexibility at the local level, it also means that assistance to laid-off workers varies. Nevertheless, the range of services offered to DoD civilians adds up to considerably more than the average defense industry worker receives, particularly blue-collar workers and workers in small firms.

Advance Notice

The WARN act requires private employers to provide at least 60 days' notice to workers affected by mass layoffs. A new rule from the Office of Personnel Management (OPM), taking effect November 6, 1991, now requires the same for all Federal employees, including DoD employees. Even before the rule took effect, all the military services

[89]SRI International and Berkeley Planning Associates, "Study of the Implementation of the Economic Dislocation and Worker Adjustment Assistance Act: Substate Issues," op. cit., p. 38; OTA interviews with State and local EDWAA officials.

except the Navy required a minimum of 60 days' notice. (The Navy required that each facility establish some kind of outplacement effort and sign up workers for DoD's internal placement program before the RIF, and individuals had to be given an additional 30 days' notice if they asked for it.) According to a General Accounting Office (GAO) study of 16 defense installations undergoing RIFs, one gave 44 days' notice while the other 15, including 3 of 4 Navy installations, gave 60 days or more.[90]

DoD-Wide Placement Programs

DoD concentrates its efforts on computerized employee placement programs, primarily the Department's Priority Placement Program (PPP), but also the Displaced Employee Program of the OPM (available to all Federal employees) and an automated resume referral service. These programs supplement the outplacement efforts that each service operates independently.

The Priority Placement Program

The centerpiece of the Department's efforts is the PPP, established in 1965 to respond to a number of base closures at that time. It is an automated system, matching employees who are scheduled to be separated or downgraded with vacant DoD positions for which they are fully qualified.[91] The system not only benefits employees but also yields savings to DoD in severance pay, unemployment compensation, and lump sum annual leave payments. All DoD employees who are scheduled to be separated and are entitled to severance pay are automatically registered in PPP. At the time of registration, participants may specify the locations they are willing to accept (which must include, at a minimum, the employee's own geographic area).

PPP's computerized listings contain the grade level of participants and as many as five skills for which they are qualified. The listings are sent biweekly to every DoD Civilian Personnel Office in the world. Personnel staff are responsible for matching eligible candidates on the list with vacancies in their organization. If the new job requires a move to another location, moving costs are borne by the government.

The key to PPP is that when a vacant position matches the skill and grade of a PPP registrant, all recruiting action stops and that job must be offered to the registrant. However, the registrant typically has only 24 hours to decide; a registrant refusing a job in a location he or she has previously selected as acceptable is removed from the system and does not qualify for additional benefits such as severance pay.[92]

From 1965 to 1990, over 90,000 registrants found jobs through PPP; the number in 1990 was 3,159. In many cases, PPP gives a significant boost to outplacement efforts. For example, in layoffs from the Pueblo (CO) Depot, nearly one-third of those laid off found jobs through PPP. In the Portsmouth Naval Shipyard layoffs, one-quarter of RIFed employees were placed through PPP. Local DoD outplacement officials interviewed by OTA were unanimous in their belief that PPP works well. In fact, most claimed that any employee willing to relocate would find alternative DoD employment with PPP.

When PPP finds a position for a registrant, it does so quickly. In 1990, one-third of the total placements were made within 30 days of registering, and nearly two-thirds within 60 days.[93] Since most DoD civilians get at least 60 days' notice, the program apparently finds jobs for most people before they are laid off. Note, however, that contractors and non-civil-service employees are not eligible for PPP. In some cases, these people make up a significant number of employees on a base.

While PPP has apparently worked well in the past, there is some question as to whether it can take care of the large number of people threatened with RIFs in the defense build-down. The rate of PPP usage has recently increased, with registrations in the first 4 months of 1991 already surpassing total registrations in 1988. At the same time, the placement rate

[90]Testimony on Advance Notice: Public and Private Sector Policy and Practice, by Franklin Frazier and Bernard L. Ungar, GAO, before the Subcommittee on Human Resources, House Committee on Post Office and Civil Service, Apr. 18, 1991.

[91]DoD is streamlining the PPP regulations and also making it possible for personnel offices around the world to enter the data directly onto PCs and upload the data directly to the PPP data center in Dayton, OH.

[92]According to DoD spokesmen, this requirement is applied with some flexibility. For example, a registrant whose situation has changed (say, through illness in the family) so that a previously selected location is no longer acceptable might not be removed from the PPP system or forfeit severance pay.

[93]Office of the Assistant Secretary of Defense for Force Management and Personnel.

for PPP declined, falling from a high of 48 percent placed in 1989 to 35 percent in the first 4 months of 1991. However, not all registrants stay in the system; some retire, some decline a PPP offer, and in many cases, RIFs are canceled. Given the rate of natural attrition from DoD and the current hiring freeze, it is likely that PPP will continue to provide placements for a significant number of DoD civilians. A helpful factor is that people hired through PPP do not count against the hiring unit's freeze, which provides an incentive to hire from PPP. In addition, the fact that layoffs from Round Two of base closings will not begin until 1995 means that some of the big layoffs will be spread out over time, thus increasing the chances of PPP placement.

PPP works best where there is a large concentration of civilian DoD jobs, such as Washington, DC and San Diego, CA. In areas with few DoD jobs, people may be unwilling to move to get a job through PPP. For example, one reason for setting up an aggressive outplacement program at the Mare Island (CA) Naval Shipyard was the belief that few employees would want to leave the San Francisco Bay area, but DoD jobs there were relatively scarce. Similarly, PPP was of only limited use in the RIF of 890 positions at the Portsmouth Naval Shipyard in 1990. About 600 employees registered with the PPP and 95 got placed. Forty declined offers, primarily because they did not want to move out of the area. According to base officials, PPP was able to place everyone willing to move out of the region.

OPM Placement Program

The Office of Personal Management also operates a placement program, the Displaced Employee Program (DEP), for all Federal employees who are involuntarily separated or notified of separation. OPM prohibits agencies from filling positions from outside the government when qualified DEP registrants are available, but it does allow them to cancel vacancies or fill them internally. In a 1983 study, GAO concluded that the OPM program can provide some placements but is less effective than DoD's PPP because it does not require hiring from the list.[94] In fiscal year 1990, the program placed only 25 of the 724 priority referrals in permanent Federal positions.[95] Notwithstanding the program's limited record of success, DoD makes this program available to displaced DoD civilians.

Defense Outplacement Referral System

As discussed in chapter 5, DoD is establishing an automated resume referral service. This system primarily targets private sector firms (although other Federal and State agencies can use it) who, by calling a 900 number, can receive resumes of DoD military personnel. While the system was originally designed for military personnel, DoD has made the system available to civilians. DoD civilians also have access to a computerized Transition Bulletin Board that allows employers to list employment openings.

Severance Pay and Unemployment Insurance

Displaced DoD employees may receive severance pay of up to 1 year's salary, depending on age and length of service. In many States they are also eligible for unemployment insurance benefits, usually for up to 26 weeks after severance pay runs out, although in some States, UI benefits are reduced by the amount of severance pay received.

As structured at the moment, DoD transition benefits sometimes offer perverse incentives to their civilian employees, and to military separatees as well. Because employees departing voluntarily are not eligible for severance pay, incentives for leaving early before a formal RIF are mixed.[96] Those expecting a RIF might want to get a jump on the process of finding a new job; on the other hand, they might never have to leave if enough others depart voluntarily before the RIF. And if they wait until they are formally RIFed, they can collect severance pay. DoD civilians around the Nation have recommended that DoD provide some type of bonus to individuals who voluntarily leave before a RIF, on the grounds that this not only would save DoD money but also would reduce the number of people involuntarily separated. However, because of the costs involved and because legislative action would be necessary, DoD believes that at this time adminis-

[94]GAO found that in 1983, agencies canceled or filled internally almost half of the 5,183 vacancies for which OPM had referred registrants and that OPM placed only 648 (9.9 percent) of the 6,569 registrants. Statement of Rosslyn S. Kleeman, Associate Director, General Government Division, GAO, before the Subcommittee on Human Resources, House Committee on Post Office and Civil Service, Oct. 2, 1984.

[95]Frazier and Ungar, GAO testimony, op. cit.

[96]Voluntary job leavers are not eligible for UI either, but severance pay is set at the level of the employee's salary, with UI benefits limited to a rather low level. Thus the incentive to collect UI is less.

trative measures such as the hiring freeze and outplacement efforts are sufficient.

Another problem is that DoD civilian workers are not eligible for employee assistance programs after they have been separated. These include access to personal and financial counseling. DoD is working with OPM to modify the rule so that laid-off civilians will be eligible for these programs up to 6 months after separation.

Job Search Assistance Programs

In addition to the job referral systems described above, DoD is encouraging each of the services to establish more active assistance programs. For example, DoD is providing a handbook and policy manual on downsizing and base closures to be distributed to its civilian personnel offices in fall 1991. Among the issues discussed is how to work with State and local EDWAA service providers and how to set up outplacement centers. DoD is also preparing a pamphlet to answer questions frequently raised by affected employees.

The only DoD-wide assistance program is TAP, a 3-day workshop providing soon-to-be-displaced civilian employees and separated members of the armed services with training to assess their occupational skills, conduct job searches, develop resumes, and prepare for interviews. TAP was designed for departing military personnel, but DoD allows civilians to participate. TAP is described in chapter 5.

Use of labor-management committees to operate transition services at DoD installations undergoing a RIF varies considerably. While some have used the committee structure and found it beneficial, others have resisted the idea. Successful examples such as the experience at Pueblo help overcome this resistance.

Army Assistance Programs

The Army is perhaps the furthest along of the three services in establishing servicewide assistance programs. In 1990, it established the Army Career and Alumni Program (ACAP) to help both military and civilians make the transition out of the Army. The Army plans to set up 61 ACAP centers at its larger bases around the world. ACAP is also described in chapter 5.

In addition to ACAP, a number of installations have established their own programs. For example, at the urging of the Colorado Governor's Office of Job Training and the DoD civilian workers, two installations in Colorado, Fort Carson and the Pueblo Depot, developed aggressive outplacement efforts in cooperation with the state EDWAA program. These programs formed part of the model for ACAP (see box 3-B).

Air Force Programs

The Air Force has been slower than the Army in developing outplacement efforts and has decided not to mandate a program from the "corporate" level since there is so much variation among bases. The Air Force Command sees its role as disseminating information on what is going on at bases around the Nation and how best to support transitions.

Toward that end the Air Force is examining administrative and legislative changes that might improve transition programs. For example, it is considering rule changes to allow employees time off work for job interviews, which is permitted and encouraged by the Office of the Secretary of Defense. The Air Force also recently put together a guidebook and held training sessions for personnel offices on how to manage large RIFs and base closures. The guidebook makes little mention of the possible need for an outplacement center.[97] However, a Transition Assistance Plan that the Air Force is distributing to its bases encourages the family support centers at each base to conduct outplacement services, including job banks, resume writing, and interviewing skills. Bases have also been given authority to hire one specific person to do counseling and be the outplacement project officer.

Even without a specific mandate from the Air Force, some bases have developed their own displaced worker projects for civilians. For example, Chanute Air Force Base in Illinois established its outplacement effort, called Project Choice and modeled after the Colorado base closure projects, for the 2,000 civilians working there. In May 1990, base officials met with the local SDA and the state Rapid Response Team, and soon after established a labor-

[97]The guide does discuss briefly the need for some kind of outplacement efforts when the base is closing, but gives little guidance on what kinds of efforts might be helpful. ("Air Force Guide to Conducting a Reduction in Force or Transfer of Function," prepared by Headquarters, USAF, Directorate of Civilian Personnel, 1991.)

management committee with a lieutenant colonel from the base as neutral chair. The committee opened an outplacement center, staffed by the local SDA, in November 1990; the center will remain open until June 1994, 9 months after the closure. To pay for the center, the State of Illinois is providing some of its 40 percent EDWAA funds and is also applying for a DOL discretionary grant of $3.2 million for 2 years.

The center trained some employees who are to be RIFed as Project Choice advisers; they do peer counseling and make referrals to the center. All employees can use the center as much as needed during the work day, provided they get release time from their supervisors. Clients first undergo a skills assessment and receive a full course of job search skills training. By mid-1991, 537 had enrolled in the program and 232 had taken training courses.

Chanute is part of the Air Force's Air Training Command (ATC), which is promoting the Chanute model to three other bases undergoing closure. The Training Command has written and distributed a guidebook and held a conference on how to set up transition programs.[98] The ATC has briefed other Air Force Commands and Navy personnel staff on their experiences. Mather Air Force Base in California has already developed a similar project and other bases, such as Lowry in Denver and Williams in Arizona, are following suit.[99]

Navy Programs

Of the three services, the Navy has perhaps done the least to set up servicewide civilian assistance programs. The Navy is encouraging its installations to establish outplacement programs, but the decision to do so is left up to the local commanding officer. Guidance may be inadequate; one base personnel officer told OTA that many bases are unsure how to go about setting up transition centers.

Nevertheless, several Navy installations have set up their own outplacement efforts. One of the earliest was at Mare Island Naval Shipyard, in Vallejo, CA. Because several ships due for overhaul were decommissioned, Mare Island's expected work load dropped significantly. Employment at the shipyard dropped from 10,000 in 1988 to 7,100 in 1991. Throughout, Mare Island base officials have tried to cut back in ways that would avoid mandatory RIFs. For example, when 200 engineering and technician positions were eliminated in October 1988, the base held a job fair attended by 24 companies. Afterwards, enough people voluntarily took outside jobs that the RIF was canceled. Similarly, when 600 blue-collar jobs were slated for abolition in summer 1989, another job fair, attended by 40 companies and open to all shipyard employees, helped to avoid the RIF. However, many workers with needed skills left during the 1989 effort, so in 1990 participation in job fairs and other outplacement activities was limited to certain occupational groups. In both years, an outplacement center supplemented the job fairs and trained workers in job search skills.

In 1990, Mare Island had to make much bigger cuts, reducing employment by 2,000. The base again organized job fairs, which 154 employers attended, and 19 other employers were brought in to conduct interviews. These efforts resulted in offers of jobs to 434 people, 350 of whom accepted. Besides the job fairs and the outplacement center, the base organized some 130 job clubs, in which 1,300 people participated. PPP was able to place 200 of the 800 who enrolled, but many of the other 600 were not willing to accept jobs outside the San Francisco Bay area. The result of all these efforts was that only 459 people were laid off, while over 1,500 got outside jobs and left voluntarily.

Because the local economy worsened in the 1990-91 recession, Mare Island developed more aggressive efforts for its planned 1991 layoffs. Base officials sent newsletters to employees' homes to inform them of base efforts, and they gave 25 employees training and release time both to lead job clubs and to spend 4 hours a day calling companies to turn up positions for Mare Island workers.

Mare Island, like other DoD installations, has a problem of free riders—people who will not leave voluntarily in the hope that others will leave and the RIF will be canceled. One way service providers have dealt with the problem is to conduct a mock RIF, identifying those likely to be laid off. These people are then informed them of available services.

Another problem encountered by Mare Island is that the local EDWAA agencies declined to work

[98]*Civilian Training Assistance Program (CTAP)*, Air Training Command, Civilian Automated Training Office, Lackland AFB, TX, 1991.

[99]Letter to OTA from E. Jene Liaci, Air Training Command, Civilian Automated Training Office, Lackland AFB, Oct. 9, 1991.

with employees until they were actually displaced. (Under the law, EDWAA services may be provided to workers who have received notice of termination but are not yet actually laid off; EDWAA does not cover any services for active workers who have not received notice of layoff.) One local SDA official justified withholding services until workers are actually "out on the street" on grounds that the RIFed employees might be recalled. The result, however, is that laid-off workers who may want training or other EDWAA services must wait weeks or months to get them. Base officials also complained that because there were four SDAs in the affected area, coordination was difficult. Each SDA worked differently, and the result was a "pretty unmanageable" process. As noted above, the Portsmouth Naval Shipyard also had trouble dealing with multiple SDAs.

Links to EDWAA

DoD outplacement programs do not appear to have strong links to EDWAA. Several DoD officials involved in managing the downsizing (at both the service and base levels) told OTA they were either not aware of EDWAA or were not sure how to get access to it. GAO reported similar findings: of 16 DoD installations GAO contacted, 11 were aware of the services available under EDWAA, but only 5 used them.[100] Even when DoD installations provide adjustment services, EDWAA is important as the principal source for retraining funds. But institutional bonds between DoD and State displaced worker units remain undeveloped. For example, there appear to be no formal links between the Army's ACAP centers and EDWAA. Similarly, the Air Force's guide to conducting a RIF makes only scant mention of public programs, suggesting that "visits from state employment offices, other federal agencies, and so forth should be scheduled . . . ."[101] Informal relations are equally lacking. As mentioned, base personnel offices don't really know where to start in approaching EDWAA providers.[102] DoD hopes to remedy the situation through its downsizing handbook, which will discuss EDWAA and provide State contacts. However, DoD does not want to mandate that the programs link with EDWAA; rather it is hoped that installation commanders will work voluntarily with State and local officials.

Another reason for the lack of collaboration is that until November 1991 Federal agencies were not required to notify the State displaced worker unit of impending layoffs. However, the new rule requires such notification.

INDUSTRY EFFORTS

Some defense industry companies have active programs to help their displaced workers get new jobs or enter training. From the company point of view, adjustment programs enhance the company's reputation as a responsible employer. Companies seen as simply throwing away their laid-off workers might have a problem keeping existing workers or attracting good ones when they hire again. Moreover, morale and productivity often improve if workers see that the company is trying to help them. Outplacement efforts can also reduce a company's UI and other separation costs.

From a public policy perspective, company participation is key to success. First, companies know their plans for layoff, even before the WARN notice is given, thus enabling them to plan for services before the layoff is announced.[103] Second, many companies are able to put up some funds of their own while waiting for EDWAA money to arrive, which means that services can be provided much earlier. Conversely, the fact that EDWAA funds will become available is often an important factor in getting companies to contribute their own resources.

Not all companies go to the same lengths to help their departing employees. According to a 1983-84 GAO survey, the benefit most often provided to displaced employees by businesses experiencing a closing or permanent layoff was severance pay; 45 percent of the firms offered it to at least some of their workers. Thirty-one percent offered some placement assistance, while 30 percent provided no assistance

[100]Frazier and Ungar, GAO testimony, op. cit.

[101]USAF, Directorate of Civilian Personnel, op. cit.

[102]Director, Staffing and Career Development, Office of the Deputy Assistant Secretary of Defense, Civilian Personnel Policy/Equal Opportunity.

[103]Fedrau and Balfe found that corporate planning for adjustment programs often begins shortly before the announcement of a downsizing. Fedrau and Balfe, op. cit., pp. 138-149.

of any kind.[104] Because larger firms often have greater financial resources, they are more likely to offer services to their displaced workers than are smaller ones. And companies are more inclined to provide services to their salaried workers—managers, professionals, and white-collar employees—than to their hourly workers. The GAO survey found that for every kind of assistance companies offered displaced workers—income maintenance, continuation of health insurance, job search assistance, counseling, or a comprehensive benefits package—considerably more went to white-collar workers than to blue-collar workers.[105]

Most of the large defense contractors interviewed by OTA provided at least some services to their laid-off workers (see table 3-12). Like businesses in general, defense firms are more likely to offer services for salaried personnel, especially executives, than for hourly staff, although a few defense companies made no such distinctions, providing much the same services for all. GE Aerospace is a leading example; its company-operated projects in Pittsfield and Burlington, MA are open to all employees, salaried and hourly alike.

Many large defense firms set up outplacement centers; some go further and offer extensive benefits and programs. Many companies provide severance pay equal to 1 week's pay for each year of employment. A few provide training stipends. For example, white-collar employees at General Electric have $5,000 to use over 2 years for training. Blue-collar workers get $2,000 per year to use over 5 years for either classroom or on-the-job training. At Texas Instruments, defense workers with over 15 years' experience may receive $6,000 for training, additional severance pay, and relocation assistance, including reimbursement of realtors' commissions and moving costs.

Some defense firms have provided a full menu of outplacement services. For example, in moving from Burbank, CA to Marietta, GA, Lockheed Aeronautical Systems laid off most of its 8,000 defense employees in Burbank. Lockheed used its own funds to hire Drake, Beam, Morin (DBM), a professional outplacement firm, to set up a spacious and well-appointed on-site outplacement center for salaried managers, engineers, and other white-collar workers. The center opened 6 months before the first layoffs and provided a full range of services, including resume preparation, interview skill training (with videotaped mock interviews), job development, and counseling. Before using the outplacement center, salaried personnel must take a company-paid 3-day course covering skills assessment, career goals, resume writing, and job search skills. Each worker is then assigned a case manager for individual counseling and advice. The center has a full complement of facilities, including workstations, free long-distance phone and fax service, word-processing, newspapers and other publications, and various directories and other resource materials. The center also employs a full-time job developer who provides listings of job leads and makes monthly mailings of resume books to employers nationwide. In addition, the California Employment Development Department has a person on site, with access to the State's computerized job match program. This center is heavily used. One year after it opened, it had served about 1,300 clients, and was still handling about 85 users per day.

For hourly workers, Lockheed established a center run by DBM and funded by the local SDA. Located about a mile from the plant in the local International Association of Machinists offices, the center did not open until 5 months after the initial layoffs because of delays in EDWAA funding. It is equipped with area newspapers, work tables, and typewriters. In addition, workers can receive career counseling. This center is much less used than the one for salaried employees.

The GE Aerospace Division center in Pittsfield, MA serves both hourly and salaried workers and is run jointly by union and company officials. Initially, GE planned to establish two separate centers but decided to provide services for both in the same building, although a wall was put up dividing hourly from salaried workers. To the surprise of GE management, the hourly and salaried workers enjoyed having services provided together, and now use the services in any part of the center, regardless of "what side of the wall they are on."

[104]U.S. General Accounting Office, *Plant Closings: Limited Advance Notice and Assistance Provided Dislocated Workers*, GAO-HRD-87-105 (Washington, DC: 1987), pp. 46, 82.

[105]Ibid., p. 48.

Table 3-12—Selected Defense Layoffs: Worker Services Provided

Firm	Size of layoff	Placement center	Firm Dollars	EDWAA Dollars	Out-placement firm	Salaried and hourly served together
General Dynamics (TX)	9,000	x	x	x	x	
Lockheed (GA)	8,000	x	x	x	x	
Lockheed (CA)	8,000	x	x	x	x	
GE Aerospace (MA)	5,500	x	x	x		x
GE Jet Engines (MA)	2,200	x	x	x		x
United Nuclear (CT)	1,100	x	x	x		x
GE Aerospace (MA)	600	x	x	x		x
Electric Boat (CT)	582	x	x	x		x
Texas Instruments (TX)	1,600	x	x		x	
Westinghouse (MD)	1,232	x	x			x
McDonnell Douglas (MO)	7,900	x		x		x
Rockwell (CA)	6,600	x		x	x	
McDonnell Douglas (CA)	5,000	x		x		x
Grumman (NY)	1,800			x		

SOURCE: Office of Technology Assessment, 1991.

Firms organize and pay for their programs in different ways (see table 3-12). Some, such as Lockheed, hired a professional outplacement firm. Others, such as Electric Boat and UNC of Connecticut, set up, managed, and paid for their own centers but used EDWAA funds to pay for retraining services. Several firms, including GE Aircraft Engines and two GE Aerospace facilities in Massachusetts, established centers jointly funded by the company and EDWAA. Some companies, such as McDonnell Douglas, provided staff support and space for a center but relied primarily on EDWAA to pay for and provide services to their laid-off defense workers.

Many defense firms work closely with State and local EDWAA programs to set up outplacement centers on the plant premises; Rockwell's North American Aircraft plant in California and Lockheed in Georgia are examples. This arrangement allows workers to receive counseling, job search skills training, and other assistance right in the plant before layoff. The presence of career centers at the plants can serve as a psychological cushion to workers who have received notice of layoff and others who may anticipate getting a pink slip.

Not all large defense firms have cooperated with EDWAA providers. For example, on grounds of protecting the privacy of its employees, an aerospace contractor on Long Island, NY declined to give EDWAA service providers either the names of its laid-off workers or the job classifications of those dismissed.[106] After laying off about 1,800 workers in early 1989, the firm held a small job fair to which all four local Employment Services were invited and seated at one table. However, the company refused to allow either the local or State EDWAA agencies to hold briefings at the plant to describe available services. According to a company official, the firm regards offers of retraining and placement assistance from the county governments as "solutions in search of a problem."[107] The EDWAA project thus had difficulty locating the laid-off workers eligible for assistance. The SDA local ultimately asked the company to mail to its former employees letters containing information on the assistance available. More than a year later, only about 260 of these workers had received service from the Oyster Bay and Suffolk County retraining program.

Smaller defense companies are less likely to have the resources to fund outplacement efforts. For workers laid off from these firms, top quality EDWAA services become all the more important.

From the defense companies' perspective, working with EDWAA service providers has been a mixed experience. Most defense firms felt that State and local service providers were helpful. Some had high praise for EDWAA organizations. For example, GE officials at three separate defense plants in

[106]Kravitz, op. cit.

[107]Ibid.

Massachusetts credited the State's Industrial Services Program (the State EDWAA agency) with providing critical financial and technical assistance that enabled them to organize their centers. Following a 1988-89 layoff from Lockheed's plant in Marietta, GA, both Lockheed officials and a private company that operated services for the displaced workers (the Derson Group) were emphatic in their support of the EDWAA program. They praised it for helping the company conduct orderly layoffs while filling production needs.

In other cases, firms were less positive. One common complaint was that the process is too slow. A number of firms waited long periods of time to receive DOL discretionary grants. As noted above, General Dynamics laid off 3,400 workers on January 8, 1991 following the A-12 cancellation. Although some of these workers received limited services from their local SDAs, a $6.9-million EDWAA discretionary grant from the Secretary of Labor was approved on February 8, but did not begin until May because of delays at all levels. General Dynamics' 1990 experience with an anticipated layoff was not much better. The company approached State and local EDWAA officials in early 1990 to ask for help in dealing with layoffs due to begin in June, but it was not until 60 days after the WARN notices were delivered that the State was able to provide services. UNC (CT) reported similar frustrations in trying to work with its local SDA. Because the SDA was quite small and had little experience with plant closings, it was ill-prepared for a 1,100-person plant closing. This was why UNC requested that the company, rather than the SDA, manage a $1 million DOL discretionary grant for retraining UNC's displaced workers.

HOW ARE LAID-OFF DEFENSE WORKERS LIKELY TO FARE?

In some ways, defense workers displaced in the 1990s may be better off than displaced workers generally were in the 1980s. In contrast to layoffs of the early 1980s, which were predominantly blue-collar, defense layoffs encompass a broader spectrum of occupations and levels. Displaced defense workers in professional and technical occupations are in a better position than most to find satisfactory new jobs, in part because they tend to be more geographically mobile than production workers, and in part because they are more educated and more highly skilled than the work force as a whole. Particular sub-groups, such as minorities, older workers, and blue-collar workers with low skills, may have a more difficult time. The fact that 57 percent of defense jobs are in manufacturing, compared to 17 percent in the economy at large, adds to their problems. Manufacturing workers, especially those in semi-skilled blue-collar jobs, have a harder time than other displaced workers in finding new jobs. The continuing decline in U.S. manufacturing employment diminishes the chances for less skilled workers displaced from defense jobs. Also, lower and midlevel managers could be caught in the squeeze of streamlining production and automation of many of their tasks.

On the positive side, public and private efforts to assist displaced workers are more developed than in the early 1980s. The WARN law will give many displaced workers 60 days' notice of layoff (though loopholes in the law limit its coverage). Notwithstanding problems with EDWAA and the unwillingness or inability of some firms and defense installations to provide transition assistance to laid-off workers, the majority of defense workers now have outplacement services available to them. Many firms, particularly larger ones, provide at least some kinds of services themselves. Most DoD civilians have a somewhat broader package of outplacement services than defense industry workers. However, workers in smaller defense firms usually have few if any company services and must rely on publicly provided services. And public services may not be offered so promptly or reliably for small layoffs from small companies as for large ones, since these layoffs get less publicity and may not trigger WARN notices.

Notwithstanding problems related to rapid response and quality of services, EDWAA has gained from nearly a decade of experience and is helping defense workers. The additional $150 million allocated to EDWAA for defense workers for fiscal years 1991-93 could be very helpful, provided that States and localities can get past the obstacles to access to these DOL discretionary funds. These extra funds could pay for services for approximately 75,000 defense workers,[108] not enough for about

[108]OTA estimates EDWAA costs per participant at approximately $2,000 in program year 1990. The estimate is based on spending in the program year per new enrollee in that years.

Table 3-13—Workers' Experience Following Selected Defense Layoffs, 1990-91

Site	Percent white collar	Months since layoff	Employed			Looking for work	Retired	In training
			Total	Locally	Moved			
Texas Instruments (TX)	90%	9	59%	40%	19%	34%	3%	4%
UNC Nuclear (CT)	66	9	80	40	40	5	9	6
GE Aerospace (Pittsfield, MA)	20	8.5	38	31	7	12	10	38
McDonnell Douglas (CA)	na	7	65	36	29	26	5	1
GE Aircraft Engines (MA)	90	6	23	7	16	54	20	3
Portsmouth Naval (NH)	76	2	35	20	15	26	20	18
GE Aerospace (Burlington, MA)	50	3.5	19	11	8	35	12	22
Pueblo Depot (CO)	na	na	72	36	36	0%	28%	0%
McDonnell Douglas (MO)	50	8	45	39	6			
Westinghouse (MD)	47	5	19	17	2	60	18	4

NOTES: In some cases, layoffs occurred over a period of several months. In these cases, the average date of layoff was used to determine the number of months since layoff.

SOURCE: Office of Technology Assessment, 1991.

12-13 percent of the 600,000 or so defense workers expected to be displaced in those 3 years. However, not every displaced worker needs or seeks assistance. Currently, about 9 percent of eligible workers receive EDWAA services.

Despite these positive factors, the nationwide 1990-91 recession and still tougher times in several regional economies have interfered with the immediate job prospects of displaced defense workers. Compared to the economic situation in some earlier periods of defense cutbacks, conditions for displaced workers are worse today. In the most recent of these periods, the late 1960s and early 1970s, when defense spending for the Vietnam War was declining, the labor market was strong, except for the brief 1970-71 recession. Even though defense workers are now better situated in some ways, the state of the economy could cancel out these advantages, at least temporarily.

Even if the national economy were thriving, displaced defense workers in unusually defense-dependent communities could have a hard time getting back on their feet. Unfortunately, the 1990-91 recession hit exceptionally hard in some of the regions that are most defense-dependent, in particular Los Angeles-Long Beach, where the unemployment rate was 9.4 percent in September 1991, and Massachusetts, where unemployment rates varied from 8.4 to 12 percent—compared to a national rate of 6.9 percent.

Evidence, albeit scanty, does exist on how well displaced defense workers are faring. It is difficult to obtain complete and current data on the experiences of dislocated defense workers, and generalizations are risky because of variations in local conditions, the state of the national economy, and the types of workers laid off from various places. For data collected by OTA on what is happening to defense workers laid off at a number of sites around the nation, see table 3-13.

The effect of poor economic conditions on post-layoff experience can be seen in Massachusetts, where after 6 months only 7 percent of the workers laid off from GE Jet Engines in the Boston suburb of Lynn were employed locally. To be sure, some (16 percent) have relocated, many to GE facilities elsewhere, and a number have retired. However, the poor job market in Boston (unemployment 8.0 percent in September 1991) makes finding a job there difficult, even for highly skilled engineers who have been given top quality outplacement services. Former GE Aerospace workers in Pittsfield, MA were in an even tougher situation, since unemployment there was 9.5 percent.

Where the local economy is stronger, there is greater success. For example, over one-third of the workers laid off from McDonnell Douglas in Long Beach, CA in mid-1990 were reemployed locally 6 months later, in a labor market that was weakening but still stronger that of Massachusetts. Similarly, after 9 months, nearly 60 percent of workers laid off from Texas Instruments in Dallas were reemployed. Workers laid off from GE in Lynn, MA in 1988-89, when the local economy was still strong, had a much easier time finding jobs than those laid off in 1990-91.

Workers willing and able to relocate often have better expectations than those staying put. For

example, 2 months after layoff, three-quarters of the workers who had lost jobs at the Portsmouth (NH) Naval Yard, and wanted new jobs, were employed. But many were placed through the Priority Placement Program and moved to other areas. According to outplacement officials at Electric Boat, which is located in the highly defense-dependent area of southeast Connecticut, about 90 percent of the displaced white-collar workers who found jobs had relocated. About 40 percent of workers laid off from UNC (in the same area) relocated; only about 5 percent of all the workers losing jobs at UNC were out of work in November 1990, 9 months after the layoffs. Of those moving out of state, all were professionals. In part because of the defense dependence and poor condition of the local economy, the rate of reemployment for hourly workers is much lower, and unless they enrolled in retraining, they have tended to take pay cuts. It took an average of 4 months for laid-off UNC workers to find jobs, assuming that they actively looked for work beforehand.[109]

These data do not suggest that it is easy to come through loss of a defense job unscathed. For example, a 34 percent unemployment rate for Texas Instrument workers 9 months after layoff is not exactly desirable. However, an example such as Fort Carson, CO, where all but one of 289 displaced defense workers had jobs by the time they were laid off, shows what can be done with enough lead time and with active, dedicated reemployment, relocation, and retraining services.

Overall, displaced defense workers are probably better positioned than other displaced workers, both in terms of skills and services provided to them. However, the significantly uneven quality of EDWAA services, unless remedied, will hinder adjustment success. Finally, the health of the U.S. economy and regional economies, will remain a critical factor in determining the success of displaced defense workers.

[109]Information provided by Holly Ellis, director of UNC's outplacement effort, November 1990.

Chapter 4

Engineers: A Special Case

Contents

	Page
INTRODUCTION	103
PROSPECTS FOR DISPLACED DEFENSE ENGINEERS	103
ENGINEERS' EXPERIENCE AFTER THE VIETNAM WAR	106
MOVING FROM DEFENSE TO CIVILIAN EMPLOYMENT	107
Inter-Industry Mobility: The Record	107
Salary Levels	108
CURRENT LAYOFF AND REEMPLOYMENT EXPERIENCE	109
Layoffs	110
Reemployment	110
MOBILITY AND CAREER-LONG EDUCATION	112
REEMPLOYMENT AND RETRAINING ASSISTANCE FOR ENGINEERS	115
Engineers' Needs	115
Responses From 1970 to 1973: The Worst of Times	116
Responses Today: Professional Associations	117
Company Responses	118
Government Programs	121
Teacher Training	124
Entrepreneurial Assistance	125

Boxes

Box	*Page*
4-A. The National Technological University: A Partnership for Continuing Engineering Education	114
4-B. Continuing Education for Engineers at Texas Instruments	115
4-C. Retraining of Engineers: Boeing's Commercial Airplane Group	122

Figure

Figure	*Page*
4-1. Bachelor's Degrees Awarded in Engineering, 1945-90	105

Tables

Table	*Page*
4-1. Engineering Occupations in Defense and the U.S. Economy	104
4-2. Median Annual Salaries of Engineers by Industry Group and Years Since Bachelor's Degree	109
4-3. Total Mean Compensation of Engineers in Manufacturing, by Product Area	109
4-4. Involuntary Unemployment Rates for Electrical and Electronics Engineers, Early 1990	110
4-5. Benefits and Services Provided to Displaced Engineers	119

Chapter 4
Engineers: A Special Case

INTRODUCTION

Among the many thousands of workers displaced from defense jobs, one group of special concern is engineers. Their skills and education make them a national asset. An important public policy issue is how to put displaced defense engineers to good use on the civilian side of the economy.

Engineers are heavily represented in the defense sector. Military purchases are concentrated in manufacturing, especially durable goods, and these are engineering-intensive industries.[1] Moreover, the defense side of durable goods manufacturing industries (e.g., aircraft manufacture) is more engineering-intensive than the commercial side. Estimates of the number of engineers engaged in defense work differ, depending on definitions and method, but a reasonable estimate for 1990 (the latest year for which data are available) is 342,000, or 18 percent, of the Nation's 1.86 million engineers, including 73,000 employed directly by the Department of Defense (DoD) (table 4-1).

Recent layoffs reflect the concentration of engineers in defense industries and their vulnerability during downsizing. Roughly 30 percent of the 6,500 layoffs at the McDonnell Douglas facility in Long Beach, CA from July 1990 to June 1991 were engineers. About 30 percent of the 3,000 workers laid off at McDonnell Douglas in St. Louis in the summer of 1990 were engineers. Of the 3,000 workers laid off from the same facility immediately after the A-12 program was canceled in January 1991, nearly half were engineers. The General Dynamics facility in Fort Worth, TX, laid off 9,000 employees from July 1990 to July 1991; of these, 2,500 (27 percent) were engineers.

Reports from several places affected by defense cutbacks since 1988 indicate that many of the laid-off workers have had some difficulty finding new jobs, but engineers generally fared better than blue-collar workers. Eventually, most defense engineers have found jobs in their fields at good salaries. However, the job search is often long and arduous, and not infrequently the new job is with another defense firm and thus vulnerable to future layoff. Certain subgroups, chiefly older engineers and nondegree engineers, have had the most trouble finding new employment. By the end of 1991, defense layoffs were still accelerating.

PROSPECTS FOR DISPLACED DEFENSE ENGINEERS

Total engineering employment grew during the 1980s, rising from 1.6 million in 1984 to 1.86 million in 1990.[2] OTA's estimate of 342,000 engineers, or 18 percent of the total, in the defense sector is based on a National Science Foundation (NSF) survey in which engineers reported whether their jobs were funded by the Department of Defense (DoD). The percentage replying in the affirmative was then applied to total engineering employment, as reported by the Bureau of Labor Statistics.[3]

OTA estimates that from 1990 to 1995 as many as 127,000 defense engineering jobs could disappear with reductions in defense spending, the winding down of established weapons programs, and a scarcity of new programs.[4] This estimate assumes

[1]Sixty percent of all engineering jobs are in the manufacturing sector, 53 percent in durable goods. National Science Foundation, *Science and Engineering Personnel: A National Overview, Special Report*, NSF 90-310 (Washington, DC: The Foundation, 1990), table B-18.

[2]U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* (various issues), annual averages.

[3]This includes engineers employed as civilians by DoD, but not those whose jobs depended on non-DoD defense spending (see table 4-1 for further explanation).

[4]An often cited and substantially lower estimate is the forecast by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) of a loss of 55,000 defense engineering jobs from 1989 to 1995. (*Engineering Manpower Newsletter*, vol. 2, No. 10A, Oct. 15, 1990, p. 1.) However, this estimate assumed a very modest decline in spending, smaller than is currently projected by DoD, and a base level of defense engineering employment of only 240,000. IEEE's base-level number for defense engineers rests on application of the DRI/NSF economic modeling system to the Bureau of Labor Statistics (BLS) estimate of the total number of U.S. engineers (based in turn on the Current Population Surveys conducted by the Bureau of the Census). OTA has concluded that this method produces an underestimate of defense engineers, because it assumes that defense manufacturing at the individual industry level is no more engineering-intensive than commercial manufacturing in the same industry. The IEEE estimate also assumed a 3 percent annual average reduction in defense spending. However, DoD now projects an annual average reduction of 4.1 percent from 1988 to 1995, and if DoD spending eventually declines to as low as $169 billion in 2001, the rate of reduction through 1995 would probably be slightly faster. In the case of the faster paced reduction, OTA estimates elimination of 127,000 defense-related engineering positions from 1990 to 1995.

Table 4-1—Engineering Occupations in Defense and the U.S. Economy

Specialty	Total engineers (thousands)	Non-defense engineers (thousands)	Non-defense engineers percent	Defense engineers[a] (thousands)	Defense engineers[a] percent	Percent of total in defense	Annual employment growth 1987-1990
Aerospace	109	62	4%	47	14%	43.2%	1.6%
Chemical	71	67	4	4	1	5.3	4.1
Civil	234	210	14	24	7	10.1	3.7
Electrical[b]	581	428	28	153	45	26.4	2.2
Industrial	204	176	12	28	8	13.8	-2.6
Mechanical	316	266	17	50	15	15.9	4.5
Subtotal	1,515	1,209	80	306	89	20.2	2.2
Other	347	311	20	36	11	10.5	3.7
Total	1,862	1,520	100	342	100	18.4	2.5

[a]Includes defense industry engineers and DoD military and civilian engineers.
[b]Includes electrical and electronics engineers.

SOURCE: Total U.S. engineering employment from the Bureau of Labor Statistics (BLS), *Employment and Earnings*, various issues. Defense industry engineering based on data from the National Science Foundation, *U.S. Scientists and Engineers: 1986*, NSF 87-322 (Washington, DC: 1987). The percentage of engineers in each occupational category reporting that their jobs were funded by DoD was applied to the total number of engineers reported in that category by BLS. This method was adapted from Ann Markusen and Scott Campbell, "The Occupational, Industrial and Regional Distribution of Defense-Related Economic Activity," draft paper for presentation at the Annual North American Meetings of the Regional Science Association, Boston, MA, Nov. 8-9, 1990.

that engineering positions would be reduced in proportion to the overall reduction in defense employment. On the other hand, if DoD decides in the future to develop new systems without putting them into production (one strategy proposed for an era of smaller defense budgets), the reduction in the defense engineering work force could be less than would otherwise be expected.

The timing of layoffs for engineers is often different from that of the defense work force generally. Engineering reductions tend to be front-loaded, preceding layoffs from production lines. This is because programs nearing the end of their production runs are less engineering-intensive; the engineers have completed their work and can be released before shop floor workers. Many of the biggest defense programs of the 1980s (e.g., General Dynamics's F-16 and McDonnell Douglas's F-15 fighter aircraft for the Air Force, Grumman's F-14 for the Navy, and General Dynamics's M1A2 tank) are coming to an end and few new programs are on the horizon to replace them, which means engineers can be let go while many production workers are still needed. Also, engineers are more heavily affected by the termination of new systems in their development stage. For example, the cancellation of the Navy's next generation attack jet, the A-12, caused the immediate dismissal of 7,000 workers, half of whom were engineers. In this case, the engineers were laid off before most of the production workers were even assigned to the program.

This suggests that yearly employment loss for defense engineers may have peaked. However, some individuals could go through a second or even a third wave of displacement, because considerable numbers of laid-off defense engineers have found new jobs with other defense companies. This is an old tradition among defense engineers, but it has new meaning in a period of long-sustained cutbacks.

During the 1980s defense buildup, there was a good deal of employment shuffling among defense companies, as one started work on a new contract and ramped up while another finished a program and shrank. Sometimes, as in the enormous Plant 42 complex in Palmdale, CA, these companies were next door to each other. Movement between firms was fairly easy in an environment of increasing or stable spending. But in 1990, when Lockheed closed its aircraft manufacturing facility at Burbank with a layoff of 9,500 employees, McDonnell Douglas in Long Beach reduced employment by 5,000, and other companies also cut back and laid off workers, this previously open regional job market suddenly shut down.

Early reports from outplacement centers that have tracked laid-off defense engineers indicate that many engineers (sometimes 40 percent or more) are still finding work in the defense sector. Most of these hirings are to replace workers lost to normal attrition. But as the number of total defense engineering positions continues to decline, this high rate of industry reemployment cannot be sustained.

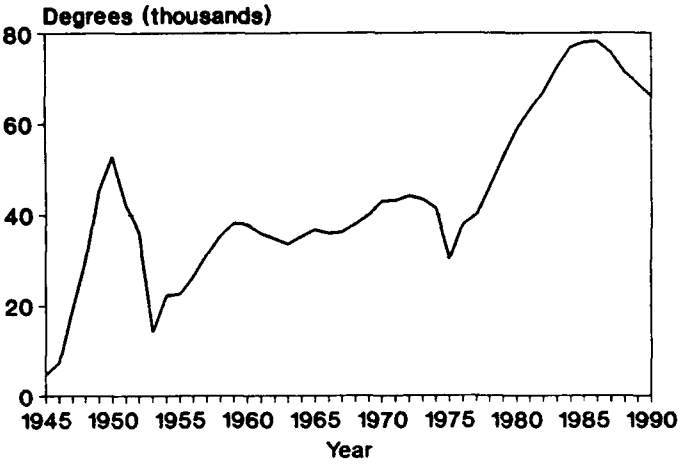
While engineers as a group have been successful thus far in avoiding overly long periods and high costs of displacement, many are still at risk.

None of this means that defense engineers are in a desperate position. For years, engineers have fared better than the work force in general. Throughout the 1980s, the average annual unemployment rate for engineers ranged from 1.4 to 3.0 percent while the overall rate varied from 5.2 to 9.5 percent. Nevertheless, unemployment rates that look small on the national scale can indicate hard times regionally for engineers; the peak unemployment rate for engineers in the 1970-73 period was 2.9 percent, in 1971. Yet unemployment among engineers was severe in some areas, especially in and around Seattle. With the current layoffs of engineers not only by defense contractors but also by computer companies and automobile manufacturers, the national unemployment rate for engineers rose from 1.4 percent in the first quarter of 1989 to 2.6 percent in the first quarter of 1991.[5]

Until recently, unemployment among engineers was low even among older, typically less employable, engineers. The Institute of Electrical and Electronics Engineers, Inc. (IEEE), which represents nearly 250,000 engineers in these specialties, found in early 1990 that only 1.9 percent of its members in the 50 to 59 age category were "involuntarily unemployed," compared with 1.4 percent for all member engineers. However, an indication of weakening demand was the finding that 20 percent of the engineers over 50 had been offered incentives to retire early in the previous 2 years (up from 16 percent in IEEE's 1989 survey) and 14 percent of the engineers over 50 had retired before they intended to (up from 6 percent in the 1989 survey).[6]

Forecasts from the late 1980s, before the end of the Cold War changed the outlook for defense employment, predicted a healthy market for engineers through the end of the century, with employment growth of 2 to 3 percent per year.[7] Whether those demand projections will prove out is open to question, but there is firmer evidence of a diminishing supply of engineers. Demographic trends suggest that the number of engineering school graduates will not increase. The source of potential students, the number of young adults in the U.S. population, peaked in 1982 and will decrease steadily until 1998.[8] The percentage of college freshmen selecting engineering over other majors might change direction and rise, but the recent trend has been down.[9] Figure 4-1 shows the number of bachelor's degrees granted in U.S. engineering schools each year since 1945. Degrees awarded peaked at 78,178 in 1986 and have fallen steadily since, to 65,967 in 1990.[10] To the extent that new engineering graduates are in short supply, engineers affected by the defense build-down could be a valuable resource to meet the demand.

Figure 4-1—Bachelor's Degrees Awarded in Engineering, 1945-90



SOURCE: Engineering Manpower Commission, summer 1991.

[5]Unpublished data from the BLS, U.S. Department of Labor. These quarterly rates are not seasonally adjusted. The unemployment rate for engineers dropped later in 1991, falling to 2.1 percent in the third quarter; the average unemployment rate for the year ending Sept. 30, 1991 was 2.3 percent.

[6]Institute of Electrical and Electronics Engineers, Inc., *IEEE Member Opinion Survey, 1990* (New York, NY: 1990), pp. 2-11, 2-18, and 3-16.

[7]George Silvestri and John Lukasiewicz, "Projections of Occupational Employment," *Monthly Labor Review*, November 1989, p. 45; U.S. National Science Board, *Science and Engineering Indicators—1989*, NSB-1 (Washington, DC: U.S. Government Printing Office, 1989), p.235; Gary Stix, "From Swords to Plowshares," *IEEE Spectrum*, November 1989, p. 45; U.S. Department of Energy, "Energy-Related Scientists and Engineers, 1988 to 1994," internal working paper, December 1989, pp. 3-5.

[8]Nestor E. Terlechyi, *Employment of Natural Scientists and Engineers: Recent Trends and Prospects*, Report No. 224 (Washington, DC: National Planning Association, 1986).

[9]OTA has previously documented a decline in interest of entering freshmen in natural science and engineering majors—from 27 percent, or about 286,000, in 1978, to 24 percent, or about 246,000, in 1986. U.S. Congress, Office of Technology Assessment, *Educating Scientists and Engineers: Grade School to Grad School*, OTA-SET-377 (Washington, DC: U.S. Government Printing Office, June 1988), p. 48.

[10]*Manpower Comments*, vol. 27, No. 10, December 1990, p. 26.

ENGINEERS' EXPERIENCE AFTER THE VIETNAM WAR

Current decreases in the defense budget have aroused interest in examining previous reductions for indications of what to expect and lessons on how to cope. However, the previous reductions differed significantly from the present one. The sharp drop after World War II did not result in much unemployment for engineers because pent-up demand for automobiles and other consumer items supported a rapid conversion of companies (and engineers) from defense to commercial work. Layoffs at the end of the Korean War were minimal because the Cold War had begun. Defense spending (especially in aircraft) remained high compared to the peacetime levels just after World War II, including substantial spending for research and development (R&D) on sophisticated weapon systems.

The concern today is to avoid repeating the dislocations of the early 1970s, when the Vietnam War build-down coincided with detente between the United States and the Soviet Union. In constant 1991 dollars, defense outlays dropped from $342 to $235 billion from 1968 to 1973, with a further drop to $213 billion in 1976. NASA and its contractors watched their employment plummet from 410,000, including 86,000 scientists and engineers, to 135,000 from 1965 to 1973.[11] Civil aircraft sales fell sharply in the 1968-71 period, from $5.0 to $3.8 billion.[12] The result of these three simultaneous blows was a steep drop in aerospace industry employment, from 1.5 million in 1968 to 920,000 in 1972, and a further decline to 820,000 in 1977. Defense industry jobs plunged 900,000 in the 2 years 1969-71. A Department of Labor (DOL) program begun in 1972 to provide assistance to unemployed engineers, scientists, and technicians estimated that 75,000 to 100,000 of these professionals were out of work at the time.[13]

Current economic and employment conditions bear some resemblance to those in 1968. From 1968 to 1976, defense industry employment fell 47 percent; from 1987 to 1995, it could drop as much as 40 percent. In the early to mid-1970s, the U.S. economy moved in and out of recession; unemployment climbed from 3.4 percent in 1969 to 5.8 percent in 1971, and then, after a partial recovery in 1972-73, up to 8.3 percent in 1975. In 1990, the economy again moved into a recession, and unemployment rose from 5.1 percent in June 1990 to 6.7 percent in October 1991.

Other aspects of the economy and employment are quite different now. In 1968 defense spending was 9.2 percent of the gross national product (GNP); it was 6.5 percent in 1987 and had dropped further to 5.5 percent by 1991. Defense contracts are less important to many local economies now than they were in 1970.[14] Importantly, the defense and commercial aerospace businesses both fell sharply at the same time in 1970-73, while in the early 1990s commercial aircraft production remained fairly strong as military aircraft production declined. And where total employment in the space program fell by two-thirds between 1965 and 1973, it has been relatively stable ever since. The aerospace industry is more diverse now than in the past; in the 1960s, government spending was responsible for approximately 80 percent of aerospace sales, but it currently accounts for only about 55 percent.[15]

All in all, the stability of the nondefense segments of the aerospace business (commercial aircraft and space) has softened the impact of the engineering layoffs in the defense segment. In 1970-73, defense industry cutbacks and other layoffs resulted in a 13 percent reduction in total engineering employment.[16] From 1987 to 1990, while defense industry employment was declining 6 percent, total engineering employment continued to increase. Even if there were no overall growth in engineering employment between 1990 and 1995, and 127,000 defense

[11]Trudy Bell, "Back to the Future: A Perspective," *IEEE Spectrum*, November 1989, p. 44; Aerospace Industries Association, *Aerospace Facts and Figures 1990-91* (Washington, DC: 1990), p. 152.

[12]Aerospace Industries Association, *Aerospace Facts and Figures 1983-84* (Washington, DC: 1983), p.15.

[13]Comptroller General of the United States, "Reemployment Assistance for Engineers, Scientists, and Technicians Unemployed Because of Aerospace and Defense Cutbacks," Report to the Congress from the General Accounting Office, Accession Number 093372, Dec. 5, 1973, p. 1.

[14]As noted in ch. 1, the defense purchases in California declined from 14.6 percent of gross State product in 1968 to approximately 7 percent in 1990.

[15]Aerospace Industries Association, "Aerospace Employment Trends, 1961-90—The Impact of Defense and Commercial Spending and Other Factors," March 1990.

[16]National Academy of Engineering, Committee on Engineering Manpower Policy, *Engineering and Scientific Manpower—Recommendations for the Seventies* (Washington, DC: 1973), p. 8.

engineering positions were lost while no new jobs were created elsewhere—not a likely prospect—less than 7 percent of engineering positions would be lost. To reach a 13 percent loss, an additional 117,000 nondefense positions would have to disappear. This seems beyond the bounds of reasonable likelihood, given recent and long-term trends.

These comparisons indicate the employment situation for defense industry engineers *as a group* should not be as difficult in the early 1990s as it was 20 years earlier. The larger, less defense-dependent economy should more readily reabsorb the engineers. The lessons from the government programs of the earlier era will be discussed later in this chapter.

MOVING FROM DEFENSE TO CIVILIAN EMPLOYMENT

Defense engineers have several distinct demographic and professional characteristics that may affect their prospects for finding jobs in the civilian sector. First, they are somewhat older and have higher levels of education.[17] While they may possess educational advantages in seeking new jobs, the pool of equivalent commercial engineering jobs may be limited. It is possible that their extra education may even be a handicap; they could be rejected as overqualified.

Some people fear that the nature of defense work makes engineers too rigid and specialized for work in the commercial environment. Also, defense engineers are said to be slow to move to the civilian sector because they are overpaid in the defense sector and hold unreasonably high expectations for their earnings potential in commercial enterprises. The available evidence, discussed below, suggests that these fears are exaggerated.

Finally, defense engineers have different specialties from the general run of engineers, and moving to another specialty requires substantial retraining. The principal engineering specialties are electrical (including electronics), civil, mechanical, industrial, aerospace, and chemical. As table 4-1 shows, defense engineers are much more concentrated in aerospace and electrical specialties than engineers generally, and less in civil and chemical specialties. Displaced defense engineers whose specialties have a comparatively limited civilian market—especially if that market is not growing—are likely to encounter more than the usual difficulties moving into civilian jobs. But so far data on actual reemployment experience by specialty is too limited to allow any hard and fast conclusions.

Inter-Industry Mobility: The Record

Some civilian employers are predisposed against the defense industry and its employees—sometimes even when the employer and employee are in different divisions of the same firm—on the grounds that defense and civilian work environments differ too much for defense engineers to make the move.[18] Key differences are the time frames for product development (long in defense, short to medium in commercial); the balance between cost and performance (cost is often second to performance in defense, cost and reliability are more important in commercial); and the need to satisfy one customer in defense, versus many in commercial. In addition, the critics say that defense engineers put so much of their effort into pushing paper to meet burdensome DoD documentation requirements that their technical skills become obsolete from under-use.

These opinions can be tested against recent experience. Reports so far show that more than 60 percent of Lockheed's white-collar outplacements from its Burbank facility, 82 percent of Texas Instruments's white- and blue-collar outplacements from its Dallas defense plants, and 83 percent of laid-off McDonnell Douglas's engineering outplacements have been with nondefense firms. How many of the placements from Lockheed and Texas Instruments were engineers moving to new engineering positions is not clear, but officials at both companies believe it is a substantial number.[19]

[17]Joshua Lerner, "The Mobility of Corporate Scientists and Engineers Between Civil and Defense Activities: Evidence from the SSE Database," Science, Technology, and Public Policy Program, Harvard University, Science, Technology and Public Policy Program, Discussion Paper 90-02, August 1990, p.12.

[18]According to *Business Week* (July 2, 1990, p. 67), "Even highly skilled engineers sometimes have trouble finding jobs, tainted by the defense industry's reputation as being bureaucratic, late to market, and frequently over-cost." Seymour Melman, an advocate of defense-to-civilian industry conversions, states: "Engineers with long experience in the military industry are professionally incapacitated to various degrees from performing in the civilian economy." (quoted in Stix, *IEEE Spectrum*, op. cit., p. 45.)

[19]Kathryn Griffiths, Lockheed (Burbank) Career Center, personal communication, June 3, 1991; Dan McMurtry, Texas Instruments Placement Center, personal communication, May 16, 1991.

Grumman reported that most of its engineers outplaced during 1989 ended up in engineering jobs, with slightly less than half outside of defense.[20] Many of the younger engineers left manufacturing and were working in financial services and computer systems. None of these company officials offered examples of moves by defense engineers into nondefense aerospace engineering. However, a representative of the engineers' union at Boeing, the Seattle Professional Engineering Employees Association, stated that the company frequently moves engineers between the defense and commercial sides of the company.[21]

The National Science Foundation's (NSF) Survey of Scientists and Engineers (SSE) shows more mobility between the two sectors than might have been expected. In a study for Harvard University's Science, Technology and Public Policy Program, Lerner used the SSE data to examine mobility between the defense and civilian sectors from 1982 to 1986, a time when employment in the defense sector was increasing rapidly.[22] He found that 24 percent of the scientists and engineers employed in the defense industry in 1982 had transferred to civilian industry jobs 4 years later. He also reported that much of this mobility apparently took place within firms.

Taken together, the SSE data and the more recent, though incomplete, company outplacement data show that many defense industry engineers do successfully move into civilian industry jobs. Individual defense engineers may fail to maintain up-to-date technical skills and thus limit their reemployment possibilities, but this failing is not unique to defense engineering. Many defense engineers are working on the leading edge of technology in materials, electronics, and communications, and are in a strong position to move into the civilian sector.

Salary Levels

Another factor said to limit mobility between the two sectors is differing pay levels; some employers generalize that defense industry engineers are overpaid compared to their counterparts in the commercial sector. Two sets of figures, comparative salaries in different industries and the salaries of engineers moving from one sector to the other, cast some doubt on this perception.

Table 4-2 shows median annual salaries in 1989 for engineers in six major industrial groups, by number of years since the engineers received their bachelor's degrees. The first three industry groups (aerospace; electrical machinery, electronics, and computers; and electronic equipment) have a significant defense industry component. But salaries for engineers in those groups trail those in two of the three commercial sector groups (electric utilities and chemicals, drugs, and plastics) and are only slightly ahead of the third (automotive). Table 4-3 shows the mean total compensation for all engineers in five manufacturing areas in 1989, without regard for years of experience. Defense industry engineers are concentrated in the third of the five areas listed, electronics and aerospace products. Engineers in this category have an advantage over those in the business equipment and wood products industries, but not over those in chemicals and primary metals.

The 1982 SSE compared average salaries for large numbers of defense and nondefense scientists and engineers. It showed that salaries were somewhat higher on the defense side: 32 percent of defense industry scientists and engineers made over $40,000 in that year, compared to 26 percent on the nondefense side. The survey also indicated, however, that the differences could be attributed to: 1) age differences between the two groups (61 percent of the defense scientists and engineers were over 40 years old vs. 45 percent of the nondefense); 2) the higher education level of defense engineers (53 percent with 5 or more years of post-high-school education vs. 48 percent of the nondefense); and 3) the longer tenure of scientists and engineers in defense companies with their current employers.[23]

Another indicator that defense industry engineers are not overpaid is their ability to maintain salary levels when they move into civilian jobs. In general, mobility—changing occupations, changing employ-

[20]Richard Opsaul, Grumman Corp., Bethpage, NY, personal communication, Nov. 7, 1991.

[21]Dan Mahoney, president, Seattle Professional Engineering Employees Association, personal communication, Dec. 10, 1990.

[22]Lerner, op. cit. Interestingly, research on several defense layoffs in the early 1960s, a time when defense employment was also increasing, found that 35 percent of defense engineers transferred to nondefense work. (B. Curtis Eaton, "Defense Engineers: Do They Have Special Reemployment Problems?" *Monthly Labor Review*, vol. 94, No. 7, July 1971.)

[23]Lerner, ibid., p. 12.

Table 4-2—Median Annual Salaries of Engineers by Industry Group and Years Since Bachelor's Degree (In 1989)

Industry	Years since baccalaureate 0	9-11	18-20
Aerospace	$30,050	$41,500	$51,650
Electrical machinery, electronics, and computers	30,450	43,350	51,650
Electronic equipment	30,450	43,500	51,800
Chemicals, drugs, and plastics	31,700	49,100	59,900
Automotive	30,150	40,950	46,300
Electric utilities	31,600	47,100	56,750

SOURCE: *Salaries of Scientists, Engineers, and Technicians*, compiled by Commission on Professionals in Science and Technology, 14th ed., February 1990, adapted from table 126; data originally accumulated by Engineering Manpower Commission, American Association of Engineering Societies, 1989.

Table 4-3—Total Mean Compensation of Engineers in Manufacturing, by Product Area (In 1989)

Type of product	Total compensation
Chemicals, pharmaceuticals, plastics, and rubber	$40,388
Primary metal products	39,411
Electrical, electronics, aerospace, and aircraft products	39,106
Business equipment	34,299
Furniture and wood products	33,257

SOURCE: *Salaries of Scientists, Engineers, and Technicians*, compiled by Commission on Professionals in Science and Technology, 14th ed., February 1990, adapted from table 156. Data originally accumulated by Abbott Langer and Associates, *Compensation in Manufacturing*, April 1989.

ers, or moving into a field that does not match the field of highest degree—has negative effects on an engineer's salary.[24] However, several defense industry outplacement officers reported to OTA that displaced engineers who had found new engineering jobs did not take salary cuts; a 1991 survey of defense workers displaced from McDonnell Douglas made a similar finding.[25] SSE data showed that scientists and engineers who moved from defense to nondefense jobs between 1982 and 1986 fared better in salary changes than those who moved in the opposite direction; 20 percent of the first group had salary increases of $15,000 or more during the 4-year period, against 14 percent of the second group.[26]

In short, experience before the current defense cutbacks provides little indication that the salaries of defense engineers were inflated compared to those of nondefense engineers or that their expectations of maintaining salary levels when they moved into nondefense jobs were unrealistic. However, finding a new job after layoff is a different proposition from a voluntary move, which was probably the situation in most of the moves between defense and nondefense jobs tracked by NSF in the period 1982-86. Even if they were laid off, displaced professionals had a far easier time finding new jobs without sacrificing pay levels than most blue-collar and less skilled white-collar workers in the prosperous mid- and late 1980s. This may no longer be the case. The stagnant or recessionary economy of the early 1990s makes this a less propitious time for finding a replacement job at equal pay, even for engineers. Moreover, as the discussion below suggests, engineers who have moved into management positions and have not kept up their technical skills, or who have become overspecialized or inflexible, or who do not have an engineering degree but are nevertheless classified by their company as engineers, may indeed have difficulty in moving to another job without a significant cut in salary.

CURRENT LAYOFF AND REEMPLOYMENT EXPERIENCE

Although no accurate count is available, it is clear that tens of thousands of engineers had been laid off from defense jobs since defense spending started to decline, with the biggest layoffs occurring in 1990 and 1991. Because sizable layoffs began so recently, few studies on engineers' experience have been completed. Most of the following discussion is based on interviews with company human resource staffs, State and local government personnel, and the engineers themselves, supplemented by reports in newspapers and magazines. This evidence indicates that engineers are by no means as distressed by displacement as they were in the cutback following the Vietnam War, but that the job search can be long and frustrating, and that older engineers and those without up-to-date skills face genuine difficulties.

[24]Robert C. Dauffenbach, "Quality and Qualifications in the Market for Scientists and Engineers," Final Report to National Science Foundation, NSF-SRS-8511331, 1990, p. 56. Changes in responsibility are an exception.

[25]Fifty-seven percent of the engineers laid off from McDonnell Douglas's defense facilities in St. Louis in 1990 and 1991 received the same salary at their new jobs as at their old, while 20 percent went up and 23 percent went down. E. Terrence Jones, "The Layoffs at McDonnell Douglas: A Survey Analysis," mimeo, September 1991.

[26]Lerner, op. cit., pp. 20 and 25.

Layoffs

Some plant closures or contract cancellations result in layoffs of all engineers, regardless of age, experience, or performance. For example, at UNC Nuclear in Montville, CT, termination of the plant's contract to build nuclear reactor powerplants for Navy submarines means that all of the facility's 300 engineers will have lost their jobs by the end of 1992. Similarly, Lockheed's decision to end its aircraft construction program at its Burbank, CA facility has meant layoffs for most of its engineers, regardless of their skills or experience.

In other cases, companies are picking and choosing. McDonnell Douglas's vice-president of human resources said of the company's 1990 elimination of 17,000 positions, primarily white-collar jobs, "Generally, we thought, okay, what are the things we can eliminate and what are the things we must do? After we decided that, we asked, who are the people best suited to do the work that's left?"[27] General Dynamics, United Technologies Corp.'s Pratt and Whitney Division, and General Electric's Aerospace Division are among the major defense contractors who are selectively downsizing to reduce costs and increase efficiency and competitiveness. In addition to layoffs of engineers in technical positions, economic pressures are leading companies to thin out management layers and reduce the size of their central staffs.

State and local reemployment assistance agencies report that, in some companies that are laying off selectively, older engineers are being replaced with lower-salaried young engineers. Confirmation of these reports is difficult to come by. However, the IEEE survey noted previously indicates that more older engineers are being "encouraged" to retire early than were in the recent past.[28]

Reemployment

Engineers' prospects of finding a satisfactory new job depend on a combination of factors, chiefly: 1) their age; 2) their credentials and special skills; 3) their willingness to relocate; and 4) the health of the local and national economies. The health of the national economy is an overriding determinant of employment opportunities, but each of the other factors has considerable impact on how engineers fare.

Table 4-4—Involuntary Unemployment Rates for Electrical and Electronics Engineers, Early 1990

Region	All other ages	Over 55
Northeast	1.8%	1.7%
East	1.3	1.7
Southeast	1.2	3.0
Central	2.2	3.7
Southwest	1.8	1.7
West	0.9	3.1
United States	1.5	2.4

SOURCE: Institute of Electrical and Electronics Engineers, Inc., "IEEE Member Opinion Survey, 1990" (New York, NY: 1990), pp. D-15 and D-67. Table is adapted from data on these two pages, with all retired respondents, voluntary and involuntary, excluded.

Engineers under 35 combine relatively low salaries, high mobility, and well-developed computer skills. Most young engineers with some experience are having little difficulty finding new jobs. In contrast, most outplacement and employment offices interviewed reported that older (over 50) engineers are having more trouble. The IEEE survey of electrical and electronics engineers in late 1989 indicated an involuntary unemployment rate of 2.4 percent for those over 55 years of age compared to a rate of 1.5 percent for those of all other ages combined.[29] Table 4-4 shows comparable unemployment rates in the two categories for six U.S. geographic regions. Since 40 percent of the respondents aged 55 or over were retired, and since 14 percent of those indicated they had been forced to retire prematurely, the actual involuntary unemployment rates among over-55 electrical and electronics engineers is likely to be 5 percent or more.

Outplacement officers reported that many mid-level engineering managers (aged 40 to 55) are having a hard time finding reemployment after the 1990-91 layoffs. Their difficulties often involve one or more of these factors: 1) high salary expectations; 2) unwillingness or inability to relocate; 3) technical obsolescence; and 4) corporate restructurings, which have reduced the number of management levels in many companies. Engineers who have been promoted into mid-level management positions may have let technical skills atrophy; they find reemployment as an engineer after layoff difficult.

[27] *Business Month*, October 1990, p. 78.

[28] IEEE, op. cit., pp. 2-18.

[29] Ibid., pp. D-15 and D-67.

Engineers without bachelor's degrees are also having a hard time getting new jobs. Many defense contractors have, over the years, promoted or hired non-degreed people for jobs classified as engineering, and now report them as having trouble finding new jobs. The 1982 SSE showed that 5.7 percent of people employed as engineers at that time lacked bachelor's degrees. Seventy-five percent of those classified as "aeronautical engineers" possessed aeronautical or other engineering degrees, but 13 percent either lacked a degree in science or engineering or had no bachelor's degree at all.[30] When members of these groups are laid off, they often suffer from the lack of broad-based technical skills developed in engineering degree programs. Personnel offices may add to the problem by being unwilling to take a chance on applicants without the proper paper credentials. During the hard times for engineers in the early 1970s, there were similar difficulties for non-degreed engineers: in mid-1971, the unemployment rate for engineers without a bachelor's degree stood at 4.4 percent, compared to 2.8 percent for those with the degree.[31]

Several outplacement centers report exceptional reemployment difficulties for engineers who have become very specialized, especially those engaged for years in engineering activities peculiar to defense contracting, e.g., reliability, documentation, and defense software. Staff members at the outplacement center for the General Electric Aerospace Division plant in Burlington, MA say that 15 to 20 percent of the engineers laid off there are niched in very narrow, defense-oriented fields and are having considerable difficulty finding new jobs.[32]

On the other hand, many outplacement offices reported little trouble in placing engineers who were in nonmanagerial jobs in high technology fields. UNC Naval Products, in Montville, CT, for example, reported few problems in placing its electrical and mechanical engineers, many of whom were actively involved with robotics. Engineers with sophisticated processing and manufacturing expertise often make employment transitions easily. Engineers at the M-1 tank production facility at General Dynamics Land Systems Division north of Detroit, for example, are frequently drawn away by the area's automobile manufacturers.

Finally, the willingness and ability to relocate can be important. With the New England economy having hard times, the UNC Naval Products plant reported that half of its engineers laid off in 1990 found new jobs outside of Connecticut. Earlier, exit interviews with 70 engineers laid off from Grumman's Aircraft Systems Division at Bethpage, Long Island, in 1989 indicated that almost all had stayed in engineering jobs but 53 percent had had to move out of New York State.[33] Some engineers, particularly those in two-career families, may be less willing to relocate, and hence may have a harder time getting reemployed.

Although aggregate data on engineers' reemployment experience are mostly lacking, a few companies have at least partial records. At Lockheed's company-operated outplacement service for white-collar workers in Burbank, CA, half of the people served were engineers, and about 70 percent of the total were in technically oriented professions. The office reported on 299 placements through May 10, 1991: 39 percent found jobs with other defense contractors and subcontractors; 12 percent with other commercial aerospace companies; and 49 percent with other commercial sector employers including some in computer services, entertainment, environmental services, health, insurance, and manufacturing.[34] The high percentage reemployed in other defense firms—a finding confirmed in less quantitative reports from some other companies—raises the concern that these engineers may go through additional rounds of displacement as defense spending continues to decline.

---

[30]Dauffenbach, op. cit.

[31]Kathleen Naughton, "Characteristics of Jobless Engineers," *Monthly Labor Review*, October 1972, pp. 16-21.

[32]Such difficulties are not new. A major study of the transferability of defense engineers by Stanford Research Institute in the mid-1960s (C.H. Rittenhouse, *The Transferability and Retraining of Defense Engineers*, Report No. ACDA/E-110, prepared for U.S. Arms Control and Disarmament Agency, November 1967) pointed out there were a substantially greater number of engineers in the defense industry engaged in documentation activities, e.g., in writing specifications, handbooks, and manuals, and in systems analysis and design, than there were in civilian industry. Although systems approaches are now widely used in commercial and nondefense government programs, in the mid-1960s many of the engineers laid off from all of the aforementioned job areas had major problems because of the shortage of comparable jobs outside the defense industry.

[33]Richard Opsaul, Grumman Corp. representative to the American Institute of Aeronautics and Astronautics (AIAA), personal communication, Jan. 2, 1991.

[34]Kathryn Griffiths, Lockheed (Burbank) Career Center, personal communication, June 3, 1991.

An April 1991 survey of 1,000 salaried and hourly workers laid off by Texas Instruments in 1990 showed greater mobility from the defense to the commercial sector—possibly a characteristic of the electronics sector. Ninety percent of the respondents were from the company's defense sector, and roughly two-thirds were salaried, with a substantial (but unreported) number being engineers. Eighty-two percent of the reemployed workers found their new jobs in commercial sector firms, 16 percent were rehired by Texas Instruments, and only 3 percent went to other defense firms. The data also indicate the value of early warning. In this layoff, all the workers received 60 days' advance notice; 44 percent had found new jobs within 6 weeks, well before the actual layoff occurred.[35]

MOBILITY AND CAREER-LONG EDUCATION

Adaptability is the key to mobility of engineers from defense to civilian jobs. Too many years in too narrow a specialty is the greatest handicap to an engineer seeking to move into the civilian sector. More broadly, flexibility is increasingly important to all engineers and their employers in a time of rapid technology change, intense global competition, and shifting national priorities.[36]

Companies, the government, engineering colleges and universities, and individual engineers all have responsibilities in maintaining a versatile engineering work force. Engineers need a lifelong commitment to continuing education to avoid technical obsolescence. Universities can offer courses, at convenient times and places, that meet a midcareer engineer's professional needs. Companies can structure engineers' careers to help them avoid obsolescence by providing both internal mobility and continuing education opportunities. Government has a part to play both in providing scholarship aid directly to engineers for continuing education, and in giving companies information, technical assistance, and incentives to provide their engineers with lifelong training.

As layoffs of longtime employees are increasingly a fact of life in many U.S. companies, engineers are having to look at their jobs as renewable, short-term contracts rather than lifetime positions. It is becoming common practice, for example, for companies to reduce engineering staff to a core group and hire contract engineers for one project at a time.[37] IEEE recently advised its members to become "mature realists" and not to "assume that your employer will take care of you or that your job has tenure." It emphasized the importance of taking responsibility for one's career, and advised engineers to "recognize the need for lifelong learning to stay current and competent in your profession."[38] The case of obsolescence may sometimes be overstated.[39] Nevertheless, engineers who continuously refresh their professional skills increase their value to their employers (and to society) and are less vulnerable to replacement by recent graduates who have less experience and cost less, but are trained in up-to-date skills.

Career-long learning for engineers includes on-the-job experience, professional development, and formal course work. Several surveys indicated that most engineers had taken part in formal training at some time in their careers; that in the early 1980s about half of all engineers were participating in some kind of continuing education every year; and that participation tended to decline with age.[40] The inconvenience of course offerings, especially long travel times and distances, and excessive time taken from family and personal life were the primary

[35]Dan McMurtry, Texas Instruments Placement Center, personal communication, May 16, 1991.

[36]National Research Council (NRC), Committee on the Education and Utilization of the Engineer, Panel on Continuing Education, *Continuing Education of Engineers* (Washington, DC: National Academy Press, 1985).

[37]U.S. Congress, Office of Technology Assessment, *Higher Education for Science and Engineering—A Background Paper*, OTA-BP-SET-52 (Springfield, VA: National Technical Information Service, March 1989), p. 220, note 69.

[38]IEEE, "Professional Practices for Engineers, Scientists, and Their Employers," Entity Position Statement, IEEE United States Activities Board, Aug. 13, 1990.

[39]See, for example, H.G. Kaufman, "Continuing Professional Development at Mid-Career," *Proceedings, 1982 College-Industry-Education Conference of the American Society for Engineering Education* (Washington, DC: 1982), p. 125. Kaufman said: "It may be that, at least until midcareer, professional obsolescence may decrease with age, mostly as a result of accumulated experience and self-learning. Obsolescence may be used by employers as a convenient excuse for hiring younger and less-experienced professionals at salaries considerably lower than those which older professionals have attained."

[40]NRC, op. cit., pp. 19-27.

reasons engineers gave for not taking training courses.[41]

Help in overcoming these barriers might come from both universities and companies. Most universities, however, have other priorities. A few major ones (e.g., Stanford) have long taken an interest in continuing education to engineers and provide it in well-organized extension programs. But the large majority give it little attention, concentrating instead on what they see as their central tasks of undergraduate schooling, traditional graduate education, and research.[42] In its 1988 report on continuing education for engineers, a National Research Council (NRC) panel suggested that since industry has a direct interest in continuing education for engineers that accommodates diverse students, extends the boundaries of classes, responds to rapidly changing technology, and controls costs, industry itself should take on the primary responsibility.[43] There are ways, however, of combining industry and university responsibilities. An example is the National Technological University, described in box 4-A, which brings high-quality engineering courses from 40 universities to thousands of engineers and scientists in private industry. Several States have also supported the formation of regional technology networks of a similar kind.

Companies have much more to offer in career-long training of engineers than support of formal courses offered by university engineering faculty. Possibilities include rotations within the company to avoid over-specialization; short courses (possibly computer-based and self-paced) on specific topics; and long-term guidance by supervisors on training needs and opportunities.[44] Some U.S. companies do an excellent job of devising training programs that will keep their engineers versatile, flexible, and up-to-date. (See box 4-B for an example.) However, Japanese companies generally take this obligation more seriously. One study found that large Japanese firms are far more likely than U.S. companies to broaden engineers' experience by moving them around within the company.[45] Another described the Japanese employer's obligation to train the employee as "a corollary of the traditional long-range outlook in Japan" and a complement to "the employee's sense of duty to the company."[46] Young engineers are introduced to the company with a combination of formal classes at a company institute, assignment to a specific but off-line engineering project, rotation within the company, and most important, long-term guidance by a mentor who is responsible for the engineer's well-being and education. For older engineers, there are corporate technical schools, engineering seminars, internal 1-year "engineering cramming" programs, company-funded studies at Japanese or foreign universities, and for many mature engineers, a job as production manager, which draws on the engineer's years of on-the-job training and job rotation experience.

The Federal Government has not taken a very active part in supporting or encouraging continuing education for engineers. The National Science Foundation offers fellowships for graduate engineering study, but the grants are targeted to conventional graduate students who have recently completed BS degrees, not to midcareer engineers looking for support of continuing education. Federal tax law does provide some encouragement for engineers to use employer-provided tuition assistance, since employees do not have to treat this assistance as taxable income (if employers provide it in a manner that meets Federal requirements).

[41]Ibid., p. 16.

[42]Ibid., pp. 49-55. The NRC report noted that neither the institutions nor the engineering faculty have much incentive to develop and take part in continuing education for engineers.

[43]Ibid.

[44]At the same time that it advised engineers to take charge of their career development, IEEE also recommended that employers establish policies for the continuing personal and professional growth of their employees. Top managers were advised to "encourage internal job transfers to broaden career experience and minimize obsolescence as a result of over-specialization," through measures such as "job posting, skills inventory, internal recruiting, counseling, internships, rotational assignments, support for personal risk, and liberal relocation benefits." IEEE, "Professional Practices for Engineers, Scientists, and Their Employers," op. cit.

[45]Leonard H. Lynn, Henry R. Piehler, and W. Paul Zahray, "Engineering Graduates in the United States and Japan: A Comparison of Their Numbers and an Empirical Study of the Careers and Methods of Information Transfer," Carnegie-Mellon University, Pittsburgh, PA, 1989. The study found that 62 percent of Japanese engineers had at least one job rotation assignment, 35 percent were assigned to production at some point, and 50 percent had one outside assignment in R&D. The comparable figures for American engineers were 35 percent with a job rotation assignment, 14 percent assigned to production, and 14 percent with an outside assignment to R&D.

[46]Jeffrey Frey and William Finan, "Engineering Education in Japan: A Career-long Process," *Engineering Education*, July/August 1991, pp. 466-472. The authors were describing major Japanese companies that subscribe to the practice of career-long employment.

Box 4-A—The National Technological University: A Partnership for Continuing Engineering Education

The National Technological University (NTU) is a private nonprofit institution, governed by a board made up primarily of industry executives, that brings television courses via satellite network to engineers, scientists, and technical managers in 124 organizations at 350 sites.[1] The courses are taught by faculty from 40 leading engineering schools, including 27 State universities and land grant colleges and several highly regarded private institutions (e.g., Cornell, Rensselaer Polytechnic Institute). Most of the clients are private firms, among them such industry leaders as AT&T, Du Pont, General Electric, Hewlett-Packard, IBM, Motorola, and Xerox. Clients also include universities, U.S. Government agencies, and several of the Department of Energy's contractor-operated national laboratories. All students are employees of client organizations.

Founded in 1984, NTU had 260 faculty members in the 1990-91 school year, delivering 370 courses to 4,155 students enrolled for graduate credit and 386 noncredit courses in advanced technology and management to about 85,000 participants. By 1990, 150 students had graduated from NTU with the M.S. degree.

The NTU network uses an advanced telecommunications system, operating day and night on the GSTAR-1 communications satellite, and providing four channels of instructional television. Many courses are broadcast live, and students can communicate with instructors in real time by telephone or fax. However, most students view the programs on tape at times of their choosing, and get in touch with instructors by telephone, electronic mail, or fax during the instructors' office hours. These adult students seem to fare well enough without the instant two-way communication that children need for distance learning.[2] Students are encouraged to view the programs in groups, to gain from immediate face-to-face interaction and mutual reinforcement.

NTU is an outgrowth of the Association for Media-Based Continuing Education for Engineers (AMCEE), a consortium of a dozen colleges founded in 1976 to produce and distribute video programs for practicing engineers. From AMCEE's Board of Directors came the idea of a national degree-granting engineering college that would deliver its programs via satellite. The National Science Foundation gave startup support to AMCEE, and the Department of Defense put up seed money for NTU, but operations are now funded mostly by fees from clients. However, the Defense Advanced Research Projects Agency recently awarded NTU a $1.5-million grant in matching funds for installation of a state-of-the-art digital compressed video transmission system. Investments by NTU, its industrial customers, and its member schools, will bring the total funding for the new system to about $5 million. Chief advantages of the system will be improved video and audio quality and a many-fold increase in channel capacity.

---

[1]Most of the material on NTU is drawn from Lionel V. Baldwin, "Higher-Education Partnerships in Engineering and Science," *The Annals of the American Academy of Political and Social Science*, March 1991, pp. 76-92; and National Technical University, *Annual Report 1990-91*, 700 Centre Avenue, Fort Collins, CO 80526.

[2]A detailed examination of distance learning is in U.S. Congress, Office of Technology Assessment, *Linking for Learning: A New Course for Education*, OTA-SET-430 (Washington, DC: U.S. Government Printing Office, November 1989).

However, Congress has never made this tax exemption a permanent part of the law, but has repeatedly extended it for limited periods.

The U.S. Government does little to spur or help employers to provide training to their employees generally, including continuing education for engineers. Several other countries use a payroll-based levy to encourage employers to train workers; the levy can be forgiven if employers do sufficient training on their own. Moreover, the U.S. Government offers little in the way of technical assistance to employers or professional societies that might wish to develop training programs for their employees or members.[47] Because of the public interest in making use of the skills of all the Nation's engineers, especially since there are indications that the supply may shrink in the next few years, there is reason for the government to give special attention to policies

[47]For detailed examination of worker training issues in general, see U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy*, OTA-ITE-457 (Washington, DC: U.S. Government Printing Office, September 1990).

Box 4-B—Continuing Education for Engineers at Texas Instruments

Several large defense contractors are strongly committed to continuing education of their engineers and other employees. An example comes from the Defense Systems and Electronics Group of Texas Instruments (TI).[1]

The TI program requires new employees to work with their supervisors to develop a personal 3- to 5-year training education plan, and then to update it regularly for the rest of their career with the company. TI has developed training profiles by job titles; the profiles list mandatory, recommended, and optional courses that serve as the starting point for each employee's personal training and education plan.

TI provides its engineers with opportunities both inside and outside the company to meet their training goals. The Group's Human Resources Development Department offers some 125 2- to 5-day courses, a few of which are computer-based and self-paced. Among the subjects covered are computer systems, including computer languages, operating systems, microprocessors, and software engineering; electrical, mechanical, and other engineering; and leadership and quality development.

For longer term educational courses, TI provides help with tuition through its Educational Assistance program, which is dedicated to helping individual employees better their job performance through career-long education. For employees taking an approved course, TI pays all the costs of tuition, books, and fees for the first $100 per semester hour, and 80 percent of all charges above that. Engineers are encouraged to pursue graduate degrees, especially in technical areas but also in business administration. Course work is generally done on the employee's own time.

The TAGER Television Network offers TI employees another way to receive advanced courses in engineering, computer science, mathematics, and management. Developed by a consortium of North Texas colleges and universities, TAGER uses one-way television and two-way telephone hookups to present credit and noncredit courses to 15 companies at 30 sites in the Dallas-Fort Worth area. Courses are offered primarily during working hours but also on week night evenings. M.S. degree programs in the TAGER network include electrical, mechanical, and computer engineering, computer science, operations research, and engineering management. TI also provides satellite-delivered courses in engineering and management from the National Technological University.

[1]Roughly one-quarter of Texas Instruments' business is in defense.

that would make career-long education and training for engineers more readily accessible.

REEMPLOYMENT AND RETRAINING ASSISTANCE FOR ENGINEERS

Engineers' Needs

Engineers laid off by defense industry employers typically need a range of outplacement services, many of them identical to the services that are useful to all displaced workers. These common services include skills assessment and job counseling, personal counseling, job search skills training, and job development, including company-sponsored job fairs. Engineers' needs do differ in some respects, however. For example, job banks and job fairs for the engineers are more useful if the potential employers come from all over the United States, while production workers are often interested mainly in local jobs.

Retraining needs can also be rather different. Many blue- and pink-collar workers can gain a good deal from relatively short-term skills courses, particularly those designed by local community colleges to meet the needs of displaced workers. Engineers who require retraining may need courses that are considerably longer and more expensive.

Moreover, engineers may need access to employment and training services for a relatively long time. Job searches for engineers average longer than those of blue-collar workers. A personnel officer for McDonnell-Douglas says, "For every $10,000 per year a person makes, it takes 4 to 6 weeks more to find a position."[48] At a General Electric plant in hard-hit Massachusetts, a personnel officer points out, "Even in good times, the average placement time for engineers was 3 to 6 months."[49] Outplace-

[48]Personnel officer, McDonnell Douglas, personal communication, Oct. 19, 1990.

[49]Frederick T. Anderson, manager, professional staffing, GE Aerospace, Lynn, MA, personal communication, Mar. 11, 1991.

ment offices say that the 1990-91 recession has typically added another 1 to 2 months to the length of job searches for engineers.

Responses From 1970 to 1973: The Worst of Times

The employment situation for engineers was much worse in the early 1970s than in the early 1990s: total engineering employment then was considerably less (1.2 million in 1970 vs. 1.8 million in 1990); the defense aircraft, space, and commercial aircraft industries had all contracted significantly at the same time; and the economy was much more defense-dependent. A national program for assistance to displaced workers did not exist in the 1970s, and in its absence several government and other reemployment and retraining efforts targeted to engineers were established. These may be applicable—and perhaps more effective—in an era when the engineers' situation is not so difficult.

The Federal Government's principal response was expansion of a small, trial assistance effort into a national program, the Technology *Mobilization* and Reemployment Program (TMRP). TMRP provided funds for job development, travel for job searches, relocation, and training for specific jobs. An estimated 75,000 to 100,000 engineers, scientists, and technicians were unemployed when the program began.[50] When the 2-year program ended in June 1973, some $28 million had been spent and 34,000 participants were known to be reemployed.[51] A 1973 General Accounting Office (GAO) report[52] criticized the program for falling short of its estimates of the number of people it would serve (35 percent of the goal) and the amount of financial aid it would disburse (19 percent), but otherwise regarded the program as reasonably successful.

One aspect of TMRP was a skills conversion study. Under a contract from the Department of Labor (DOL), the National Society of Professional Engineers (NSPE) organized research teams of unemployed aerospace/defense engineers in 14 cities with the highest unemployment rates for technical professionals. The teams examined potential employers' needs in 21 fields such as medical services, criminal justice, food products, and transportation, and identified some 55,000 job opportunities.[53]

Following the skills conversion study, DOL awarded NSPE a second contract, the Technology Utilization Project (TUP), to retrain aerospace/defense workers. Engineers and scientists were retrained for jobs in 11 industries with good job opportunities: food products, health care, transportation, wood products, power resources, pollution control, criminal justice, banking and finance, solid waste, educational technology, and occupational safety. Of 329 persons enrolled in the course, 302 found employment by early January 1973, and most in the occupations for which they had been trained. GAO recommended that skill conversion studies be given high priority for early implementation in future employment crises for technical professionals.[54]

The TUP's successes provided a counter to employer attitudes common in the early 1970s (and still prevalent in 1991). The attitude was that aerospace engineers were not good prospects for nonaerospace employment because they were overpaid, too specialized, and too old, and would return to aerospace as soon as they could. After the project ended, DOL reported the following:

- Employers mistakenly thought defense aerospace engineer salaries averaged $25,000; for those who participated in the training the average was $16,000.
- The technological spinoff from aerospace specialization convinced many employers that experience in defense aerospace was more an advantage than a disadvantage.
- The average age of the participants in training was 45.4, but these retrained engineers ap-

[50]Comptroller General of the United States, "Reemployment Assistance for Engineers, Scientists, and Technicians Unemployed Because of Aerospace and Defense Cutbacks," op. cit., p. 1.

[51]President's Economic Adjustment Committee and Office of Economic Adjustment (DoD), *Economic Adjustment/Conversion*, July, 1985.

[52]Comptroller General of the United States, "Reemployment Assistance for Engineers, Scientists, and Technicians Unemployed Because of Aerospace and Defense Cutbacks," op. cit., p. 14.

[53]Naughton, op. cit., p. 20; "Aerospace/Defense Job Skills Conversion Project Develops Action Responses to Engineering Employment," *Professional Engineer This Month*, vol. 42, No. 6, June 1972, p. 17.

[54]Comptroller General, "Reemployment Assistance for Engineers, Scientists, and Technicians Unemployed Because of Aerospace and Defense Cutbacks," op. cit.

peared to take less time to become productive than new college graduates.

- Only one-third of the unemployed engineers returned to aerospace; many preferred the security of another industry.[55]

The Aerospace Employment Project was a small-scale, federally funded program, carried out by the National League of Cities and the U.S. Conference of Mayors, that retrained former aerospace and defense industry professionals for local government jobs. A total of 376 professionals were selected from some 7,000 applicants in the 10 highest unemployment areas in the United States. After attending 30-day courses at Massachusetts Institute of Technology (MIT) or the University of California at Berkeley, and after being organized into supportive self-help groups, the participants were made available to prospective employers. The program proved effective in giving the engineers new skills, and most participants found new jobs, but the job search was lengthy and most of the engineers took salary cuts. Roughly 8 of 10 participants were placed within 7 months of course completion, 65 percent in local government and the balance in private industry. Most participants reported that the new jobs did require substantially different skills from those involved in their old jobs so that retraining was appropriate.[56]

Professional societies (IEEE and the American Institute of Aeronautics and Astronautics (AIAA)) set up other programs to help engineers in the 1970-73 period. Both organizations worked with DOL to use both volunteers and paid, previously laid-off engineers in job and personal counseling programs and in self-help groups in areas where unemployment was high.[57] AIAA, for example, eventually provided 175 workshops in 43 cities, and served 14,600 out-of-work professionals.[58] Assistance from peers proved to be a key to success in these programs.[59]

Responses Today: Professional Associations

During the 1970-73 employment slump—the worst period for engineers since World War II—the professional associations were very active in helping their displaced members get back into the work force. During the current cutbacks, perhaps because of stronger outplacement efforts by many defense firms and the presence of the Economic Dislocation and Worker Adjustment Assistance (EDWAA) government programs, and because the slump for engineers is not as severe as that of two decades ago, the associations are not as heavily involved. They do, however, provide some services.

IEEE regularly tracks employment trends for its members, holds biennial Career Conferences, and has been actively promoting continuing education. (Electrical engineers represented 44 percent of defense-related engineering employment in 1990.) IEEE has taken a lead role in maintaining resume data banks for professional association members; developed and published a two-volume "employment guide" for scientists and engineers; helped build local consultant networks, which can support entrepreneurial efforts by displaced engineers; encouraged recruiting at IEEE conferences; and contracted with a private firm to present job fairs and job search seminars for local IEEE sections around the country.

AIAA (aeronautical and astronautical engineers represented 15 percent of defense-related engineering employment in 1990) has taken a very low-key role in the reemployment effort It has revised and reprinted a popular 1970s job hunting guide and has provided free insertions of "Available for Employment" ads in the organization's monthly magazine.

Engineers are not heavily unionized, but those unions that exist have made some efforts at promoting conversion from defense to commercial production. One of the more creative union efforts was the Wichita Engineering Association's negotiations with Boeing, which resulted in the cross-training program described later in this chapter.

---

[55]Albert E. Berndt, "Government Efforts To Utilize Engineering Manpower," in S.S. Dubin, H. Shelton, and J. McConnell (eds.), *Maintaining Professional and Technical Competence of the Older Engineer—Engineering and Psychological Concepts*, op. cit.

[56]H.G. Kaufman, *Professionals in Search of Work: Coping with the Stress of Job Loss and Unemployment* (New York, NY: John Wiley & Sons, 1982), p. 207.

[57]Stix, op. cit., p. 47; Berndt, op. cit., p. 140.

[58]Kaufman, op. cit., p. 212.

[59]Ibid., p. 138.

On Long Island, a group of engineers formed "The Center for Practical Solutions" in early 1990 to help each other with employment problems and opportunities and to develop jobs in the area. The group is trying to create new jobs through infusion of technology into existing companies and support of entrepreneurial efforts. The center includes people with expertise in marketing, sales, law, and accounting, to support development of businesses for the manufacture of commercial, environmental, transportation, and medical products.

Company Responses

A qualitative review of reemployment programs for engineers around the country indicates that many of the better ones are built around active company participation. When company programs are in place, government programs can be very effective complements, providing additional readjustment/reemployment services and staff. Partnerships between local EDWAA agencies and the companies can draw on the strengths of both and produce effective programs.

In the current downsizing, most large defense industry employers are providing engineers and other white-collar employees with a wide variety of outplacement services.[60] Companies may have more than one reason for taking on this responsibility. Besides feeling a duty to longtime employees, some are also concerned about maintaining morale among both the workers who have been given advance notice of layoff and those who will remain with the company.

Company outplacement services are a relatively new benefit. Before 1970, most defense industry firms took no responsibility for helping laid-off engineers find new jobs. In the San Francisco area during major defense industry layoffs in 1964-65, for example, only a quarter of the scientists and engineers laid off by 62 defense industry firms received outplacement services. The average time between layoff notice and end of employment for all 62 firms was only 7 days.[61]

Company outplacement services may be provided directly by the employer's human resources office or by an outplacement firm hired by the employer, and are often supplemented by some services provided by local and State EDWAA agencies. Although cooperation between companies and government dislocated worker assistance programs can work well, companies sometimes lose patience with the delays or inadequacies of government programs. Several companies reported that they sought help from the federally funded, State and locally operated EDWAA program when facing layoffs, but decided to provide the primary services themselves because the government agencies could not get projects set up quickly enough, did not have funds available, or declined to fund certain services (such as workshops by outside consultants).

Table 4-5 summarizes the services provided to engineers at 13 plants of large defense contractors after layoffs announced during 1990 or early 1991. Most of the large defense contractors make substantial efforts, with or without government assistance, to provide basic services (the second through seventh categories of "Benefits and Services Provided" in table 4-5). The aim is to help the employee find a new job as rapidly as possible, and to minimize the stress on employees from the time the layoff is announced until they find new jobs. Survey responses from 11 aerospace firms that had laid off scientists and engineers and provided outplacement services during 1989-90 indicated the average cost of the services provided ranged from $100 to almost $6,000 per employee; the median amount was $1,000.[62]

Reemployment programs for engineers and other white-collar workers typically start with a 2- or 3-day orientation, which includes topics such as skills assessment, resume preparation, interview techniques, importance of networking, and potential personal stresses. Such basic information may not seem necessary, especially in areas such as southern California where many aerospace workers have changed employers frequently and kept job-hunting skills honed. However, the layoffs of the 1990s are

[60]Some firms also provide services to their blue-collar workers but tend to rely more on State and local government employment and training programs. Engineers and other white-collar workers frequently receive outplacement services at one office or location, blue-collar workers at another. See ch. 3.

[61]R.P. Loomba, "A Study of the Re-Employment and Unemployment Experiences of Scientists and Engineers Laid Off From 62 Aerospace and Electronics Firms in the San Francisco Bay Area During 1963-65," San Jose State College, San Jose, CA, Feb. 15, 1967.

[62]Aerospace Industries Association Survey, "Company Policies for Dealing with Economic Adjustment and Its Impact on Aerospace Workers," 1990.

Table 4-5—Benefits and Services Provided to Displaced Engineers

Company	Location	Number of engineers laid-off	Dates	Benefits and services provided								
				Severance pay	Job-search skills training	Office space	Job counseling	Personal counseling	Job banks[a]	Job fairs	On-site retraining courses	Funding for off-site training
Lockheed	Burbank, CA				C	C	C		C+G	C	—	—
McDonnell-Douglas	Long Beach, CA	1,990	7-90/6-91	—	C+G	C+G	C+G	C+G	C+G	C+G	—	G
Northrop	Los Angeles, CA (multiple sites)	1,200[b]	1-90/12-90	—	C+G	C	C	G	C+G	C	—	G
Rockwell-North American Aircraft	Los Angeles. CA	160	10-89/12-90	C	C	C	C	C	C	C	—	G
GD Electric Boat[c]	Groton, CT	75	10-90/1-91	—	C	C	C	C	G	—	—	G
UNC Naval Products	Montville, CT	240	2-90/12-90	C	CG	C	CG	C	G	CG	—	C+G
Boeing	Wichita, KS	60	1-90/12-90	—	C	C	C	—	—	—	C[d]	—
GE Aerospace	Burlington, MA	150	1-91/12-91	C	C	C	C+G	C+G	C+G	C	C+G	C+G
GE Aircraft Engines	Lynn, MA	350	10-90/2-91	C	C	C	C	C	C	C	C	C
McDonnell-Douglas	St. Louis, MO	1,900	7-90/6-91	—	C/G[e]	C/G	C/G	C/G	C/G	C	C	G
Grumman	Long Island, NY	230	1-90/12-90	C	C	—	C	—	—	C	—	G
Texas Instruments	Dallas, TX	700	1-90/ 5-91	C	C	C	C	C	C	C	C	C+G
GD Fort Worth[c]	Fort Worth, TX	2,500	6-90/ 6-91	—	C	C	C	C	C	C+G	—	G

KEY: C—company operated and funded.
G—government operated and funded.
C+G—joint operation.
C/G—company operated, government funded.
— —not provided.

[a]Every State has an Employment Service that maintains a job bank; displaced engineers may, however, rely primarily on job listings developed at the company outplacement center.
[b]Includes engineers and other white-collar job holders.
[c]Electric Boat and Fort Worth are subsidiaries of General Dynamics (GD).
[d]Company provided crosstraining for 176 engineers to change jobs within Boeing.
[e]Programs designated C/G were company provided until November 1990, then turned over to government agency.

SOURCE: Office of Technology Assessment, 1991.

also displacing engineers who have been with the same employer for 15 or 20 years and have not had to look for a new position since they graduated from college.

After the orientation many of the engineers are ready to begin their job searches, while others take time to evaluate future career directions. Peers are often effective job counselors for engineers, and job clubs (peer support groups in which job-hunting experiences and job leads can be shared) are also popular and useful. Many companies provide laid-off engineers with office space for job search activities; this often includes a desk, photocopying and long-distance telephone privileges, and access to word-processing equipment or secretarial assistance.

Companies also assist their engineers by putting them in contact with potential employers through job fairs and job banks. In St. Louis, for example, McDonnell Douglas brought in more than 115 companies to job fairs for employees it laid off in mid-1990. Most outplacement offices maintain job banks (listings of available jobs), although these range widely in size and quality. Lockheed's Burbank, CA center for displaced salaried workers gathers job listings from some 800 potential employers and also distributes to employers a weekly newsletter describing the talents of specific Lockheed employees being laid off. Some companies, such as General Electric, maintain listings of professional opportunities available at the company's other locations.[63]

Personal counseling, usually in the form of group instruction on potential psychological, family, and financial problems, is an important service provided by many companies. Individual counseling on the same issues is frequently made available, sometimes through existing company employee assistance programs. Because unemployment periods for engineers are often relatively long, stresses can build up and the personal counseling programs become critical.

Although most large defense companies offer their laid-off employees substantial reemployment help, either by themselves or cooperatively with State and local agencies, others do less. After a large layoff in early 1989, one Long Island aerospace firm provided severance pay, job fairs, and informal counseling, but also: 1) informed most workers of layoffs on the day they were laid off, in some cases giving them less than 30 minutes to leave; 2) refused to permit local and State reemployment assistance programs to hold briefings at the affected plant to describe available services; and 3) refused to provide the assistance programs with the names of the laid-off workers.[64]

In addition to the tasks of finding a new job and managing the stresses of unemployment, laid-off engineers sometimes need training to fit the new job or to make them more appealing to potential employers. Interviews with laid-off engineers, outplacement office staff, and government employment agency directors indicate that retraining has not been a high priority for displaced engineers during the current cutbacks. Like blue-collar workers, many unemployed professionals are unwilling to risk retraining unless they are provided financial assistance and the promise of a job upon completion.[65]

The responses of the companies (and government agencies) to retraining needs at the 13 plants are shown in the last two columns of table 4-5. Retraining assistance is not provided by nearly as many companies as the more basic outplacement services. Training is expensive, and the companies have generally relied on government programs for this service. A few companies make tuition grants for training courses as part of severance packages. For example, General Electric's Aerospace Division will reimburse tuition costs up to $5,000 for each of the 2 years following an engineer's layoff. Hughes Aircraft reimburses each laid-off employee up to $5,000 for tuition for continuing education, improving technical skills, or completely changing profession.[66] Texas Instruments provides any worker who has been with the company for 15 years up to $6,000

[63]The seven largest aerospace employers in California joined the State in 1988 in forming the Aerospace Human Resources Network, with an office in Manhattan Beach, to help engineers and other white-collar employees transfer from one company to another as defense contracts ebbed and flowed. By late 1990, however, no one was doing much hiring. The network had essentially become an outplacement service for all of the employers. The members decided to end their joint effort and return to local (company- and State-run) employment offices.

[64]Linda Kravitz, "Wages of Peace: Community and Industry Experience with Military Cutbacks," contractor report prepared for the Office of Technology Assessment, July 1990.

[65]Kaufman, op. cit., p. 205.

[66]John Voelcker, "Reemployment Assistance Limited," *IEEE Spectrum*, November 1989, p. 54.

in tuition assistance during the 2 years following layoff. Other companies complete payment for any courses in which engineers are enrolled at the time of the layoff announcement.

When training needs are fairly narrow and shared by a number of clients, outplacement projects sometimes offer their own short courses. Typical subjects include computer-aided design and manufacturing (CAD/CAM) and specific computer programming languages. Classes in how to start a small business are popular offerings. These courses may be paid for either by the company or out of EDWAA funds.

Mass retraining of engineers for other jobs within the company is less common. An effort by Boeing's Wichita Division to retrain its defense engineers (described in box 4-C) is a successful but unusual example. In contrast, a company retraining program launched in a southern California aerospace plant was terminated when more than 60 percent of the class members dropped out. The keys to success in group retraining efforts appear to be careful selection of candidates and availability of jobs that will require engineering rather than technician or blue-collar skills.

Defense industry employers use several strategies to minimize layoffs. Normal attrition due to retirement or voluntary quits can reduce employment levels without layoffs. Some companies offer voluntary early retirement, although it appears that some recent early retirements have not been truly voluntary. An approach used in the past in single-firm cutbacks but less available now is the loan of engineers to other companies. In 1978-80, for example, Rockwell's North American Aircraft Division loaned engineers to Boeing and McDonnell Douglas with an option to call them back at any time with 30 days notice; Rockwell did so when B-1B bomber production began in the early 1980s.[67] Because the spending cutbacks have hit virtually all defense contractors, few are in a position to borrow engineers today. In the 1970s, several companies used shortened work weeks or work sharing, in which two employees alternate in a single job slot, to avoid dismissals;[68] they have not been used significantly in the current cutbacks, at least not by the large companies.

Government Programs

Federal programs of immediate importance to engineers facing layoffs because of defense retrenchments are the mandate for early notification of layoffs, under the Worker Adjustment and Retraining Act (WARN), and the EDWAA program as a source of funding or provider of retraining and reemployment services. These programs are discussed generally in chapter 3. The discussion here focuses on their effectiveness.

The early notification that WARN requires has proven very useful to local and State government agencies in getting programs into place for displaced engineers—in those cases where WARN has applied.[69] Like other workers, professionals who start their job search before they are laid off are likely to have a shorter period of unemployment than those who start looking after layoff.[70]

Federally funded EDWAA services are a major source of reemployment assistance for dislocated engineers. As described in chapter 3, EDWAA funds can be used for retraining, job search skills training, placement services, relocation assistance, and other specific support services for dislocated workers. Although most large defense contractors are currently providing readjustment and reemployment services other than retraining to their laid-off engineers, the EDWAA program still plays a very necessary role. State and local EDWAA agencies can provide reemployment services to engineers when companies are too small to afford them, when larger companies decline to provide them, and when companies that provide the services initially later want to turn the task over to someone else. EDWAA agencies can also provide technical assistance to

[67]David Rowley, Vice-President, Human Resources, Rockwell International, Aircraft Division, El Segundo, CA, personal communication, Feb. 1, 1991.

[68]Kaufman, op. cit., p. 259.

[69]The WARN legislation requires early notification whenever layoffs in a 30-day period involve either one-third or more of a company's employees (minimum of 50) or 500 or more employees. The law also provides numerous exemptions, e.g., when a plant closing or layoff is the result of the ending of a project for which employment was understood to be limited to the project's duration, or when it is the result of business circumstances that were not foreseeable. McDonnell Douglas and General Dynamics both took exemptions for large layoffs when the Navy abruptly canceled the A-12 program in January 1991.

[70]Kaufman, op. cit., p. 149.

Box 4-C—Retraining of Engineers: Boeing's Commercial Airplane Group

A model effort in retraining defense industry engineers for commercial engineering jobs within the company is in the Wichita (KS) Division of Boeing's Commercial Airplane Group. After a company reorganization in 1989, Boeing began to phase out military aircraft work at the Wichita facility, moving the work to other Boeing plants in Seattle and Philadelphia. At the same time, the Commercial Airplane Group at Wichita had a big backlog of work and faced a serious shortage of structural design engineers.

Expecting sizable layoffs from the cutback in military work, the engineers' union, the Wichita Engineering Association, worked out a retraining agreement with the company in December 1989. Association members who were candidates for layoffs would be offered a chance at retraining for structural engineering positions.

Over the next 13 months, 176 engineers—mostly mechanical, civil, and aeronautical—entered the Cross Training Program. Their previous experience varied widely, and their ages ranged from 24 to 60. To be eligible, they must have completed basic engineering mechanics courses in statics, dynamics, and strength of materials. And they had to be committed to careers in airframe structural design.

The training course was on paid time and was taught in the plant by Boeing engineers. It included 6 weeks of classroom training, followed by 6 weeks of engineering liaison work on the plant floor. All but 8 of the original 176 engineers completed the 12-week program.

Afterwards, the trainees were assigned to structural engineering jobs as "apprentice engineers," a special cross-training category they are allowed to keep for 18 months, with no cut in salary from their previous positions. As apprentices, their progress is reviewed every 90 days. Additional training, such as advanced structural design courses, is available from Wichita State University. At the end of the apprentice period, the engineers become qualified structural engineers and move into the pool with others in the same category.

With most of the trainees still in the apprentice designer category at this writing, it is too soon to say whether the program has fully succeeded. If it does, the company and the engineers will both emerge as winners.

company projects, and they can provide services the company does not sponsor.

EDWAA agencies that are in partnership with companies often contribute by training company outplacement staff, conducting parts of workshops, preparing discretionary grant proposals, and providing specific services such as personal counseling to employees or operation of State job banks. At the General Electric Aerospace Division plant at Burlington, MA, for example, the State's EDWAA-funded contractor provided a job developer, a training coordinator, and a peer counselor, as well as training funds, to complement the staff, services, and facilities the company provided. It also counseled company officials on how best to set up an outplacement program. In St. Louis, McDonnell Douglas provided the basic outplacement services to engineers at company centers while the EDWAA agencies helped the company establish the centers, provided advanced CAD/CAM training to a group of engineers and funded individual courses for others, supported new business development by offering entrepreneurship training and incubator space, and took over operation of the company-established centers several months after the initial large layoff. Sometimes, it is possible for the defense company itself to become the EDWAA-funded service provider. At its Montville, CT plant (slated to close completely by the end of 1992), UNC Naval Products administers an EDWAA-funded contract to provide a full range of outplacement services to the dislocated employees.

In cases where companies do not provide outplacement help or have closed down their outplacement centers, engineers may turn to EDWAA-funded and operated centers. Some EDWAA projects are tailored to respond to a particular plant layoff, but many are open to all of a community's dislocated workers. Some of the centers are effective, giving individual attention to all workers, providing a range of readjustment and reemployment assistance services, and fitting retraining to each individual's background and abilities. In others, the EDWAA service providers are accustomed to working primarily with blue-collar workers and are not committed to serving dislocated white-collar

workers and professionals.[71] Moreover, during the recession and stagnant economic conditions of 1991, some EDWAA programs became so overstretched with demands for services that they provided only minimal help to those they considered most able to fend for themselves. This included most engineers.

Earlier, before demands for services became so insistent, some States had set up centers that were targeted specifically to professional employees. For example, the Commonwealth Career Center, located in Boston's southwest suburbs, was intended primarily to serve engineers and other professionals laid off by computer, defense, and financial firms. This center concentrated on job development and intensive, individual case management. In Texas, EDWAA agencies have contracted with the Center for Applied Technology, part of the University of Houston, to operate Career Resource Centers for professional and technical staff laid off in the Dallas, Austin, and Houston areas. The centers provide a range of readjustment and reemployment services as well as a considerable number of training courses. California's Employment Development Department is helping job-seeking engineers and other professional, managerial, and technical workers by supporting Experience Unlimited (EU) job clubs in its local offices. The EU clubs are voluntary self-help groups of the unemployed or underemployed, mostly mid- to upper-level executives. Members use the clubs to network and develop job search skills. They are expected to spend at least 4 hours per week in club activities designed to help them or fellow club members find jobs.

The costs of retraining usually fall on government sources, if not on the engineers themselves. Retraining or continuing education at the professional level is expensive. Some local service providers have virtually no EDWAA funds available for individualized courses for engineers; others consider advanced training for engineers an expensive luxury, and give priority to shorter term retraining of blue-collar workers without transferable job skills. Some are willing to support engineers' training but restrict their choices.

The Federal law that established EDWAA places few restrictions on training choices, but DOL's EDWAA regulations state: "Retraining services . . . should be limited to those individuals who can most benefit from and are in need of such services."[72] Many State and local agencies interpret this regulation to exclude dislocated workers with college degrees from EDWAA training. Most do not allow the use of EDWAA funds for pursuit of a full degree program, although they may fund a limited number of courses to complete a degree program already well underway. One agency (not atypically) interpreted the regulation to bar a laid-off defense industry mathematician from receiving EDWAA funds for retraining to become a high school mathematics teacher. The agency would not fund the retraining because the young woman "already had a marketable degree in mathematics." As discussed in chapter 3, the same DOL regulation and policy usually disallows EDWAA training funds for skill upgrading. This could present a particular problem for engineers otherwise eligible for EDWAA retraining; jobs may be available in their specialty but only to those with the most up-to-date skills.

In principle, publicly financed training might appropriately be given to any displaced workers, including engineers, who need it to improve transferable skills. However, considering that training for engineers is expensive, and that EDWAA funds are limited—especially when recession is aggravating displacement and escalating demands for service—service providers will face tough choices over how to spend their scarce resources. They may have to limit their help to engineers to outplacement services, which are relatively cheap, and save training for those who can benefit from shorter term, less costly courses. However, if a particular center serving engineers focuses too much on outplacement services, it runs the risk of coming up against the law's requirement that each EDWAA project must spend half its funds on training (unless the Governor reduces the portion to 30 percent). As noted in chapter 3, this requirement removes flexibility from projects primarily serving engineers, managers, and other professionals who may be job-ready and need no training. Considering the value to society of preserving and upgrading the skills of its engineers, there is good reason to consider options other than the EDWAA program for keeping midcareer engi-

[71] Some Service Delivery Areas, concentrating on services to low-income and disadvantaged workers, have little experience or even interest in serving displaced workers in general, whether engineers, technicians, operatives, or clerical workers. See the discussion in ch. 3.

[72] 20 CFR 631.41(d)

neers in the profession. Chapter 2 discusses policy options for encouragement and support of continuing education of engineers—thus helping to avoid displacement and waste of this human resource. Two other options that seem particularly appropriate for engineers are described below.

Teacher Training

One creative approach to the reemployment of retired or unemployed engineers is to train them as certified math and science teachers for junior and senior high schools. Under one such program, started in September 1990 and funded jointly by Rockwell International and the State of California, 17 Los Angeles area Rockwell retirees aged 55 to 65 enrolled in a 9-month alternative credentials program. (Rockwell, like many defense industry firms, allows retirement as early as age 55 with 30 years company experience.) The engineers' practical experience was expected to add an extra dimension to their teaching. The company expected to see the program expanded to a number of other Los Angeles firms in 1991-92.[73] Several large nondefense companies, including Polaroid, IBM, and Kodak, have also established teaching as a second career programs.

Although the Rockwell project was not designed for laid-off employees, similar programs in other areas have been expanded to include both retired and laid-off engineers and scientists.[74] Such programs may be a good alternative for older engineers who often have the toughest time finding new jobs; at the same time, school systems would have a new supply of badly needed math and science teachers. In many districts, salaries for public school teachers are so low that the choice is not feasible for midcareer engineers with large financial responsibilities, although it can be attractive for retirees who are able to collect both a pension and a teacher's salary. However, in some school districts, where respectable salary increases were adopted during the 1980s, secondary and middle school teaching has become a viable alternative for laid-off engineers, especially perhaps for younger engineers and scientists with employed spouses.

The National Executive Service Corps (NESC), a New York City-based nonprofit group that provides retired businesspeople as consultants to other nonprofit organizations, has used Carnegie Foundation aid to train retired engineers (and other holders of relevant degrees) as high school math and science teachers. NESC works with businesses to recruit retirees and with local colleges to establish alternative pathways to teaching credentials. NESC has found that many engineers and scientists had thought seriously of teaching while they were in college, but decided not to because of the low salaries; the higher salary levels in some districts have allowed them to reconsider.[75] The program established 12 demonstration projects in 10 States from 1987 to 1990.

The NESC program is too new to allow full evaluation of its results, but it has chalked up some successes. For example, in a NESC-sponsored program at Texas Christian University (TCU) in Fort Worth, TX, retired, laid-off, and other individuals with undergraduate math or science degrees can receive interim teaching credentials after completing two courses at TCU and full credentials after finishing two more courses and 1 year as a paid, full-time, intern teacher in the Fort Worth system. Nineteen of the 20 men and women who completed the TCU training in the first 2 years of the program were teaching in the Fort Worth schools as of January 1991, and another 15 were enrolled in the current course program. Both TCU and the school district subsidize the second career teachers with tuition rebates.

State government agencies play an important role in such projects because they establish the requirements for certification for the prospective teachers; the route to credentials varies considerably from State to State. The New Jersey Board of Education's Provisional Teacher Program, established in 1985, is among the oldest alternative credentials programs. Although it is not limited to developing math and

[73]Tim Violette, Manager, Human Resources Planning, Rockwell International, Corporate Office, El Segundo, CA, personal communication, Jan. 24, 1991.

[74]In 1988 OTA reported the existence of an estimated 26 such programs across the United States. U.S. Congress, Office of Technology Assessment, *Elementary and Secondary School Education for Science and Engineering—A Technical Memorandum*, OTA-TM-SET-41 (Washington, DC: U.S. Government Printing Office, December 1988), p. 61.

[75]Dorothy Windhorst, Vice-President for Mathematics and Science Education, National Executive Service Corps, personal communication, Apr. 19, 1991.

science teachers, it is answering some basic questions about the effectiveness of teaching as a second career for engineers and others. Candidates for the program must have a college degree in the field they are going to teach and a passing grade in that field on the National Teacher Examination. After 200 clock hours of training during a year of "provisional" teaching, the candidate goes rapidly from observation, to practice teaching, to periodically observed, but otherwise unsupervised, teaching. At the end of the year, the new teachers are eligible for the State's standard formal certification. While some school districts give the new teachers credit for previous work experience, others do not.

The New Jersey program has found that: 1) alternative credentials teachers of mathematics and sciences know their subject matter significantly better than traditional credentials teachers; 2) the attrition rate during the first year of teaching is much lower (5 percent in 1989-90) for alternative credentials teachers than for those with traditional credentials; 3) principals have been very satisfied with the performance of the "provisional teachers"—despite initial reluctance to accept them; and 4) minority participation is a side benefit of the program—23 percent of the teachers from the alternative credentials program are from ethnic/racial minority groups, versus 11 percent from traditional credentials programs.[76]

Entrepreneurial Assistance

Helping small businesses get started is a standard feature of economic development efforts by State and local government agencies; it is being widely employed in efforts to respond to defense spending cuts (see ch. 6). Several agencies providing help to displaced workers have made entrepreneurial assistance one of their approaches to finding new employment for laid-off workers, including engineers.

For example, the St. Louis (MO) County Economic Council is helping displaced McDonnell Douglas engineers and other employees start their own businesses. Typically, after a major blue- and white-collar layoff, 10 percent of the displaced employees will at least initially be interested in going into business for themselves. In the wake of the July 1990 McDonnell Douglas layoff, the County Economic Council obtained a $123,000 EDWAA grant to offer the laid-off workers short courses on starting small businesses. Some 500 people showed up at a 1-day entrepreneurial training seminar, and 275 of them, mostly engineers, signed up for a 10-session course. Participants got instruction in how to start and operate a small business and were required to prepare a business plan for their proposed enterprises. The council also helped the prospective entrepreneurs get startup loans from the Small Business Administration and from a special, low-interest State fund. McDonnell Douglas donated building space for an incubator for some of the new enterprises.

There is no accurate count yet of how many participants in the entrepreneurial training program started up businesses or what fields they entered, but at least a few firms based on engineering skills did result from the entrepreneurial training program. Six months afterward, the McDonnell Douglas incubator housed three firms operated by the company's former employees, and a fourth was expected; the three firms specialized in computer repair and service, software and personal computer system installation, and contract management. A meeting of alumni of the program disclosed that seven more new businesses had started up, in such areas as desktop publishing, church sound system installation, and video production. However, it appears that most of those who took part in the entrepreneurial training program after the McDonnell Douglas layoff went into a service or retail business based on a personal hobby, not on technologies related to their former jobs.[77]

The DOL is supporting business startups by dislocated workers (not necessarily from defense industries) with demonstration projects in Washington State and Massachusetts. Patterned on large programs in France and Great Britain, the U.S. projects provide financial assistance or income support during business startups. In Washington State, workers who decide to start their own businesses may be granted lump-sum payments equal to the total amounts remaining in their unemployment insurance (UI) accounts to help with

[76]Ellen Schechter, Director of Teacher Education, New Jersey State Department of Education, personal communication, May 22, 1991. See New Jersey State Department of Education of the Provisional Teacher Program: "A Profile of Applicants to New Jersey's Alternate Route to Certification"; "Second Year Report" (1986); "Third Year Report" (1987); and "Sixth Year Report" (1991).

[77]Gene Bosch, Director, St. Louis Technology Center, personal communication, June 1991.

startup expenses. In Massachusetts the prospective entrepreneurs are allowed to draw their regular UI benefits while devoting full time to starting their businesses; standard UI job-search requirements are waived. In both States the participants receive a wide range of business development services, e.g., seminars and counseling on planning, marketing, and management.

In Washington State, 451 of 754 dislocated workers who showed strong interest in starting their own businesses were selected for the demonstration project. A surprising 14 percent of the resulting new businesses were small-scale manufacturing. In Massachusetts, 62 of 105 workers were selected for the demonstration project, and of these 42 reportedly established businesses; 62 percent of the participants were from professional, managerial, and technical occupations.[78]

Small business support programs apparently do provide some job opportunities, but the smattering of evidence so far suggests that few of the engineers being laid off from defense jobs have started spinoff high technology companies. According to one St. Louis service provider, those who want to start a high technology firm do so on their own, irrespective of layoff announcements.[79] Of the 32 businesses in the St. Louis Technology Center, a thriving high-tech incubator, none was organized by laid-off McDonnell Douglas employees; only one laid-off employee had approached the director. However, most of the center's entrepreneurs had at one time been engineers or scientists for McDonnell Douglas, Monsanto Chemical, Emerson Electric, or similar companies.[80]

It is possible that not many defense engineers have the combination of technical and managerial skills and entrepreneurial drive needed to succeed in starting up a high technology business. The temperament to work successfully as a member of a large defense industry team may differ from that required to start a new small business. Those that do have the requisite interest and drive to start a business may simply leave on their own, without being laid off.

[78]Stephen A. Wandner and Jon C. Messenger, "The Self-Employment Experience in the United States: Demonstration Projects in Washington State and Massachusetts," paper submitted to the Organization for Economic Cooperation and Development, April 1991.

[79]Bosch, op. cit.

[80]Ibid. Catherine Renault, Director of the Entrepreneurship Center at George Mason University in suburban Washington, DC, says the same holds true for her high-tech incubator: only one or two people laid off from other jobs have become involved in the 60 companies that have developed in the incubator.

Chapter 5

Veterans' Adjustment

Contents

	Page
INTRODUCTION	129
THE MILITARY SERVICES: NUMBERS AND COMPOSITION	129
CHARACTERISTICS OF ENLISTED SERVICE MEN AND WOMEN	131
Education and Aptitude	131
Skills and Training	133
Employer Perceptions	133
THE NUMBERS AND COMPOSITION OF THE CUT	133
How the Forces Are Cut	134
Cuts in Each of the Services	136
Minorities	137
Other Differential Effects	139
VETERANS IN THE CIVILIAN ECONOMY	139
Skill Transfer	141
How Recent Veterans Are Faring	141
PROGRAMS TO AID ADJUSTMENT	142
Basic Separation Benefits	142
Transition Assistance	143
Educational Benefits: The Montgomery GI Bill	147
Soldiers as Teachers	149
IN CONCLUSION	149

Boxes

Box	*Page*
5-A. Replacing the Opportunity of Military Service: Is a Civilian Service the Solution?	140
5-B. Transition Assistance at Fort Dix, NY	146

Figures

Figure	*Page*
5-1. Distribution of AFQT Scores, 1989	132
5-2. Distribution of Military Occupations	132
5-3. Civilian Employers' Perceptions of Soldiers' Education Levels	133
5-4. Active Duty Military Personnel, 1974 to 1997	134
5-5. Reduction in End Strength and Involuntary Separations	135
5-6. Accessions, Separations and Changes in End Strength	136
5-7. Military Personnel Drawdown by Service	137

Tables

Table	*Page*
5-1. Geographical Distribution of Active Duty Personnel in the United States, 1989	131
5-2. Geographical Distribution of Recruits, 1989	131
5-3. Characteristics of Enlisted Troops by Service	138
5-4. Percentage of 1989 Accessions in Each Armed Forces Qualification Test Category by Race	139

Chapter 5
Veterans' Adjustment

INTRODUCTION

Active duty personnel unwillingly discharged from the military are a significant group of workers displaced in the post-Cold War defense spending cutbacks. There is a strong argument on equity grounds for helping ex-service men and women adjust to the civilian economy. Moreover, if there are serious difficulties in transition, the armed forces might find it hard to recruit young people of the caliber needed to maintain the smaller, more technology-intensive force of the future.

Many of the factors affecting the ability of civilian displaced workers to find new jobs also apply to veterans. This chapter focuses on the particular problems military separatees are likely to face and the programs available to help them adjust to their new circumstances. It also compares the situation of separatees in the early 1990s with that of veterans in previous build-downs.

For the most part, today's veterans are better prepared to face the civilian labor market than their Vietnam era counterparts were. The abilities and education levels of military enlistees are considerably higher in 1990 than they were in 1970.[1] Today's soldiers receive more training in skills with civilian applications and are more likely to have selected their own fields of specialization.[2] Although it is too soon to know for certain, opinion surveys indicate that the success of Operations Desert Shield and Desert Storm have changed for the better the way Americans look at their soldiers.[3] Lingering (if inaccurate) images of drug abuse and low levels of aptitude and education seem to have faded. This change in perception, as much as anything else, could ease the transition of military personnel into the civilian economy. Considering the caliber of people currently in the services, the relatively modest number of involuntary separations expected, and the decreasing number of young people entering the U.S. labor force, many of those let go by the armed forces over the next 5 years have a good chance of making a smooth transition to the civilian economy. Many will have a better chance if given effective assistance.

Nevertheless, involuntary separations of men and women from the armed services create some problems that private sector layoffs do not, and the impact of displacement of soldiers could be greater than the numbers suggest. Since the All Volunteer Force (AVF) was established, the services have pushed job security as a benefit; they imply that as a long as you do your job well you can stay on and move up. Layoffs will involve going back on this implicit promise. That is regrettable in itself; it could also hurt future recruitment and the morale of those who remain.

THE MILITARY SERVICES: NUMBERS AND COMPOSITION

Since 1973, the United States has relied solely on volunteers to fill the ranks of the armed forces. During those years, the size of the active duty military force has varied from a low of 2.032 million in 1979 to a peak of 2.224 million in 1987.[4] At the end of fiscal year 1990, the total number of active duty service members was 2,069,357.[5] The largest service is the Army with 732,403 members, followed by the Navy with 579,417, the Air Force with 535,233, and the Marines with 196,652.[6] The active

[1]Bruce Palmer, "A Careful Look at Defense Manpower," *Military Review*, vol. 56, September 1976; and Department of Defense, Office of the Assistant Secretary (Force Management and Personnel), *Population Representation in the Military Services: Fiscal Year 1989* (Washington: Department of Defense, 1990)

[2]The term soldier is used generically to mean soldier, sailor, airman or marine.

[3]In February of 1991, over 70 percent of respondents to a *New York Times/CBS News* poll felt that U.S. forces performed better in the Gulf War than they had expected. Over 90 percent of respondents to the same poll rated the performance of the Gulf War soldiers as "excellent" and over 70 percent reported having gained respect for U.S. armed forces.

[4]Active duty service members are the focus of this chapter because, unlike members of the reserves, they rely solely on the military for employment. While return of reservists called up for duty in the Persian Gulf War to their civilian careers is an important issue, it is not within the scope of this report. All calculations of reductions in end-strength exclude these reservists.

[5]This includes 25,652 reservists who had been called to active duty as part of Operation Desert Storm.

[6]Department of Defense, Office of the Assistant Secretary, Force Management and Personnel, spring 1991.

duty military comprised 1.7 percent of all employment in the United States in 1990; this compares with defense industry employment at 2.6 percent, and civilian Department of Defense (DoD) employment amounting to 0.9 percent.[7] Among certain subpopulations, dependence on the military for employment is considerably higher. The group most dependent on the active duty military for employment are young black males. Military service accounts for 10.6 percent of employment of black males between the ages of 18 and 29, compared to 5.4 percent for white males of the same age.

Employment in the armed services is spread throughout the United States and the world. In fiscal year 1990, 1.1 million (55 percent) of the 2.1 million service men and women on active duty were stationed at bases in the United States. The next largest group, 227,000 troops (11 percent), was in West Germany. Another 175,000 were listed as "afloat" (at sea). The remaining troops were distributed in other foreign lands, predominantly in Europe and Asia. Of the troops stationed in the United States, the Southeast has much more than its proportionate share and the Northeast and North Central regions much less (table 5-1).

New recruits are drawn more from the South and Mountain regions than elsewhere in the country, and less from the Northeast (table 5-2). The State with the highest level of accession (Montana) has twice the national average, while the one with lowest rate of accession (Massachusetts) has slightly less than half the national average.[8]

The military's two major categories are commissioned officers and enlisted personnel. By and large, enlisted personnel are recruited directly out of high school. Commissioned officers are brought in through the service academies, Officer Candidate Schools, and Reserve Officer Training Corps (ROTC). Almost all are college graduates.

The 296,589 commissioned officers on active duty at the end of fiscal year 1990 are about 14 percent of the total active duty force. Under current DoD projections, the total reduction in the officer ranks will be about 54,408 (17.7 percent) from 1990 to 1995.[9] Officers are far more likely than enlisted personnel to serve until they are eligible for retirement; roughly 40 percent of all officers retire from the military having served at least 20 years.[10] Because the officer ranks experience low rates of turnover, about half of the reductions in officer ranks will probably be carried out through involuntary separations, with the remainder occurring through reductions in new entrants, early retirement options, and normal attrition.[11] With their college educations, they should have wider opportunities and less difficulty adjusting to the civilian economy than the rank-and-file enlisted personnel.[12] For this reason, commissioned officers are not the principal focus in this chapter. However, transition programs that apply to enlisted personnel are also available to officers.

Most of the military is composed of enlisted personnel. Under current DoD projections, the total reduction in enlisted ranks from 1990 to 1995 will be 337,123 (20 percent).[13] Enlisted personnel are the foot soldiers, the support providers, and the technicians. Recruited fresh out of high school, they are younger than commissioned officers and tend to serve shorter periods of time. Their median age is 19.6 years at accession and 26.4 years overall, whereas officers have a median age of 25.4 years at accession and 33.4 years overall.[14] In fiscal year 1990, 49 percent of enlistees completing their first term of service (2 to 5 years) did not choose to

[7]The 1.7 percent figure includes military members not serving in the United States. These soldiers are not considered in the Census Bureaus tabulation of U.S. employment or labor force data. The estimate of employment in defense industry and data on DoD civilian employment are from the Department of Defense, Office of the Comptroller, *Budget Estimates for FY 1992* (Washington, DC: March 1991).

[8]Department of Defense, *Population Representation in the Military Services: Fiscal Year 1989*, op. cit., p. 38.

[9]DoD, Office of the Assistant Secretary, Force Management and Personnel, unpublished projections as of April 1991.

[10]Ibid.

[11]Data on involuntary separations from DoD, Office of the Assistant Secretary, Force Management and Personnel, projections as of May 1991. New provisions of the Defense Authorization Act of 1991 allow the services to offer cash incentives to some soldiers if they willingly separate. Thus the overall number of "involuntary" separations will probably be lower than those shown in the May 1991 projections.

[12]For displaced workers in general, those with higher levels of education fare better in getting replacement jobs than those with fewer years of schooling. Michael Pogursky and Paul Swaim, "Do More-Educated Workers Fare Better Following Job Displacement?" *Monthly Labor Review*, vol. 112, August 1989.

[13]DoD, Office of the Assistant Secretary, Force Management and Personnel, projections as of May 1991.

[14]Department of Defense, *Population Representation in the Military Services: Fiscal Year 1989*, op. cit.

Table 5-1—Geographical Distribution of Active Duty Personnel in the United States, 1989

Region	Active duty personnel (percent)	Employed persons (percent)
Northeast	6.1%	20.8%
North central	10.2	24.8
South atlantic	31.8	17.5
East south central	6.3	5.7
West south central	14.1	10.3
Mountain	8.3	5.2
Pacific	23.3	15.5
Total	100.0%	100.0%

SOURCES: Department of Defense, Directorate for Information, Operations and Reports, *Selected Manpower Statistics, FY 1989*, MO-1 (Washington, DC: 1990); and Bureau of Labor Statistics, *Employment and Earnings*, annual averages, 1990.

Table 5-2—Geographical Distribution of Recruits, 1989

Region	Recruits (percent)	Civilians 16 to 24 years' old (percent)
Northeast	14.2%	20.8%
North central	25.9	25.0
South atlantic	18.8	16.4
East south central	7.5	6.4
West south central	14.1	10.8
Mountain	6.5	5.1
Pacific	13.1	15.5
Total	100.0%	100.0%

SOURCE: Department of Defense, Office of the Assistant Secretary, Force Management and Personnel, *Population Representation in the Military Services: Fiscal Year 1989* (Washington, DC: 1990).

continue with another. Only about 12 percent of enlisted personnel leave the military having served the retirement minimum of 20 years.[15] Because of this higher rate of turnover, the services will not have to rely very heavily on involuntary separations to trim the enlisted ranks. Under recent plans, less than 15 percent of enlisted reductions will be from involuntary separations.[16] However, greater numbers of enlisted personnel will be most affected by the drawdown of forces, they may have fewer options in civilian life than college educated officers, and they are of most public concern in veterans' adjustment policies.

CHARACTERISTICS OF ENLISTED SERVICE MEN AND WOMEN

Today's volunteer force is no underclass army. While various measures of socioeconomic status are lower on average for military personnel than for the overall population, the differences are very small and are due largely to underrepresentation of the highest status levels in the military.[17] In a 1989 report, DoD concluded:

> The contention that the enlisted ranks are recruited from the lower socio-economic strata of society is not supported by the evidence. In the last half of fiscal year 1989, the period for which data are available, the great majority of the parents of recruits had a high school education or better, were married, and owned their own homes.[18]

Enlisted military personnel do not trail their civilian counterparts in educational attainment, aptitude, or training. The All Volunteer Force is not America's employer of last resort. Moreover, as discussed below, many of the skills and occupations prevalent in the military are transferable to the civilian economy.

Education and Aptitude

The military forces have a greater share of people with average to above average aptitude than American society as a whole. The Armed Forces Qualification Test (AFQT) is administered to every potential recruit. The scores are calculated on a percentile basis. Each service has its own minimum requirement for enlistment; in general the services admit people with lower AFQT scores if they have a high school diploma. Scores on the AFQT are often reported in five categories, with the middle category further split to separate those above and below the mean value, as follows: I (93 to 99 percentile), II (65 to 92 percentile), IIIA (50 to 64 percentile), IIIB (31 to 49 Percentile), IV (10 to 30 Percentile), and V (1 to 10 percentile). As figure 5-1 indicates, the

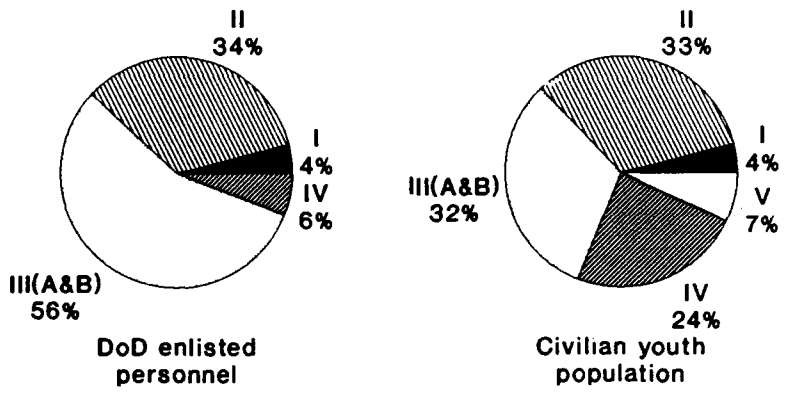
[15]Lt. Col. David Moore, Office of the Assistant Secretary of Defense, Force Management and Personnel, personal communication, Nov. 13, 1991.

[16]Data on involuntary separations from DoD, Office of the Assistant Secretary, Force Management and Personnel, projections as of May 1991. As noted, new provisions of the Defense Authorization Act of 1991 allow the services to offer cash incentives to some soldiers if they willingly separate. Thus the overall number of "involuntary" separations will probably be lower than those shown in the May 1991 projections.

[17]Robert Hale, Congressional Budget Office, testimony at hearings before the House Subcommittee on Education, Training, and Employment, Committee on Veterans' Affairs, Oct. 17, 1991, Congressional Budget Office.

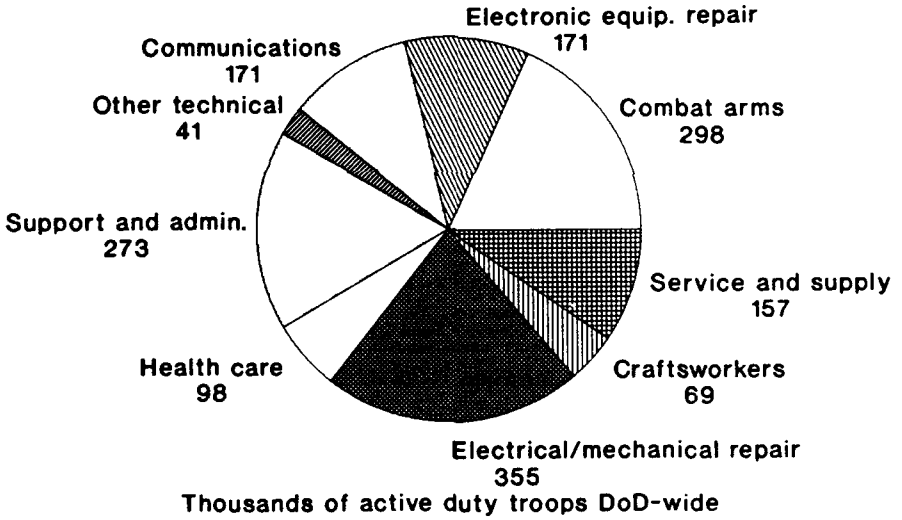
[18]Department of Defense, *Population Representation in the Military Services: Fiscal Year 1989*, op. cit., p. 55.

Figure 5-1—Distribution of AFQT Scores, 1989



SOURCE: Department of Defense, Office of the Assistant Secretary, Force Management and Personnel, *Population Representation in the Military Services, Fiscal Year 1989* (Washington, DC: July 1990), p. 27.

Figure 5-2—Distribution of Military Occupations



SOURCE: Janice Laurence, Human Resources Research Organization, "Crew Cuts: The Effects of Drawdown on Minorities," paper given at Department of Education, Office of Educational Research conference: Education's Role in the Restructuring of the Defense and Other Industries, May 16, 1991, p.17.

military has about the same representation in Categories I and II as the population at large, but has many fewer Category IVs and no Category Vs.[19]

Almost all enlisted personnel have a high school diploma; the percentage rose from around 65 percent in 1973 to over 90 percent in 1989.[20] Many older soldiers who did not have high school credentials when they entered the services have earned graduate equivalency degrees (GEDs) while on active duty (10,240 in fiscal year 1989).[21] DoD reports that its recruits read, on average, slightly above the 11th grade level, while the average reading level of the

[19]The military is prohibited from accessing any category Vs, and can only accept category IVs who are high school graduates. Because of misnorming of the AQFT test in the late 1970s, a number of category Vs were accidentally allowed to enlist. Fewer than 350 of these enlistees are still on active duty.

[20]Department of Defense, *Population Representation in the Military Services: Fiscal Year 1989*, op. cit.

[21]Clinton Lee Anderson, "Educational Resources Available for Transition of Servicemembers," presented at the Department of Education, Office of Educational Research and Improvement Conference, May 16, 1991, p. 18.

young adult population at large is just above the 9th grade level.[22]

Skills and Training

The armed forces are the single largest trainer in the United States.[23] Most military training is carried out in the first 12 to 18 months of service. After basic training, soldiers are assigned to a specialty training school, are then placed in the field, and continue to learn on the job. They may train further in the same specialty or in management to prepare for a more senior position.

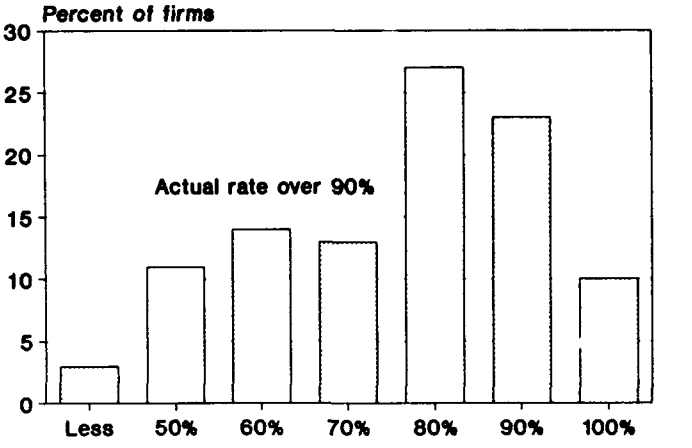
As figure 5-2 illustrates, relatively few military personnel—about 18 percent—are in combat positions. The largest skill/specialty category is electrical maintenance, a highly transferable skill.[24] Many transferable but lower skill jobs are found in the service and supply category, including food service workers, office and store managers, and truck drivers. Those in service and supply areas may not have the same earnings potential as those in technical areas but they should have good chance of finding employment in their fields of training. Even some combat occupations offer crosswalks to civilian occupations. For example, some combat engineers are hoist operators, survey technicians, or laborers; all these positions require skills that could translate into civilian jobs. Senior combat personnel who supervise repair of equipment in the field have skills that might be used in managing civilian mechanics and repairers.[25]

Employer Perceptions

Two months before the air war in the Persian Gulf began, the Army Research Institute released a report on the attitudes of employers toward recent veterans. The primary conclusion was the following:

> Results indicate that this lack of [employer] awareness may deter an employer from hiring a veteran because of inaccurate perceptions about the education level, the skills and abilities possessed by veterans, and in general, the experience, opportunities, and credentials of veterans.[26]

Figure 5-3—Civilian Employers' Perceptions of Soldiers' Education Levels



SOURCE: Schroyer, Hanson, Lerro, and Benedict, *Analysis of the ARI Survey of Employers* (Washington, DC: Army Research Institute, 1990).

While the study demonstrated that in general employers felt veterans possessed positive intangible characteristics, such as honesty and leadership (at least as much as nonveterans), they were misinformed about veterans' skills and education (figure 5-3).[27] Although it appears that Operations Desert Shield and Desert Storm have significantly altered these perceptions, misinformation about the caliber of people exiting the armed forces could still be something of a barrier to a smooth transition.

THE NUMBERS AND COMPOSITION OF THE CUT

Under current projections, a total of 390,726 active duty personnel, both enlisted and officers, would be cut from the armed forces from fiscal year 1990 to fiscal year 1995; that is 19 percent of the fiscal year 1990 force level. The largest reduction in

[22]Department of Defense, *Population Representation in the Military Services: Fiscal Year 1989*, op. cit., p. 28.

[23]For a full discussion of worker training in the United States, see U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy*, OTA-ITE-457 (Washington, DC: U.S. Government Printing Office, September 1990).

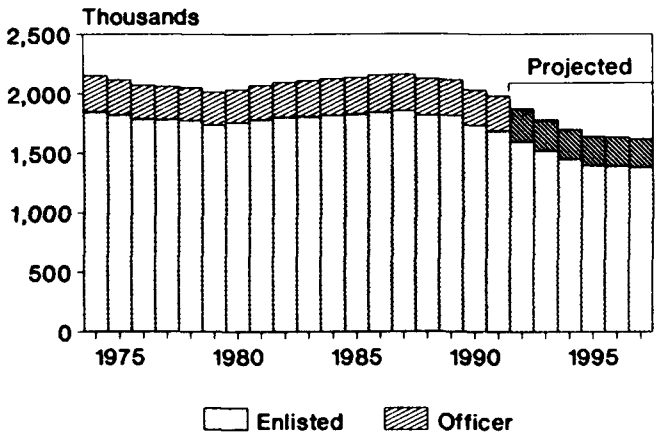
[24]Mangum and Ball report transfer rates for electrical maintenance at 53 percent as compared to 28 percent for combat arms. Stephen Mangum and David Ball, "Military Skill Training: Some Evidence of Transferability," *Armed Forces and Society*, vol. 13, No. 3, spring 1987, p. 428.

[25]*The Miltran Guide to Career Opportunities: Army Edition* (Wayne, PA: Miltran, Inc., March 1991). DoD is attempting to expand and refine a crosswalk pioneered by Miltran, a private firm that offers transition services to military personnel.

[26]Connie J. Schroyer, Linda A. Hansen, Pasquale A. Lerro, and Michael E. Benedict, *Analysis of the 1990 ARI Survey of Employers* (Washington, DC: Army Research Institute for the Behavioral and Social Sciences, 1990), p. 10.

[27]Ibid, pp. 11, 20.

Figure 5-4—Active Duty Military Personnel, 1974 to 1997



SOURCE: Department of Defense, Office of the Comptroller, *National Defense Budget Estimate for FY 1992* (Washington, DC: 1991) and projections from the Office of the Assistant Secretary of Defense, Force Management and Personnel, unpublished data, May 1991.

a single year, 106,000 troops, is currently planned to occur in fiscal year 1992 (figure 5-4). Originally, Congress required the Secretary of Defense to reduce active duty end strength (the number of active duty personnel at the end of the fiscal year) by at least 80,000 from 1990 to 1991. After Desert Storm, Congress removed the mandated reduction in 1991 military end strength.[28] The Secretary has stated, however, that forces will be reduced by 45,477 in 1991. Thus, while personnel cuts have been somewhat delayed, they will occur and they will be deep. Beyond 1995 the course is unclear. However, if present trends in security needs continue, deeper cuts in active duty forces may occur. Kauffman and Steinbruner suggest that an active duty force of 1.34 million is possible by 2001, given current trends.[29] Achieving an end strength this low would require continued reductions of about 50,000 per year after 1995.

While the overall reductions will be large, the proportion of involuntary separations will be relatively small, especially in the enlisted ranks. Even before Congress provided incentives to encourage more voluntary separations, involuntary separations were expected to amount to no more than about 20 percent of the overall reduction. In fact, fewer than 1,000 involuntary separations took place in fiscal year 1990, and fewer than 5,000 were anticipated for fiscal year 1991. The largest number of involuntary separations, roughly 27,000, was expected to take place in fiscal year 1995 and the total number over fiscal years 1990 to 1995 was to be almost 100,000 (see figure 5-5), comprising some 30,000 officers and 70,000 enlisted personnel.[30]

How the Forces Are Cut

Reductions in forces can be accomplished by two means—attrition and involuntary separation (layoff). Attrition is exceptionally effective as a means of downsizing in the armed forces (see figure 5-6). In an average recent year, roughly 290,000 members left the ranks of the armed forces (a turnover rate of about 15 percent).[31] Most of those voluntarily leaving are young enlisted personnel who did not plan a career in the military. With this rate of attrition, it might seem that the reduction of forces could be accomplished simply by massively curtailing accessions (new entrants). While this approach might avoid displacement, it is not a viable option from the perspective of force structure management or long-term security.

The military services hire only entry-level employees; advancement through the ranks is closely related to tenure. If recruitment of new soldiers were radically curtailed, there would be too many senior personnel for the number of lower level enlistees in the short run and, in the long run, there would be too few senior personnel. The military services need to maintain a balance between the number of senior and junior personnel, which can only be done by thinning the ranks evenly and continuing to recruit new entrants.[32] The lowest ranks will be reduced through normal attrition and increases in the standards for reenlistment, while the highest ranks will be thinned through early retirement.

The vesting of retirement benefits complicates military force reductions. Currently, full vesting takes place at 20 years; no benefit is paid to soldiers

[28]Persian Gulf Conflict Supplemental Authorization and Personnel Benefits Act of 1991, Public Law 102-25, Sec. 201.

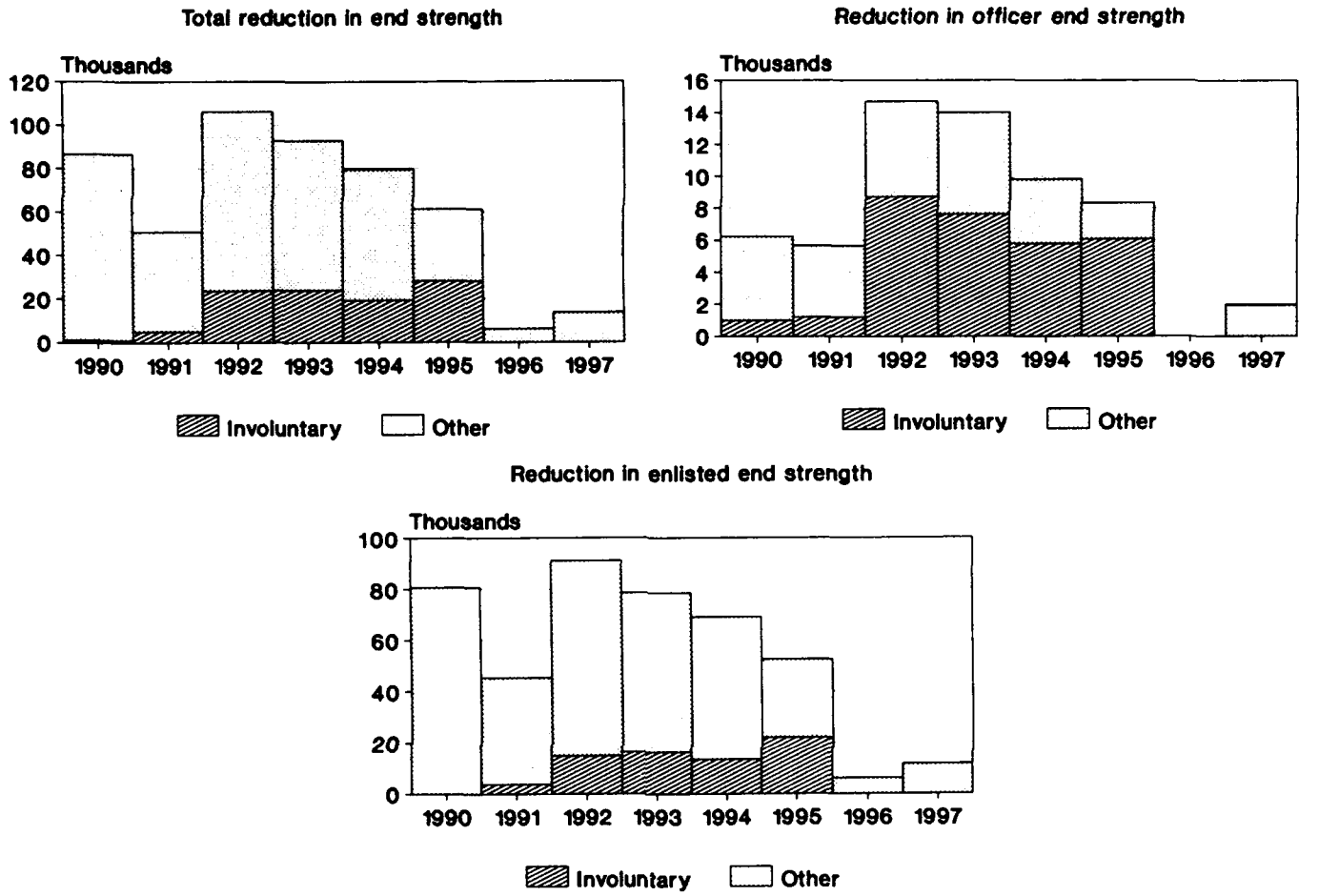
[29]William Kauffman and John Steinbruner, *Decisions for Defense: Prospects for a New World Order* (Washington, DC: The Brookings Institution, 1991).

[30]Data on involuntary separations from the DoD, Office of the Assistant Secretary, Force Management and Personnel. Estimates as of May 1991.

[31]The average for the years 1980 to 1990.

[32]U.S. Congress, Congressional Budget Office (CBO), *Managing the Reduction in Military Personnel*, CBO Paper (Washington, DC: July 1990).

Figure 5-5—Reduction in End Strength and Involuntary Separations



NOTE: Projections of involuntary separations were made before the new voluntary separation incentive was enacted; This number may overstate the actual number of involuntary separations that will take place.

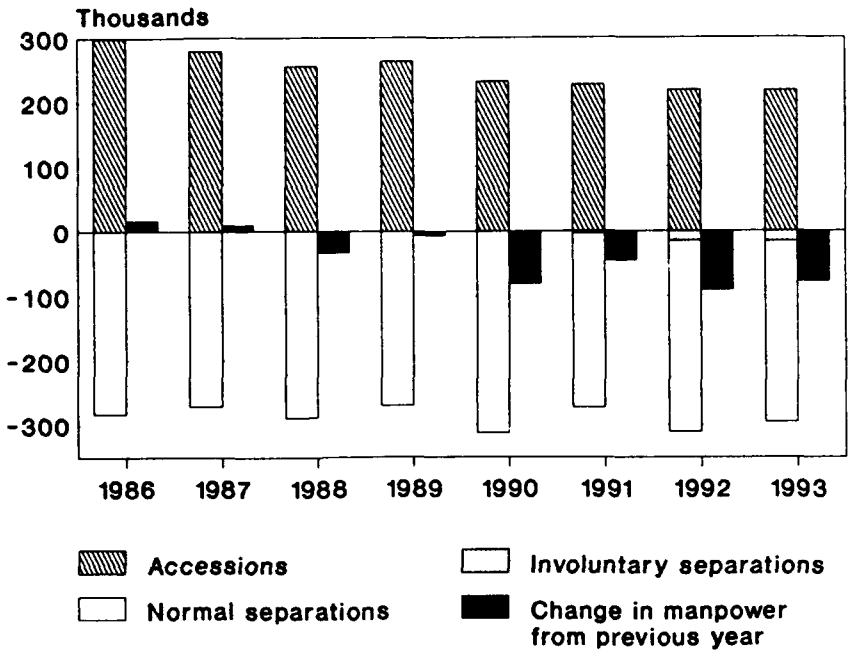
SOURCE: Office of the Assistant Secretary of Defense, Force Management and Personnel, unpublished data, May 1991.

leaving active duty with fewer than 20 years of service. This all-or-nothing system creates an incentive for midlevel soldiers to continue their careers. When the size of the armed forces remains stable over a number of years, maintaining the balance between tenure groups is not a problem. However, during downsizing, those with 10 to 15 years' experience present a dilemma for military planners. These soldiers are unlikely to leave the military voluntarily when they are so close to retirement, yet forcing them out could lessen the attractiveness of a military career. Young people might decide it is not worth taking the risk of serving 15 years only to be separated and receive no pension. Nevertheless, to allocate military personnel efficiently, the number of soldiers in the 10- to 15-years of service category must be reduced.

Recognizing the vulnerable position of midlevel career service people, Congress has granted those with more than 10 years but less than 20 years of service some protection from involuntary separation. Under the Defense Authorization Act of 1990, all other tenure groups (first-term reenlistments, accessions, and forced early retirements) must be tapped to meet the required reductions in manpower levels before any of those in the 10- to 19-year groups can be involuntarily separated. Moreover, under the 1991 Defense Authorization, the Defense Secretary is permitted to increase end strength by as much as 2 percent to avoid involuntarily separating soldiers in the 6- to 20-year category.

To further avoid large-scale involuntary separations and minimize RIFs (reductions in force, i.e. involuntary separations based solely on meeting end strength without regard to job performance), Congress recently authorized DoD midcareer soldiers to offer monetary incentives to leave the military

Figure 5-6—Accessions, Separations and Changes in End Strength



NOTE: Projections of involuntary separations were made before the new voluntary separation incentive was enacted, thus number may over state the actual number of involuntary separations which will take place.

SOURCE: Office of the Assistant Secretary of Defense, Force Management and Personnel, unpublished data, May 1991.

before retirement.[33] These payments have the potential to greatly reduce the number of required layoffs. The estimates of involuntary separations in this chapter do not reflect this early-out option and may well overstate the number of involuntary separations that will be required in the coming years.

One of the first options the services have examined in reducing force levels is stricter enforcement of existing regulations. Personnel who commit disciplinary offenses that in the past would have led to rehabilitation may now be discharged. Other longstanding but loosely enforced policies are now being more strictly enforced. For example, Army personnel, under newly developed regulations, will be discharged if they are overweight and fail to slim down after a 6-month fitness program.[34] People in this category will receive a reduced package of the special benefits available to involuntary separatees.

Cuts in Each of the Services

The Army, and to a lesser the extent the Air Force, will bear the brunt of the reductions in military forces. The Army and the Air Force shouldered the burden of the European defense, and with the Soviet threat disappearing, their missions are radically reduced. The historical missions of the Marine Corps and the Navy are thought to be a better match for the kinds of regional conflict that the United States may encounter in the future. Assuming a DoD-wide cut of 19 percent of FY 1990 end strength, the Army would lose 26.9 percent of its troops, the Air Force 18.3 percent, the Marine Corp 13.2 percent, and the Navy 12 percent (figure 5-7).[35] Involuntary separations will vary by service, with the Army and Air Force planning to use them more heavily than the Marine Corps, and the Navy planning none at the enlisted level (figure 5-7).[36]

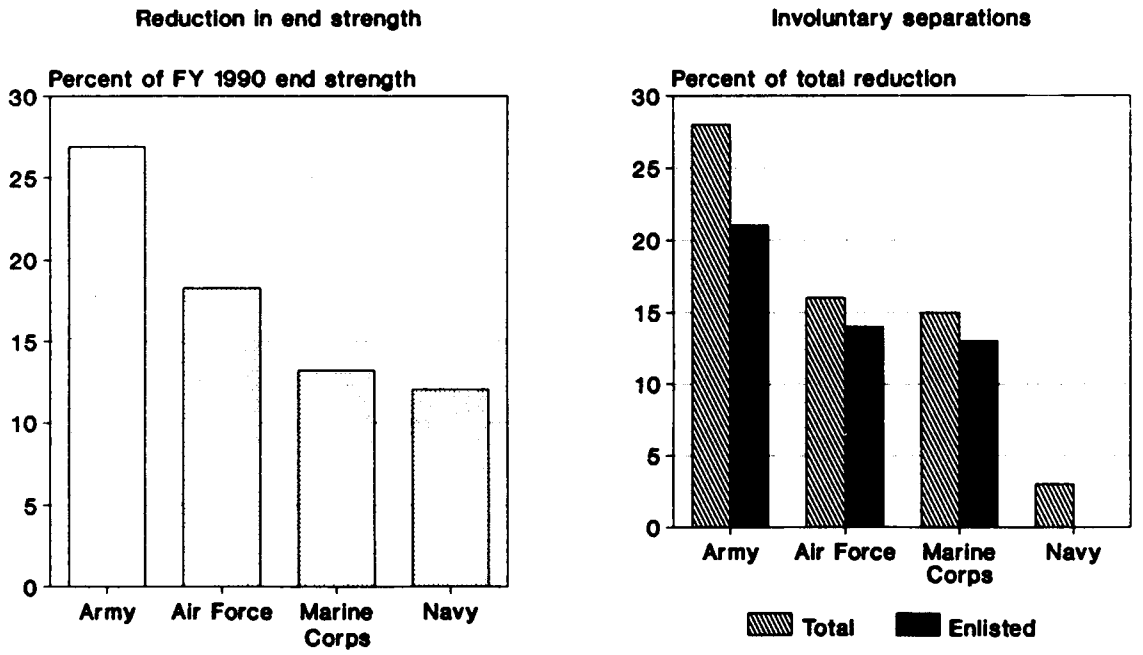
[33]Under the Defense Authorization Act of 1991.

[34]Brent Mitchell,'It's Shape Up or Ship Out in Army Now," *Washington Post*, June 18, 1991, p. A19.

[35]DoD, Office of the Assistant Secretary, Force Management and Personnel.

[36]Ibid.

Figure 5-7—Military Personnel Drawdown by Service



NOTE: Projections of involuntary separations were made before the new voluntary separation incentive was enacted; This number may overstate the actual number of involuntary separations that will take place.

SOURCE: Office of the Assistant Secretary of Defense, Force Management and Personnel, unpublished data, May 1991.

Army reductions will account for one-half of all armed services cuts. Of the estimated 100,000 DoD-wide all-services involuntary separations, from fiscal years 1990 through 1995, two-thirds will come from the Army.[37] Because the Army is the service with the smallest percentage of skilled jobs, the lowest levels of aptitude, and the highest concentration of minorities, the transition problems faced by its separatees may be somewhat greater than is implied by the aggregate levels of skills, aptitude, and minority participation in all the services (table 5-3). The Army has a larger share of combat and service and supply positions than either the Air Force or the Navy. Skills in combat occupations are generally the least transferable, and service and supply jobs tend to be rather low-skilled.

Minorities

Because minorities are overrepresented in the military as a whole and the Army in particular, they stand to be disproportionately affected by the downsizing of the military. Also, African Americans in the military have relatively lower AFQT (table 5-4) and overall ASVAB (Armed Services Vocational Aptitude Battery) test scores. To the extent that test scores predict inservice performance, and to the extent that inservice performance is the basis for deciding which soldiers shall be involuntarily separated, minority service members could be disproportionately affected. African Americans currently represent 23 percent of all members of the armed forces and 31 percent of Army personnel, but they could account for a larger percentage of those denied reenlistment.[38] However, the new system of incentives for voluntary separation may limit this effect if white soldiers, perceiving more favorable civilian job opportunities, disproportionately opt to accept the incentive.

More broadly, diminished access to military careers represents a significant loss of economic opportunity for black men. The military's reputation as the most "color-blind" large employer in the United States is well-founded. Integrated in 1948, the military currently has a higher proportion of

[37]Ibid.

[38]Janice Laurence, Human Resources Research Organization, "Crew Cuts: Effects of Defense Drawdowns on Minorities," paper presented at Department of Education, Office of Educational Research and Improvement Conference, May 16, 1991, p. 22.

Table 5-3—Characteristics of Enlisted Troops by Service

Service	Percent black	Percent high school graduate	Percent accessions category I and II minus percent category IV	Percent occupations combat or service and supply[a]
Army	31.9%	98.4%	29%	36.0%
Navy	17.4	94.3	24	14.1
Air Force	17.6	99.3	53	15.9
Marine Corps	20.7	99.9	37	38.2
Total	23.0%	97.6%	32%	25.7%

[a]Combat and Service and Supply occupations are Military Occupational Specialty codes 0 and 8.
SOURCE: Data from Department of Defense, Office of the Assistant Secretary, Force Management and Personnel, *Population Representations, FY 1989* (Washington, DC: 1990).

minorities in management positions than any other large U.S. organization.[39] Altogether, the military is a very important employer of African Americans. Of all African Americans between the ages of 18 and 29, 4.1 percent are serving in the military, compared to 2.4 percent of whites. Of all jobs held by African Americans aged 18 to 29, 7.1 percent are in the military, compared to 2.4 percent of whites. Among black men aged 18 to 29, 7.2 percent are serving in the military, accounting for 10.6 percent of the total employment of that group (table 5-4). The figures are still more striking if only those African Americans who qualify for military service are considered. In 1980, it was estimated that only 43 percent of young black men would qualify for the military as compared to 85 percent of whites.[40] New evidence suggests that, if anything the percentage has decreased since 1981,[41] but using the estimate of 43 percent, about one-quarter of the qualified employed black male population between the ages of 18 and 29 is serving in the military.

The drawdown could have a significant adverse effect on the employment prospects of African Americans. If the overall level of accession decreases 20 percent and the proportion of African Americans in accessions declines by about 20 percent,[42] the number of African Americans serving in the military could fall from the current level of about 410,000 to 260,000—36 percent in the long run. Moreover, without the benefit of military training or experience, many young black men will find it harder to get a civilian job. Although accurately measuring the value of military training and experience is difficult, many studies indicate greater increases in post-service civilian job status for black veterans that are greater than those found for white veterans.[43]

Some areas of the country will be disproportionately affected by reductions in the military forces, and minorities tend to be concentrated in those areas. The South, which has a high rate of minority enlistment and relatively low average AFQT scores, will probably be most affected.[44]

Although limiting access of African Americans to the services could be economically damaging, many black community leaders believe that too much of the burden of national defense has been placed on the shoulders of African Americans. In this respect, a more racially representative military force might be desirable. On the other hand, the sequence of fighting a war with a disproportionately black force and then disproportionately separating African Americans after the war might seem callous or unjust. Secretary Richard Cheney has testified that attempts will be made to limit disproportionate cuts of minority service men and women, but exactly how that pledge might be carried out remains to be seen. Army officials have stated that minority composi-

[39]Charles Moskos, "How Do They Do It," *The New Republic*, vol. 205, No. 6, Aug. 5, 1991, p. 20.

[40]Mark J. Eitelberg, Department of Defense, Office of the Assistant Secretary, Force Management and Personnel, *Manpower for Military Occupations* (Washington, DC: 1990), pp. 169-172.

[41]Janice Laurence, Human Resources Research Organization, personal communication, October 1991.

[42]Derived from David Boesel, Department of Education, "The Newly Unqualified," paper presented at Department of Education, Office of Education Research Conference, Education Role in the Restructuring of the Defense and Other Industries, May 16, 1989.

[43]For example, see Dennis De Tray, "Veteran Status as a Screening Device," *The American Economic Review*, March 1982, pp. 139-140.

[44]DoD, *Population Representation in the Military, FY 1989*, op. cit.

Table 5-4—Percentage of 1989 Accessions in Each Armed Forces Qualification Test (AFQT) Category by Race

AFQT category	White	Black	Other
I	5	1	2
II	41	16	25
IIIA	27	25	26
IIIB	23	46	37
IV	4	14	10
V	—	—	—
Total	100	100	100

SOURCE: Data from Department of Defense, Office of the Assistant Secretary, Force Management and Personnel, *Population Representations, FY 1989* (Washington, DC: 1990), p. 29.

tion will not be a factor in reducing forces.[45] Box 5-A discusses another option that some have proposed for enlarging opportunities for noncollege-bound youth—a civilian service.

Other Differential Effects

Women involuntarily separated from the military will be relatively few, and those few probably will not face particular difficulty in transition. Women compose 11 percent of the active duty force. In the civilian youth population, women do not have significantly higher or lower AFQT scores than men. Within the military, however, women score higher on the AFQT than men. Because they are currently not allowed to fill combat positions, women in the services are more heavily concentrated in service, administrative, and health care positions. These may not necessarily be high skill jobs but should be reasonably transferable to the civilian economy.

Finally, it seems unlikely that any particular kind of military job will be singled out for elimination. It is difficult to cut disproportionately any particular types of activities in the highly structured military; all are related in more or less fixed ratios. A certain number of combat troops requires a certain number of supply and support troops. Each fighter plane requires a pilot and a given number of technicians. The military may try to get by with fewer support personnel for each combat or technical soldier, but in the main military jobs seem likely to be cut in proportion to the overall reduction.

VETERANS IN THE CIVILIAN ECONOMY

Reports on veterans' civilian labor market experiences have focused on the degree to which military service affects civilian earnings. Many analyses of World War II veterans showed that they earned considerably more than non-veterans, even when factoring in demographic characteristics; however, some recent studies of veterans of that era refute these findings. Studies of Korea and Vietnam veterans showed either no difference or lower earnings for veterans. Considering that those wartime forces tended to have shorter terms of training and service than peacetime forces and were composed more of draftees rather than of volunteers, the relevance of the earlier studies to current conditions may be limited.

Few studies of the outcome of the All Volunteer Force (AVF) veteran transition have been undertaken. One study, which showed no benefit from military service, is not very relevant because it was based on veterans who had been recruited into the military when their AFQT scores were inflated through miscalculation.[46] The conclusion of that report was not that military training has no civilian reward but rather that the lot of people with low aptitude is not improved through military service. The experience of the service men and women facing layoff in the near future should be different. The few studies that used a more representative sample of AVF service men and women found positive earnings differentials for veterans.[47]

Several factors may account for earnings differences—positive and negative—between veterans and nonveterans.[48] Factors leading to higher earnings include: occupational training provided by military service; education assistance; greater mo-

[45]Grant Willis, "Some Fear Drawdown, Opportunity Won't Mix," *Army Times*, July 8, 1991, p. 6.

[46]Janice Laurence, Peter Ramsberger, and Monica Gribben, *Effects of Military Experience on the Post-Service Lives of Low-Aptitude Recruits: Project 100,000 and ASVAB Misnorming* (Washington, DC: Human Resources Research Organization, 1989).

[47]For examples, see Stephen Mangum and David Ball, "The Transferability of Military-Provided Occupational Training in the Post-Draft Era," *Industrial and Labor Relations Review*, vol. 42, No. 2, January 1989; Joshua Angrist, Harvard University, "The Effects of Veterans' Benefits on Veterans' Education and Earnings," paper presented at Department of Education, Office of Educational Research and Improvement Conference, May 16, 1991.

[48]David B. Kassing, "Military Experience as a Determinant of Veterans' Earnings," in *Studies Prepared for the President's Commission on an All-Volunteer Force*, vol. 2, part 3, No. 8, 1970.

Box 5-A—Replacing the Opportunity of Military Service: Is a Civilian Service the Solution?

Besides displacing some current members of the armed forces, the military drawdown will also deny the economic opportunity provided by military service and training to some 290,000 people from 1990 to 1995. Roughly 120,000 (41 percent) of those will probably be African Americans.[1] David Boesel calls the young people who would have been eligible to serve under current enlistment standards but who will be denied enlistment under higher standards the "Newly Unqualified." Because they are at the low end of the military's current aptitude distribution, they are not very likely to be college-bound and their nonmilitary job and training options are relatively few.[2]

One way to restore lost economic opportunity to these young people might be a national civilian service, offering post-service education or training benefits as well as on-the-job training to participants in return for work on projects of national interest. Among recent proposals to create a National Service Corps, Sen. Sam Nunn's in the 101st Congress gained considerable attention.[3] It sought to phase out many federally funded educational loan and grant programs, and replace them with a national service education benefit. Debate on the proposal emphasized promoting community service work by tying national service to education benefits. The goal of providing an alternative to military service for non-college bound young people got less attention. A problem in relation to this goal is that if good educational benefits are offered to national service members, and especially if other government educational programs are cut back, better educated applicants could crowd out the newly unqualified. Unless national service were made universal, middle class college-bound youth could fill most of the available spots.

The pilot National and Community Service Act that eventually became law,[4] sponsored by Sen. Edward Kennedy, contained many of the basic elements found in Sen. Nunn's bill, but it did not phase out other educational benefits. The act created two programs for 16- to 24-year-old high school graduates, the American Conservation Corps and the Human Services Corps. The conservation corps will carry out projects to improve Federal lands (reforestation, wildlife habitat maintenance, road, trail and bridge maintenance, etc.). The Human Services Corps will provide otherwise unavailable social services in fields such as health care and education. All of these positions will have a training element imparting skills that can be transferred to jobs in the private sector. Participants will receive a subsistence stipend while in the service and afterward will receive a lump sum benefit applicable to education costs or first home purchase.

A drawback to programs of this sort as a substitute for military service is that they lack the tradition of respect and prestige that comes with a military career. Most public service programs lack this special cachet for non-college-bound youth. For example, joining the Peace Corps or VISTA is socially acceptable for children of privilege, but the rate of enrollment in the Peace Corps for minorities and people of lower economic status indicates that it does not have the same appeal in those communities. To win respect, participation in any national service program must be seen as important to society. If it looks like "make work," national service will not attract the newly unqualified, nor is it likely to help them find post-service employment. It may be hard to create a program with significant social worth that is not in a field already occupied (even if inadequately) by another government program or the private sector. The emergence of environmental goals as almost universally acceptable may offer the best opportunity for national service work. Cleaning, protecting, or improving the environment is a new priority, and is not seen as adequately handled by existing programs.

Even if a national civilian service were able to attract many of the newly unqualified to participate, there is no guarantee that it would offer as much or as good post-service employment as the military. If national service is administered at the State or local level, as the National Community and Service Act will be, it probably will not provide the same increase in post-service geographic mobility provided by military service. The propensity of veterans to move away from their home towns is a key factor in the increased earnings experienced by minority veterans over comparable non-veterans.

Thus, while a system of civilian national service may be desirable, it probably would not adequately replace military service for the newly unqualified.

---

[1]Estimates derived from David Boesel, "Cutting Recruits: A Profile of the Newly Unqualified," presented at Department of Education, Office of Educational Research and Improvement Conference: Education's Role in the Restructuring of Defense and other Industries, May 16, 1991 and personal communication, November 1991. The basic assumption is that 100,000 of the positions lost in the military will occur through involuntary separation; the rest, roughly 290,000, must occur by reducing accessions (i.e., not replacing positions lost by normal attrition). The projection that 41 percent of this group will be African American is based directly on Boesel's work.

[2]Ibid.

[3]101st Congress, Senate Bill 3.

[4]P.L. 101-610.

bility (especially for minority veterans); a credentials effect; and preference in government hiring. The negative factors include the limited transferability of military training and loss of labor force experience and educational attainment compared with those who did not take time out to serve in the military.[49]

Some of the factors listed here, such as educational assistance and preferential hiring, reflect public policies to smooth the transition. Some of the negative factors, such as lost years of civilian work experience, are only temporary, and become less significant with each year of civilian work. The results of these studies tend to vary depending on how long the veteran cohort surveyed has been in the civilian workplace.

Skill Transfer

Skill transfer is both a strong positive factor in postservice adjustment and a good predictor of postservice earnings.[50] Skill transfer, moreover, benefits society as well as the individual veteran. The exodus of skilled people from the services into the civilian economy could prove to be a genuine "peace dividend" at a time when skilled young workers are in short supply.

The question is, what proportion of veterans are able to transfer their skills to the civilian workplace? Various studies offer estimates ranging from 33 to 50 percent.[51] All of the evidence indicates that skill transfer rates are higher for AVF veterans than for earlier era veterans.[52] One explanation for this is that in the AVF, a soldier's field of training is much more likely to be in his or her field of interest and therefore is more likely to be pursued after military service. Also, earlier wartime veterans were more likely to have served in nontransferable combat roles.

It is probably too optimistic to assume that as many as one-half of military separatees will be able to find civilian jobs in the fields for which the military trained them. Since a disproportionate number of separatees will come from the Army, with its lower rate of transferable skills, the rate of transfer will probably be lower than one-half. Many separated personnel could benefit from retraining or further education. However, for the majority, full-time education may not be feasible because of the need to earn a living.

How Recent Veterans Are Faring

OTA interviews with providers of transition and employment assistance to veterans indicate that employment prospects depend largely on tenure, skills, and region. While opinions of the overall value of military training and experience varied, most agreed that the group facing the greatest difficulty are young enlisted separatees—especially those having served in posts such as the infantry. These veterans find they have few skills they can list on a civilian resume. What the military has mainly taught them are attributes such as discipline and leadership, not job skills.[53] To find meaningful jobs, veterans in this category must sell employers on the idea that they are trainable and hard workers. Many local service providers said they were successful in getting veterans into apprenticeship programs, training provided by the EDWAA (Economic Dislocation and Worker Adjustment Assistance program) or on-the-job training. Overall, however, these young, less-skilled separatees seem not to fare very well. Informal tracking of separatees from Fort Dix, NJ, reveals that while most have found employment, their jobs are at low wages and provide little job satisfaction. OTA's interviews took place during the 1990-91 recession; job opportunities for these veterans may improve with economic revival.

Middle-range soldiers, those with 5 to 12 years service (especially officers), are in a relatively good position to make a transition to the civilian labor market. These are the people in whom private industry is showing the greatest interest.[54] The most senior ranks may have a harder time. Generally, more senior people go through longer job searches,

[49]Ibid.

[50]Richard V.L. Cooper, *Military Retirees' Post-Service Earnings and Employment* (Santa Monica, CA: Rand Corp., 1981). In this study, veterans able to transfer their military skills to the civilian economy are earning over $2,000 per year more than veterans who could not.

[51]Mangum and Ball, op. cit., attribute the difference to methodology. In their study, Magnum and Ball estimate the rate of transfer for veterans of the all volunteer force at 47.1 percent.

[52]Ibid.

[53]This point was raised by Charles Adimaro, Director of Army Continuing Education, Fort Dix (NJ), personal correspondence, November 1991.

[54]Janet Novak, "Back to Civvy Street," *Forbes*, vol. 147, No. 8, Apr. 15, 1991, pp. 130-131; and Lt. Gen. Edgar Chevarrie (USAF ret.), Chairman of Miltran Inc., personal communication, June 5, 1991.

though they may in the end find satisfactory jobs. An oft-used rule of thumb is one additional month of search for each additional $10,000-per-year in salary. Many senior people may not be able to enter civilian employment at the level they would like; they may have to take lesser paying, lower responsibility jobs than they had in the military.[55]

Regional differences are also apparent. In areas where the economy was relatively strong in 1991, such as northern California, providers of transition assistance are more positive about employment prospects than those in areas hit harder by the recession, such as Louisiana or New Jersey.

PROGRAMS TO AID ADJUSTMENT

Adjustment from military to civilian life is more than a change of job; it is a change in lifestyle. For this reason, programs to aid the transition of military personnel deal with issues that are not considered in most industry transition programs. For some time the military has made spiritual, family, and continuing-education counseling available to separatees. Only recently have the services begun to provide the sort of labor market assistance that many private industry employers offer their laid-off employees. Such programs were just beginning to be fully implemented by the end of 1991. Though it is too early to evaluate the quality of these programs, some preliminary observations are in order.

Basic Separation Benefits

Basic separation benefits fall into two categories: those available to all veterans when they leave the services, and those specific to soldiers involuntarily separated due to downsizing. The general benefits include unemployment compensation, preferential treatment in government hiring, eligibility for certain government-sponsored work and training programs, home mortgage guarantees, and treatment in Veterans Administration health care facilities for health problems resulting from military service. The programs for which only involuntary separatees are eligible include: separation pay, transitional health care benefits, and access to military commissaries and exchanges after separation.

Unemployment insurance (UI) is available to all separating nonretiring personnel. Military UI (dubbed UCX) is somewhat different from private sector UI in that veterans can receive the benefit regardless of whether they were involuntarily separated or chose to leave. Like private industry UI, UCX is administered through State Employment Services. UCX is available for 13 weeks anywhere in the country after a 2-week wait. It pays an average of $170 per week (compared with an average of $148 per week in private industry UI).[56] Proposals have been made in Congress to make UCX commensurate with civilian sector UI for members who are separated involuntarily (i.e., 26 weeks of benefit after a 1-week wait).

Many existing benefits for involuntarily separated members have been enhanced and expanded for an era of downsizing. Separation pay is now available to active duty enlisted personnel and officers with at least 6 years of service who are not eligible for retirement pay. After extensive delay, the services finally agreed on rules to implement the new law on separation pay. The payment is calculated as 10 percent of final base salary multiplied by the number of years of service. The maximum payout under this formula is $86,936 for officers and $53,402 for enlisted personnel.[57] On average, members separated in their third term of service will receive a separation benefit that is more than their yearly base salary.

Because almost all involuntary separations will involve either higher performance standards or application of existing but unenforced rules, the services have struggled to develop eligibility rules for transition benefits. For example, a soldier who is court-martialed and subsequently discharged is, in a sense, involuntarily separated but clearly should not be eligible for transition benefits. Eligibility for those discharged because of more rigorous enforcement of rules on physical fitness and sexual orientation is less clearcut. The solution developed for these gray area cases is to give separatees one-half of the full benefit. Full benefits will be paid to those separated under tighter standards of performance, such as maximum time in grade.

[55]Lt. Gen. Edgar Chavarrie (USAF ret.), Chairman of Miltran Inc., personal communication, June 5, 1991.

[56]Department of Commerce, *Survey of Current Business* (Washington, DC: October 1991), p. S-13.

[57]Jim Tice, "Service Sets Separation Pay Rules," *The Army Times*, Aug. 5, 1991, p. 3.

Separation pay is in part compensation to service members for the loss of retirement benefits they would have received had they been able to serve 20 years. Generous severance pay is one benefit that most private sector employees, especially blue-collar workers, do not have. Severance pay, combined with UCX, may allow veterans to participate in longer term training than is usually feasible for private sector displaced workers.

Under the Defense Authorization Act of 1990, DoD is providing transitional health care to involuntary separatees and their dependents. The insurance provides coverage of 60 days for service persons with less than 6 years' service, and 120 days for those with more than 6 years' service. Veterans can purchase an additional term at the group rate for up to 1 year from time of separation. The policy excludes most preexisting conditions at the time of separation, although conditions resulting from military service are covered by health care system of the Department of Veterans Affairs. While DoD found a private insurer to provide the extended health care benefit in fiscal year 1991, the insurer does not plan to continue the contract and it is unclear how the health insurance will be provided in fiscal year 1992.[58] DoD may be forced to provide the service through the already strapped Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) program.

Loss of access to subsidized food and consumer goods through the commissary and exchange is one obvious cost of separation from the military. In the past the armed forces did not allow separatees continued use of the commissary and exchange, but the new law allows involuntarily separated veterans to remain eligible for 2 years. For a nominal rent, they may also stay in government housing up to 90 days after separation at the discretion of the base commander.[59] Relocation to place of choice will be paid for those involuntarily separated with more than 8 years' service. For those with less than 8 years' service, relocation compensation is limited to the place of enlistment or home-of-record.

Transition Assistance

DoD-Wide Programs

Early notice will be a major benefit to separating military personnel. All involuntarily separating service members will know the exact date of their separation at least 90 days before it occurs. Advance notice to workers laid off from private industry is highly variable, but usually briefer. The WARN (Worker Adjustment and Retraining Notification) law requires 60 days' notice of large layoffs, but there are many exceptions and loopholes in the law (see ch. 3). Most military personnel have never held a full-time job in the private sector and probably need more help with job search than laid-off industry workers, so 90 days' notice is especially helpful.

Because military transition is different from private sector transition, the Armed Services have set up their own programs, separate from the EDWAA program available to all displaced workers. For example, these programs will provide more information about non-local labor markets than EDWAA usually provides, since the majority of service members will move away from area where they are stationed.

DoD and the individual uniform military services have developed their own programs in conjunction with the Department of Labor (DOL) and the Department of Veterans Affairs (DVA). The main provider of basic job search skills training for military personnel is the Transition Assistance Program (TAP) run by DOL and available to all the military services. TAP is a 3-day seminar on job search skills, offered up to 180 days before separation and providing information on labor markets, job search skills, and career opportunities. The seminars are conducted on base by local State Employment Services (ES) personnel, usually local veterans employment representatives (LVERS) or disabled veterans outreach program (DVOP) staffers. Often DoD civilian personnel supplement these ES efforts; recently private contractors have also been called on. In fiscal year 1991, 169 ES personnel and 74 DoD civilians completed the TAP trainer's course. DoD and DOL have been slowly expanding the program, first targeting States whose ES offices have substantial resources and interest. By August 1991, DOL

[58]U.S. Congress, *Conference Report on the Defense Authorization Act for Fiscal Years 1992 and 1993*, Report 102-311, p. 564.

[59]Defense Authorization Act of 1990, Public Law 101-510, Sec. 1147 (a).

had enlisted the ES in over 40 States, hypothetically covering 97 percent of the military forces (though participation rates by separatees are significantly lower). DOL has budgeted $4 million to administer the TAP program. However, this does not include the salaries of the service providers (which come from various sources, mainly the Employment Service and DoD).

TAP is modeled after a California program called the Career Awareness Program (CAP). CAP began in 1978 as a 4-hour seminar on job search skills for service members about to leave the military; the program ultimately grew to 3 days. Studies of CAP's effectiveness have shown that participants had shorter periods of unemployment following separation and earned higher starting wages than nonparticipants.[60] In 1991, the CAP program merged with TAP. California currently operates 17 of the 125 TAP sites nationwide.

The long experience of the California programs allows for some conclusions about problems that persist over time. The biggest issue is lack of human and financial resources. TAP providers believe they are reaching only about 20 percent of separatees in California.[61] If the classes are made mandatory in all armed services, as they already have been in the Marine Corps, demands for TAP courses could far outstrip available resources.[62] Even in California, where LVERS and DVOP staffers are fairly plentiful, providers expressed doubt that ES personnel could meet the demand for TAP courses. One solution is greater collaboration between DoD civilian and State ES providers, as is already occurring in some parts of the country where the ES instructors teach part of each course and the DoD civilians another.

Another kind of transition service available to all the armed services will be skill certification. Beginning in early 1992, DoD plans to offer certifications to departing personnel that document the trade training the soldiers have received in the military, with a detailed transcript of all training and work experience. The certificate will indicate equivalent civilian job titles for all military occupational specialties (MOS) listed. While the system should help describe exactly what a military person of a certain MOS is trained to do, and will prove to potential employers that veterans have had the training they claim, it is not a substitute for civilian certification or licensing requirements.

DoD has also developed a labor exchange called the Defense Outplacement Referral System (DORS) that began operating in November 1991. Separating service members fill out an information card, or "mini-resume," listing the type and location of job they are seeking and giving data on education and work experience. The information is pooled in the central office of the Defense Manpower Data Center, where potential employers can register and request mini-resumes of up to 25 separatees. The resumes are selected in the order they are received, sent to the requesting employer, and then placed at the end of the list. The system costs soldiers nothing, but employers are charged for telephone calls to a "900" telephone number. Possibly the charge to employers may limit the program's appeal; however, DoD officials say it was designed to pay for itself and might not otherwise exist. One operational snag is that some commercial phone systems do not allow access to "900" telephone numbers, making use of the system difficult for some employers. Although most firms do not recruit employees by long-distance phone, the DORS system may help employers become more familiar with the kind of training the military provides.

Service-Run Transition Programs

The TAP program offers only one-time job search skills training, not the one-on-one counseling and continued access to job search materials and information that full-service displaced worker programs offer. These supplements and followup to TAP will be provided by the individual military services. The Defense Authorization Act of 1990 requires the Secretary of Defense to establish job search centers on military bases.[63] It appears that the quality and extent of offering at these centers may vary considerably among the branches of the armed forces. As of late 1991, the Army, facing the largest cut, had the

[60]The California Employment Development Department reports that duration of employment following separation for participants averages 30.5 days as opposed to 42.2 days for non-participants; starting wages average $9.53 for participants and $7.98 for non-participants (California Employment Development Department, "Career Awareness Program," leaflet, Sacramento, CA, 1991).

[61]Joseph D. Filardo, State TAP Coordinator, personal communication, Dec. 3, 1991.

[62]The Marine Corps has made TAP classes mandatory for all separating personnel in grade E-5 or below.

[63]Defense Authorization Act of 1990, Public Law 101-510, Sec. 502(a).

most sophisticated job search centers, while the Navy, facing the smallest cut, seemed to be further behind.

The Army Career and Alumni Program (ACAP) has general transition and continuing job search assistance components. General transition counseling is carried out by Army civilian personnel. This includes counseling on personal finances and relocation as well as referral to other on-base Army services, such as the Army continuing education centers and legal counseling. The job search assistance is being handled by an outside contractor at on-base centers. In addition to job search skills classes and counseling, the centers provide information on local labor markets, help in resume writing, and access to databases of employers who are not necessarily hiring but have expressed a willingness to hire veterans. The centers also offer a "crosswalk" between Army job classification (MOS) and civilian occupational titles, helping separatees to find civilian jobs that use their military skills. Although the contractor-run centers do not offer full job placement services, they have information about job fairs and some private sector job listings, as well as access to Federal job openings and information on veterans' preferences in Federal hiring.

The Army plans to have a total of 61 ACAP centers, including 55 with job assistance centers, running by 1992. They will be located at major Army installations; smaller installations will use the nearest ACAP center or mobile services.[64] In base closures, the ACAP centers will be available to civilian as well as military personnel through the duration of the closure.

There have been a few institutional problems in the implementation of ACAP at the base level. For example, there has been some duplication in services provided by the job assistance centers and those provided by the TAP program. A recent agreement between DOL and the Army may straighten out the duplication. In other cases the contractor-run assistance centers have had problems in cooperating with the Army-run transition assistance offices, resulting in both gaps and overlaps in services. The Army is aware of these difficulties and is working to clarify the relationship between the ACAP's components.

One Army base, Fort Dix, NJ, has instituted a set of transition services in addition to ACAP. At Fort Dix, transition planning actually begins at the time of enlistment with a day-long seminar on continuing education and veterans benefits. Fort Dix has also developed a system of apprenticeships that allows separating personnel to work under civilian journeymen from the base's directorate for engineering and housing (see box 5-B). The program allows service people to gain some skills and to try out a job to see if they might like it in the civilian world.

The other military services are handling job search centers with in-house civilian personnel expanding on their existing family service centers. In the past, family service centers have focused their placement efforts on finding jobs for the spouses of service men and women. The Navy and the Air Force believe that this experience, combined with additional training, will enable family service center personnel to counsel separatees effectively. The basic DOL-run TAP program is the same for all military services, and all will be using the DoD DORS database.

Problems in Delivering Services

Overall, the transition programs were slowed by the Gulf War. Transition policy went on hold for about 6 months while most separations, voluntary or involuntary, were halted altogether. Since the "stop loss" policy of holding personnel beyond the end of their service contracts was ended in June 1991, many service people have chosen to separate immediately. Thus, the TAP and other military-provided transition programs have been counseling separatees much closer to their dates of separation than expected. This problem should dissipate as the pace and timing of separations return to normal levels.

One flaw that may persist is a lack of uniform practice in granting some of the transition benefits Congress has recently enacted. One such benefit is leave from duty to use transition assistance, a benefit that is expected to raise participation rates. While the Defense Authorization Act of 1990 provided a generous leave policy for those near their date of separation,[65] the policy is not applied consistently at the base and sub-base levels. Program operators report that some of the service members who use transition services are expected to make up time

[64]Department of the Army, *ACAP: Army Career and Alumni Program*, brochure (Washington, DC: 1991).

[65]Defense Authorization Act of 1990, Public Law 101-510, Sec. 502(a).

Box 5-B—Transition Assistance at Fort Dix, NJ

Besides the basic Army Career and Alumni Program and Transition Assistance Program transition services available at all major Army facilities, Fort Dix, NJ has established several other programs to meet the needs of its separatees.[1] Charles Adimaro, director of Army Continuing Education Services on the base, has led the effort to make smooth transition a priority at Fort Dix. Believing that soldiers need to start thinking about their futures well before they separate—in fact, at the onset of their military service—Adimaro set up a program known as "dough boy" orientation. New recruits are given information about education and career choices within weeks of their arrival at Fort Dix. This program helps soldiers plan their military careers, training, and education with an eye towards their eventual return to the civilian world.

The dough boy program is only part of what makes Fort Dix's transition services unique. Besides being a major military training post, Fort Dix is also one of the main points of separation for soldiers returning from European stations. Many those returning from Europe are young soldiers serving in infantry or other lower skill positions. Informal tracking of the experience of these separatees in the civilian job market showed that many were earning less than $10,000 a year and most were dissatisfied with their employment situation. To improve the separatees' chances of getting good civilian jobs, Adimaro invited local community colleges to teach courses on base in fields such as welding and carpentry to soldiers within 6 months of separation. While these courses were popular and did provide training separatees could use in civilian jobs, they were offered only at fixed intervals. That meant that separating soldiers who arrived after a cycle of courses had started were not eligible to participate.

Seeking an alternative to the fixed-schedule courses, Adimaro found a simple solution—apprenticeship on base.[2] The program dubbed "On Duty Job-Skills" allows soldiers who express an interest in a particular skill or trade to apprentice with civilian journeymen on the staff of the base's directorate for engineering and housing (DEH). By all accounts this training enables the separating soldier to learn about a trade, provides a useful service to the military during the soldiers last months of service, and allows the DEH to maintain a large work load despite declining budgets. Although the program is new, several success stories have already been reported, including one of a soldier who was hired by the DEH after he separated.

In most cases, the skills learned in a short apprenticeship probably are not enough for landing a good civilian job. However, the experience may help soldiers choose career goals to pursue with further training and at least gives them a civilian-type work experience to put on their resume.

---

[1]Information for this box was provided by Charles Adimaro, Director Army Continuing Education, Fort Dix, NJ, personnel communication, November 1991; and Kimberly J. McLarin, "Suddenly, they're Civilians: Where Does a Gunner Look for Work?," *The Philadelphia Inquirer*, November 15, 1991, p. A-1.

[2]Apprenticeship while on active duty was tried during the Vietnam era builddown. As part of Project Transition many soldiers participated in private industry job training during off hours. (Darwin W. Daicoff, "The Adjustment of DoD Civilian and Military Personnel" in Bernard Udis, eds., *The Economic Consequences of Reduced Defense Spending* (Lexington, MA: Lexington Books), p. 175.)

spent in the centers while others are given unconditional time off. Other recently provided transition benefits, such as reimbursement for relocation to places other than home-of-record and continued use of the commissary and exchange, are not fully understood or implemented at the base level.[66]

Other Employment Programs Available to Veterans

Veterans who have not found jobs by the time they are discharged can use the DOL's programs of employment assistance. At ES offices throughout the United States, LVER and DVOP offer job counseling and related services. They serve as the point of contact between newly separated veterans and other ES and DOL programs. Because they also serve as the main counselors in the TAP program, many of them will be familiar with job search skills training that service men and women received while still on active duty. Their presence in ES offices across the country allows veterans who have moved away from the area where they served to continue getting labor market assistance from a provider who "speaks the same language" they learned in the TAP program.

Veterans involuntarily separated from the military should also be eligible for reemployment and retraining services from the Economic Dislocation

[66]Grant White, "Lack of Regs Snags Separation Benefits," *The Navy Times*, July 8, 1991, p. 3.

and Worker Adjustment Assistance (EDWAA) program, which serves displaced workers generally (see ch. 3). At this writing, DOL had not yet worked out with DoD a practical definition of "involuntarily separated" ex-service members who will be eligible for services, but intended to do so. There were reports, in fact, that some ex-service members were already being served in some local EDWAA projects.[67]

A number of private sector non-profit organizations are aiding in the transition of ex-service members. These include the various military alumni groups such as the Non-Commissioned Officers Association, the Association of the United States Army, the Air Force Association, and the Veterans' of Foreign Wars, as well as nonmilitary organizations such as the American Association of Retired People. These organizations sponsor job fairs, offer access to job banks, and provide a potentially rich source of informal employment contacts. Some of them offer transition and benefit counseling. Another veterans' organization, Disabled American Veterans, has written a series of three guides to finding civilian employment.

One private sector for-profit firm provides a mini-resume service, similar to the DORS system. It is free to service members and available to employers who subscribe to the Human Resources Information Network online database. The same firm also publishes job information targeted to service members in *The Miltran Guide to Career Opportunities*, available in many commissary and post exchanges for $10 per issue. Copies are also available free to clients at some of the service-run job centers. The magazine reprints help wanted ads from newspapers nationwide, organizing the ads by occupational code and indexing them to MOS codes. Even though the ads are almost 3 weeks old by the time the magazine comes out, the publisher reports that over 70 percent of the positions are still open at the time of publication. Although answering help wanted ads is often an unrewarding way to apply for a job, at least it does collect information on the kinds of jobs available in various parts of the country.

Educational Benefits: The Montgomery GI Bill

For veterans without transferable skills, or for those who want to improve their skills, education, and training opportunities, the Montgomery GI Bill can contribute to civilian economic success. Although, the Montgomery GI bill is less generous than its World War II predecessor, it nevertheless offers a real educational opportunity not available to civilians. The present version of the GI Bill is optional and requires a contribution from the soldier's pay. Over 70 percent of recruits opted to participate in the GI bill program in 1989 and an open season has been declared for all service members who are to be involuntarily separated and did not sign up at the time of their enlistment.

The GI Bill was originally conceived in 1943 by President Roosevelt's Osborne Commission on veterans' readjustment. The Commission's report led to the Serviceman's Readjustment Act of 1944—the GI Bill of Rights. After World War I, veterans had been given only a lump-sum cash bonus; the GI Bill undertook to make a real difference in the life chances of returning soldiers. It paid for all tuition, fees, books, and included a monthly stipend for 4 full years of schooling. In all 7.8 million veterans—just over half of those eligible—participated, receiving benefits that totaled about $85 billion (1991 dollars).[68]

Since the original GI Bill, various educational benefit schemes for veterans have been employed. The post-Korean Conflict GI Bill provided benefits worth about $20 billion (1991 dollars) to 2.4 million veterans (43 percent of eligible veterans). The Vietnam era GI Bill served 8.2 million veterans (61 percent of those eligible) at a cost of about $6 billion (1991 dollars). Less generous than the World War II GI Bill, both plans generally required veterans to pay for part of their training or education. While the level of benefit declined from the original GI Bill to the Vietnam version, the level of participation actually increased.

When the AVF was established, planners recognized that educational benefits would be a good way to attract recruits. Under the Veterans' Educational

[67]Information provided by Office of Work-Based Learning, Department of Labor.

[68]Estimates of constant dollar spending on the GI Bill programs given in this report inflate total current dollars spent over the life of each program as if it were all spent in the middle year of each program.

Assistance Program (VEAP), established in the early 1970s, the military offered to match $2 for each $1 the soldier invested in an education account, which could grow to a total value of $8,100. In addition to the two-for-one matching, the services could also make additional contributions ("kickers") to attract people with specific skills into the military. The account could be paid out over a maximum of 36 months of training ($240 per month, assuming the maximum contribution of $2,700 by the service member). This benefit, far less generous than any of the previous educational assistance programs, was not widely used. Only 20 percent of those eligible to sign up for the VEAP received training under the program.

Spearheaded by Rep. G.V. Montgomery, a new GI Bill passed the Congress in 1984. The Montgomery GI Bill (MGIB) requires participant contribution; enlistees must pay in $100 per month for the first 12 months of a 3-year term of service. Far more generous than the VEAP, the MGIB provides an eight-to-one match of the participant's contribution. In return for the $1,200 investment in the MGIB, a serviceperson receives $10,800 in educational benefit ($300 per month spread over 36 months). A $1,200 investment in the VEAP would have yielded only $3,600 ($100 per month). As in the VEAP, the services are allowed to add kickers to the monthly benefit to aid in recruiting or retention of soldiers possessing hard-to-find skills. The most generous kicker is the Army College Fund, which can bring the total MGIB benefit up to $25,000. An additional package of veterans' benefits, recently enacted in response to the Gulf War, further sweetens the Bill. The monthly benefit for veterans who served during the Gulf War was increased from $300 per month to $350 per month. This adjustment raises the total base benefit to $12,600 or 10.5 to 1 matching by the services.[69] New law also established an open season that allows service men and women who are involuntarily separated a second chance to join the MGIB program. Their $1,200 would be withheld over the remaining period of their service.

A great majority of service men and women sign up for the MGIB program. The current sign-up rate is even higher than the 71 percent the program averaged from 1985 through the end of fiscal year 1989.[70] Because soldiers must serve 3 years on active duty to be eligible for MGIB benefits, data on how veterans are using the benefit are only beginning to come in. Of the 101,781 people receiving MGIB benefits in fiscal year 1990, 93,630 (92 percent) were enrolled in institutions of higher learning, 5,920 (5.8 percent) were enrolled in resident schools other than college, 745 (0.7 percent) were enrolled in on-the-job training programs, and the remaining 1,486 were enrolled in unspecified programs.

Not all of the people receiving MGIB benefits were veterans; 26,488 (26 percent) were still on active duty. In some of these cases the MGIB benefit may be furthering a military career as opposed to facilitating a new civilian career. This could be an advantage to individuals as well as the military. If the acquired skill or education has value in the civilian labor market, the veteran could move directly into the work force with no time out for training. However, if the skill is not in demand outside the military, then the veteran has no postservice job advantage, and no postservice education benefit either. It is a hopeful sign that 92 percent of MGIB benefit recipients are enrolled in college, since college education generally makes people more marketable for civilian jobs.[71] It is discouraging that despite the overwhelming sign-up rate for the GI Bill, only about 12 percent of those eligible to receive benefits under the program have yet done so. As one official put it, "If a program that pays out as much as $12 dollars on every dollar paid in is making money for the government something is wrong." While no one is sure why so few veterans have used their GI Bill benefits, two factors are often noted. First, most departing soldiers (including young separatees) leave the military with a spouse, and many have children. Having to provide for the immediate needs of their families may preclude full-time training or education. Second, many soldiers do not get adequate counseling about how their

[69]Persian Gulf Conflict Supplemental Authorization and Personnel Benefits Act of 1991, Public Law 102-25, Sec. 337(a)(3).

[70]Mary F. Smith, Library of Congress, Congressional Research Service, "Veteran' Educational Assistance Programs," Feb. 2, 1990.

[71]While no data are available on the use of veterans benefits and the duration of displacement following separation, in a recent study of Vietnam and early AVF soldiers, Angrist found that the use of veterans' education benefits increased their earnings by an average of about 6 percent and that most of the increase was attributable to veterans who used their benefit to attend college or graduate school. (Joshua Angrist, "The Effect of Veterans' Benefits on Veterans' Education and Earnings," unpublished discussion paper No. 1520, Harvard University, Cambridge, MA, October 1990.)

benefit can be used. Transition services should alleviate this problem.

Soldiers as Teachers

A special educational option is the New Careers in Teaching initiative, started in 1986 and planned for expansion during the next few years as part of DoD's overall transition assistance program. The idea is to train service people for teaching careers when they leave the military. So far the program has been modest. One of the larger programs is currently operated by the Navy in Washington, DC. By 1990, 48 service members had started training and 28 were teaching.[72] Because a college degree is a requirement for entering the program, officers are most likely to qualify, although some senior enlisted personnel have participated. Because the starting salaries for teachers are low and the duration of the training is fairly long, this may be a better option for retirees than for separated officers and senior enlisted personnel.

IN CONCLUSION

Military personnel are in a better position to make the transition into the civilian economy than they have been in previous build-downs. The current large peacetime military has more billets with civilian job counterparts than any wartime force since World War II. In general, the troops are above the median in educational attainment and aptitude. Another advantage for separating military personnel is an array of transition programs, which if fully implemented are richer than those available to dislocated defense industry employees. Military personnel also have more notice of separation, which gives them more time to plan for their transition and adequate opportunity to use transition services before they leave the military. The variety of education, retraining, jobs search instruction, and post-service government assistance programs, combined with severance payments and unemployment benefits, should allow most separatees a reasonably good chance of a smooth transition to the civilian economy—assuming the economy pulls out of the 1990-91 recession soon. Another caveat is that these programs are not yet in full operation. What remains to be seen is if the quality of staffing and commitment at the base level will carry out the potential of these programs. Assuming commitment on the part of the services to make transition programs work, dislocation of involuntarily separated military personnel should be small compared to dislocation in defense industries.

The greatest social costs of the military drawdown may not be to those who are involuntarily separated but to those who will never be eligible to serve under more restrictive enlistment standards. While policies to aid the roughly 100,000 service members who will be involuntarily separated through 1995 are well developed, programs to replace the lost opportunity of military service to roughly 290,000 young men and women who will not be able to enlist are lacking. Box 5-A discusses a program that might serve that purpose. Obviously, the armed services should not be maintained at their current size simply to provide a vehicle for social integration, but the fact remains that it has been just that for many people over the last 20 years.

[72]Robert MacDonald and Martha Brownie, "Career Transition Into Training: A Model Alternative Teacher Training Program," in *Technical Talent From the Military and Industry (Washington, DC: National Executive Service Corps, May 1990).*

Chapter 6

Adjustment for States and Communities

Contents

	Page
INTRODUCTION	153
THE BASIS FOR CONCERN ABOUT COMMUNITIES	153
THE LOCATION OF DEFENSE SPENDING	154
Defense-Dependent Regions	156
Urban Versus Rural Defense Dependency	157
Defense Dependency by State	157
Defense-Dependent Communities	158
FACTORS AFFECTING ECONOMIC DISTRESS	159
Compensating Economic Growth	159
Speed of Cuts and Advance Notice	159
Local Economic Conditions	160
MILITARY BASE CLOSINGS AND REALIGNMENTS	164
MITIGATING THE COMMUNITY IMPACTS OF REDUCED DEFENSE SPENDING	169
The New Economic Development Environment	170
Federal Programs To Assist Defense-Dependent Areas	172
State and Local Programs To Assist Defense-Dependent Areas	176
What Communities and States Can Do To Stimulate Economic Development	178
EFFECTIVENESS OF ECONOMIC DEVELOPMENT EFFORTS	184
The Local Economic Response to Base Closings	185
Communities Recovering From Economic Distress: Jackson County, Michigan	187
How Well Do Economic Development Policies Work?	189

Boxes

Box	*Page*
6-A. Lockheed Maintenance of Boeing 747s at Norton Air Force Base	160
6-B. Selected Types of Economic Development Programs	171
6-C. Case Study: Closure of the Kincheloe Air Force Base in Chippewa County, MI	186

Tables

Table	*Page*
6-1. Geographic Concentration of DoD Prime Contracts: Top Seven Metropolitan Areas, 1988	157
6-2. The 15 Most Defense-Dependent States, 1991	158
6-3. Defense Dependency by Size of County, 1989	159
6-4. Economic Conditions of the Most Defense-Dependent States, 1991	162
6-5. Economic Conditions of Metropolitan Areas Receiving the Most Prime Contract Awards	163
6-6. Metropolitan Areas Receiving Most Prime Contract Awards Per Employed Worker, 1989	164
6-7. Military Base Closures and Realignments With the Greatest Economic Impacts	167
6-8. Military Bases Scheduled for Closure on the EPA National Priorities List	168
6-9. Factors in Community Economic Impacts From Defense Cuts	170
6-10. Federal Funding for Economic Development, 1978 to 1990	173
6-11. Selected State and Local Incentive Package	181

Chapter 6
Adjustment for States and Communities

INTRODUCTION

National defense money is spent in all 50 States and thousands of American communities, but its importance to local economies varies greatly. Many States and communities benefited from the last defense buildup that began in the late 1970s. And many of these will feel most keenly the effects of cuts in defense spending.

Fortunately, the number of areas seriously distressed is not likely to be great. A small number of local communities are highly dependent upon defense expenditures for their economic vitality, while a larger, but still relatively small, number are moderately dependent. Not all defense-dependent communities will suffer economic distress because they possess other sources of economic strength. However, even as defense spending declines, the fate of all communities that lean on defense for their economic vitality will depend to a large degree upon how well the U.S. economy as a whole performs in this decade. Well funded and designed economic development programs can help many affected communities avoid community distress from defense cuts, assuming a relatively prosperous national economy.

THE BASIS FOR CONCERN ABOUT COMMUNITIES

Before examining the community impacts of defense cuts, it is appropriate to ask first why policymakers at the national level should be concerned with the economic well-being of particular localities. There are at least two reasons for concern, one related to the overall efficiency of the national economy and the other to economic, social, and psychological hardships experienced by people living in declining local economies.

Local economic decline can be a drag on the national economy, particularly when some places are declining and have excess capacity for growth, while others are growing and paying to add new capacity. When a community suffers dislocation and decline, some factors of production are moved and can be used elsewhere. Some firms may relocate, taking their capital, expertise, and even their machinery with them; some workers may do the same even though, for many, moving means great hardship. However, firms cannot move their buildings nor can workers move their homes. Public infrastructure, such as hospitals, schools, roads, sewers, and bridges, are likewise immobile. As a result, when communities undergo sudden and severe economic dislocation leading to outmigration, many houses, factories and offices may stand vacant and public infrastructure is under-used. Workers staying behind are likely to be unemployed or to take low-pay dead-end jobs. Area banks and savings and loans institutions may suffer or fail as investments go bad. Moreover, local spending on services usually increases, and because of a smaller tax base, tax rates often increase. This less-than-full use of public and private resources reduces the efficiency not only of the declining community itself but also of the U.S. economy as a whole.

If the departing industries or workers move to areas that are growing, there are further costs as the growing community has to pay for new infrastructure (e.g., bigger hospitals, widened roads) or else put further strains on already overextended resources, causing such things as transportation snarls, overcrowded schools, and other delays and inadequacies in public services. Private resources are strained as well, resulting in increasing land, housing, and office prices.[1] Businesses competing in international markets bear at least some of these increased costs.

In sum, a national growth pattern of regional booms and busts is inefficient and costly. In some places resources sit idle and under-used, while in others there is a mad scramble to build more. This does not mean that stasis and immobility are desirable; geographic reallocation of resources can

[1]One study of 103 Massachusetts communities found that local per-capita expenditures were highest in both rapidly declining cities and rapidly growing cities. One reason local public expenditures increase with growth is that cost of providing services for new households is often higher than the revenues they provide. (Helen Ladd, "Municipal Expenditures and the Rate of Population Change," in R. Burchell and D. Listokin (eds.), *Cities Under Stress* (Rutgers, NJ: Center for Urban Policy Research, 1981), pp. 351-68, cited in Peter Eisinger, *The Rise of the Entrepreneurial State*(Madison, WI: University of Wisconsin Press, 1988).

result in a stronger U.S. economy. For example, the century-long shift away from rural communities that accompanied mechanization and rising productivity of agriculture delivered economic benefits to society in the form of cheap, efficiently produced food. Nevertheless, there were costs in this massive shift that are often overlooked. Many rural communities contracted and others ceased to grow. Many displaced southern farm workers, poorly educated and lacking in marketable work skills, exchanged rural poverty for an urban ghetto.[2]

Community economic decline imposes social, psychological, and physical distress as well as economic costs. Not only does family stress increase, but the community sense of well-being can be damaged by sudden and severe economic dislocation. Such stress can weaken the community political fabric so that redevelopment becomes more difficult.[3] There can also be a human toll to community economic decline in the form of ill health, alcoholism, family violence, and other social disturbances.[4]

Granted that community economic decline costs the Nation and the people involved, will the market automatically respond to produce economic turnaround? Neoclassical economic theory implies that regional economic decline is self-correcting, that as labor, land, and other factor prices decline, firms will either move to or expand in the area.

For two reasons however, market adjustments alone do not reliably produce economic recovery in all places. First, it can take a long time for prices to fall far enough to put adjustment into motion. Moreover, unlike consumers who may rather easily shift to lower priced items, most firms do not necessarily move to take advantage of lower costs, because the costs of relocating are substantial. In addition, workers have noneconomic ties to localities that make it hard for them to move when local economies decline. The rise of the two-wage-earner family makes mobility even more difficult.

Second, economic decline may never be self-correcting. When it is sustained and significant it can create a vicious circle that makes the community progressively less competitive.[5] As financial, human, and civic resources shrink, investment in public and private infrastructure falls. Reduced spending on education and training, transportation, and other public infrastructure makes the region less attractive to new investment, in turn causing further economic decline. Caught in a downward spiral, it may be impossible for a community ever to regain former levels of prosperity and quality of life unless it receives economic development assistance. Such acute problems are more likely to arise in areas that were never very prosperous, while thriving communities have a greater margin, making them less likely to fall into such a self-reinforcing decline.

Thus, communities vary in their ability to respond independently to economic distress. In some, particularly those that have been growing and are diversified, market forces and price adjustments alone can bring about a relatively speedy and complete recovery. While displaced workers in these areas may need help in finding new jobs, the community itself is not likely to need much in the way of economic development efforts. At the other extreme, market forces are so stacked against some communities that even with substantial help they probably cannot recover (abandoned, isolated mining communities are an example). However, many communities fall somewhere between the two extremes. Here, market forces alone probably cannot produce a swift and robust recovery. Economic development efforts can help to catalyze market forces and prevent the community from sliding into decline.

THE LOCATION OF DEFENSE SPENDING

To understand how defense spending cuts are likely to affect States and communities, it is important to know where defense-related jobs are

[2]U.S. National Commission on Technology, Automation and Economic Progress, *Technology and the American Economy* (Washington, DC: U.S. Government Printing Office, 1966), p. 20.

[3]Michael Hibbard, "When the Going Gets Tough: Economic Reality and the Cultural Myth of Small Town America," *Journal of the American Planning Association*, vol. 52, No. 4, 1986; also Roger Bolton, " 'Place Prosperity vs. People Prosperity' Revisited," unpublished manuscript, Department of Economics, Williams College, Williamstown, MA, May 1991.

[4]For a more detailed description of social ill effects from rapid economic decline of communities see U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Workers* (Washington, DC: U.S. Government Printing Office, February 1986), pp. 125-127.

[5]The theory of cumulative causation, first proposed by Gunnar Myrdal, suggests that economic decline is not always self-correcting *Rich Lands and Poor* (New York, NY: Harper and Row, 1957).

located. Are they mostly in large cities, in a few States, in economically healthy communities, or in marginal areas? The degree of local economic distress from the build-down will depend in large part on the answers to these questions. Moreover, this knowledge can help the Federal Government, States, and communities determine how vulnerable particular places are to defense cuts and develop plans for responding to possible cuts.

The Department of Defense (DoD) publishes detailed statistics on the location of military personnel, DoD civilian jobs, and the location of prime contract awards to private industry and other institutions. However, because a substantial portion of defense industry work is subcontracted, perhaps as much as half, it is not possible to determine the location of all private sector defense-related jobs.[6] Thus, predicting the community impacts from weapons systems cuts is harder than predicting the impacts from the base closures that have been announced.

To estimate defense employment by State and local areas, some analysts rely on prime contract award (PCA) information. However, much of the prime contractors' subcontract work is done by firms in other States. Because PCA figures do not measure this, they overestimate employment in some States and underestimate it in others.[7] In an attempt to reflect more accurately subcontracting and supplier employment by State, the Defense Economic Impact Modeling System (DEIMS), an input-output model, is often used, but it too has problems that lead to overestimates of defense employment in some places and underestimates in others.[8] Without survey-based data on subcontractors, it is impossible to make precise estimates of the spatial location of defense employment.[9] Moreover, given the uncertainty about the extent and nature of future defense spending cuts, it is impossible to predict in advance which communities will be hit by defense industry cuts and by how much. However, the PCA and DEIMS data can be used to roughly identify the places at most risk. It is also possible to identify the factors that make places most vulnerable to economic distress from defense cuts.

An important factor determining community impact is the size of the spending cut relative to the size of the community. As discussed in chapter 1, defense spending is less important now in relation to the national economy than it was in the 1970s after the Vietnam War. While many State and local economies are still quite dependent on defense, most are less dependent and more diversified than they were 20 years ago.

Defense spending is highly concentrated, however. Slightly over half of all prime contract awards go to just 7 States comprising one-third of the U.S. workforce. For example, while California has 11.7 percent of the U.S. work force, it receives over 19 percent of DoD spending on prime contracts. Defense spending is still more concentrated in substate areas. In 1988, seven metropolitan areas, comprising 13 percent of the Nation's labor force, received over 30 percent of all prime contract awards (see table

[6]From 1981 to 1990 about half the value of prime contract awards was subcontracted. The share ranged from between 40 to 55 percent. (DoD, Washington Headquarters Service, Directorate for Information, Operations and Reports, Office of the Secretary, *Department of Defense Prime Contract Awards, Fiscal Year 1990*, DIOR/PO3-90. Washington, DC: U.S. Government Printing Office.

[7]For example, McDonnell Douglas Air Division received approximately $5.2 billion in prime DoD awards in 1989. Nearly one-third of the funds were subcontracted, and less than 3 percent of the subcontracted funds stayed in Missouri; California received 41 percent of the subcontracted work and New York 10 percent. McDonnell Douglas Air does little subcontracting work for other firms. Thus, reliance on PCA figures would lead to the conclusion that Missouri is actually more defense dependent than it is (by as much as 13 percent) and that California is less. (Data supplied by McDonnell Aircraft Corp., 1991).

[8]DEIMS tries to measure employment from both prime and subcontract awards. On the basis of input-output tables, the DEIMS model calculates the percentage of each industry's output that goes to national defense. It assumes, for a given industry, that the percentage of workers employed in defense work is much the same in every State. For example, it assumes that defense work is the same proportion of total work in Los Angeles machine shops as in Detroit machine shops. As a result, the model probably systematically underrepresents employment in places with large agglomerations of defense industries (e.g., California, Connecticut, Massachusetts) and systematically overstates employment in places that have diverse industry but have relatively little defense demand (e.g., many industrial states in the Midwest).

[9]OTA's estimates of defense-related employment by State are based on the following sources: The number of military and civilian positions by State is from *Selected Manpower Statistics, FY90* (DoD, Directorate for Information Operations, and Reports, 1991) and industry employment is from *Projected Defense Purchases: Detail by Industry and State, Calendar Years 1991 through 1996*, DoD, Directorate for Information, Operations, and Reports, 1991, draft (the DEIMS model). DEIMS calculates defense-related industry expenditures for each State. The OTA estimates of industry expenditures for each state comprise direct DoD expenditures (minus direct Federal pay, since military and civilian DoD positions are counted separately) plus indirect expenditures (subcontracts and spending by contractors and subcontractors for supplies). Each State's share of the national total of defense industry spending was calculated and this percentage was multiplied by the total number of industry jobs in the nation (2.9 million in 1991) to calculate the number of industry jobs in each State.

6-1). At the county level, only 9 percent (271) of the 3,137 counties in the United States exceed the national average (per worker) for prime contract awards; 93 received over three times the national average.[10] DoD research and development (R&D) spending is even more concentrated, with over two-thirds of R&D expenditures going to nine metropolitan areas with only 13.8 percent of the nation's population.[11]

Thus, while most cities and counties do not depend significantly on defense spending, a few do. For example, Sagadahoc County, ME, where the Bath Iron Works is located, receives 11 times more defense prime contract funds per capita than the national average. New London County, CT, home to General Dynamics' Electric Boat submarine facility, receives 18 times the national average. One-half of New York State's prime contract awards go to Long Island contractors; most of Georgia's are in the Atlanta area.

Some argue that because of the high degree of subcontracting, defense spending is less concentrated than a simple examination of prime awards would suggest. In fact, this does not appear to be true. The few studies examining the issue suggest that subcontracting is *more* concentrated spatially than prime contracting.[12] A possible reason for this is that although prime awards may be geographically dispersed, in part for political reasons, much of this work is subcontracted back to a few areas with high concentrations of firms and people who specialize in defense work, such as Boston, Long Island, and southern California.

In assessing the defense dependence of local communities, the secondary impacts of defense spending should not be overlooked. Calculations of defense-related employment underestimate dependence when they do not include the local jobs dependent upon spending by employees of defense firms and military bases. Varying by the nature and size of the local economy and the type of job (military vs. private industry), every defense job creates approximately another 0.2 to 1.6 jobs in the rest of the local economy.[13] For example, in southeastern Connecticut employment by defense prime contractors makes up approximately one-quarter of total area employment; regional planners estimate that altogether one-half of all jobs in the region are directly or indirectly dependent upon defense spending.[14]

Defense-Dependent Regions

Since World War II, defense procurement has focused less and less on traditional military products (e.g., trucks, tanks, rifles) and more on aerospace and electronic-based products. The locus of defense production has correspondingly shifted from the industrial Midwest to other areas of the Nation, particularly California and New England.[15] The

[10]Data supplied by the Office of Economic Adjustment, DoD. In 1989, the national average was $1,121 in prime contract awards per member of the labor force.

[11]These are, in order of DoD research and development per member of the labor force, Denver-Boulder, Boston, San Jose, Los Angeles-Long Beach, Seattle-Everett, Nassau-Suffolk Counties (NY), Anaheim, Washington (DC), Dallas Fort-Worth, and San Diego. (Data for 1988 from Donald Hicks, Bruton Center for Development Studies, University of Texas at Dallas.)

[12]Edward J. Malecki and Lois M. Stark, "Regional and Industrial Variation in Defence Spending: Some American Evidence," in Michael J. Breheny, *Defence Expenditure and Regional Development* (London: Mansell Publishing Ltd., 1988); John Rees, "The Impact of Defense Spending on Regional Industrial Change in the United States," in G. Hoffman (ed.), *Federalism and Regional Development* (Austin, TX: University of Texas Press, 1981); Charles H. Anderton and Walter Isard, "The Geography of Arms Manufacture," in *The Geography of Peace and War*, edited by David Pepper and Alan Jenkins, London: Basil Blackwell, 1985, pp. 90-103; and Breandain O'hUallachain, Regional and Technological Implications of the Recent Buildup in American Defense Spending, *Annals of the Association of American Geographers*, vol. 77, no 2. June 1987. Similar findings were reported in the 1960s. Roger F. Riefler and Paul Downing, "Regional Effect of Defense Effort on Employment," *Monthly Labor Review*, July 1968.

[13]Multipliers in smaller localities and for military bases are smaller than for larger areas and defense industrial firms. Some researchers have retrospectively examined employment and income changes after major job losses and have concluded that because the changes are smaller than anticipated, commonly accepted employment and income multipliers are too high. However, these analyses do not take into account the growth of other economic activities in the region to compensate for the losses. The calculations of the multiplier effects assume that all sources of demand other than the one being analyzed remain constant. They are hypothetical calculations. The calculated effects overestimate actual changes in employment if other sources of demand rise to compensate for part of the defense reduction, or underestimate them if other sources of demand fall to aggravate the defense reduction. For a discussion of military spending multipliers, see Joseph Cartwright and Richard Beemiller, *The Regional Economic Impact of Military Base Spending* (Washington, DC: Bureau of Economic Analysis, U.S. Department of Commerce, November 1980); also Rodney A. Erickson, "Sub Regional Impact Multipliers: Income Spread Effects From a Major Defense Installation," *Economic Geography*, vol 53. pp. 283-294.

[14]Richard B. Erickson, Executive Director, Southeastern Connecticut Regional Planning Agency, personal communication, November 1990.

[15]Edward J. Malecki and Lois M. Stark, "Regional and Industrial Variation in Defence Spending: Some American Evidence," op. cit.; Roger F. Riefler and Paul B. Downing, "Regional Effect of Defense Effort on Employment," op. cit.; and Ann Markusen, Peter Hall, Scott Campbell, and Sabina Dietrick, *The Rise of the Gunbelt: The Military Remapping of Industrial America* (New York, NY: Oxford University Press, 1991).

Table 6-1—Geographic Concentration of DoD Prime Contracts: Top Seven Metropolitan Areas, 1988

Area	Percent of total DoD expenditures (cumulative)	Percent of U.S. labor force (cumulative)
Los Angeles-Long Beach-Anaheim[a]	9.4%	4.7%
Washington, DC	14.0	6.6
Dallas-Fort Worth	18.3	8.3
St. Louis	21.9	9.4
Boston	25.2	10.7
Nassau-Suffolk Counties	28.0	11.8
San Jose	30.8	12.5

[a]Los Angeles-Long Beach and Anaheim, et al. are considered as one area here.

SOURCES: Bruton Center for Development Studies, University of Texas at Dallas; Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, June 1990.

defense buildup of the 1980s accelerated this trend. Per capita defense expenditures in the Pacific and New England census divisions increased significantly faster than in the rest of the Nation.[16] By 1989, New England and the Pacific census divisions received 2.2 and 1.5 times, respectively, the amount of spending per capita for the Nation as a whole.

Because 85 percent of military prime awards in the Pacific region are in California, impacts there are considered at the State level (see discussion below). New England however, can be considered as a regional unit because most New England States are dependent upon defense spending, making it the most defense-oriented census region in the Nation.[17] By 1991, substantial defense cuts had already occurred and were aggravating a severe regional recession. New England unemployment was at 8.3 percent compared to a nationwide average of 6.5 percent.[18] New England has suffered through defense cuts before. When defense awards declined by almost one-half between 1968 and 1973, and a number of military bases were closed in the early 1970s, the impact on the region's economy was significant.[19] A soaring unemployment rate (over 12 percent in 1975) led many to refer to the area as the New Appalachia. But the economy recovered, due to a combination of the rise of high-tech manufacturing, financial services, and, not least, defense spending. The positive impact of $150 billion in DoD purchases in the 1980s in the region should not be underestimated. Even though current cuts will occur over a longer period of time than in the post-Vietnam era, no increase in defense spending can be expected to give the region a boost.[20]

Urban Versus Rural Defense Dependency

Large cities benefit more than rural areas from defense spending. Metropolitan and nonmetropolitan counties get about the same amount of Federal funds per capita when defense and space are excluded, but metropolitan counties get three times more in defense and space spending.[21] Thus, rural areas should be less affected by the defense buildown, particularly if cuts are across the board. Steeper cuts in DoD operations (especially in military bases) may affect rural areas more than cuts made across the board, concentrated in procurement, or focused in R&D, especially since the latter is heavily concentrated in a few larger metropolitan areas. Given the economic difficulties rural areas have experienced in the 1980s, this is fortunate. The strong growth of metropolitan economies in the 1980s and their superior prospects for the future put them in a better position to absorb defense spending cuts.

Defense Dependency by State

For most States, projected cuts in defense are not large in relation to the size of their economies. Twenty-nine States have defense-related shares of

[16]From 1980 to 1986, defense expenditures increased by $221 per person in New England and $342 per person in California. In comparison, spending increased by $146 nationally and by only $68 in the heavily industrial East North Central region. In 1986, the United States spent $1,100 per capita on defense. Thomas Muller, "The Impact of Reagan Administration Policies on Regional Income and Employment," (Washington, DC: The Urban Institute, May 1986), p. 11.

[17]Lynne E. Browne, "Defense Spending and High Technology Development: National and State Issues," *New England Economic Review*, September/October, 1988, pp. 3-22.

[18]For February 1991. Calculated from U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* (Washington, DC: April 1991).

[19]Yolanda K. Henderson, "Defense Cutbacks and the New England Economy," *New England Economic Review*, July/August 1990.

[20]Richard Barff, "Living by the Sword and Dying by the Sword: Defense Spending and New England's Economy in Retrospect and Prospect," unpublished paper, Department of Geography, Dartmouth College, 1990.

[21]Nonmetropolitan counties receive $303 per capita vs. $1,011 per capita for metropolitan counties. U.S. Department of Agriculture, Economic Research Service, Agriculture and Rural Economy Division, *Rural Economic Development Policy in the 1980's: Preparing for the Future* (Washington, DC: U.S. Department of Agriculture, July 1987), pp. 11-17.

employment at or below the national average of 4.2 percent. If defense spending were reduced at a relatively rapid pace, to about $218 billion in 1995 (see ch. 3), no more than 0.18 percent of the work force (or an average of approximately 4,100 jobs per State) in these 29 below-average States would be vulnerable to job loss each year.[22] However, in some States, such as Alaska, Hawaii, Virginia, and to a lesser extent Connecticut, Maryland, and California, defense spending is large enough that cuts could have a greater impact on the economy. Only 10 States have more than 5.5 percent of their jobs in defense (table 6-2). In these States, the faster paced cuts could put around 0.3 to 0.6 percent of the States' jobs at risk in a given year. This loss may not appear overwhelming, but it could slow growth, particularly if other segments of the State economy are weak.

Table 6-2—The 15 Most Defense-Dependent States,1991

State	Defense share of employment (percent)	Total defense jobs
Alaska	13.1	34,000
Hawaii	12.1	68,000
Virginia	10.4	328,000
Connecticut	6.5	110,000
Maryland	6.2	152,000
Utah	5.9	45,000
New Mexico	5.9	40,000
California	5.9	829,000
Washington	5.7	137,000
Colorado	5.6	96,000
Massachusetts	5.3	157,000
Arizona	5.2	86,000
Mississippi	5.1	56,000
Oklahoma	4.9	73,000
Missouri	4.8	121,000
U.S. total	4.2	5,016,000

SOURCES: Employment data from Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, June 1991. Total U.S. defense employment from Department of Defense, Office of the Comptroller, *National Budget Estimate for FY 1992* (Washington, DC: 1990). Allocations of defense employment by State by the Office of Technology Assessment, based on the Defense Impact Economic Modeling System (DIEMS). Total defense jobs refers to jobs within the United States and excludes DoD military personnel stationed overseas.

Defense-Dependent Communities

While regional and State impacts of reduced defense spending promise to be manageable overall, particularly if the build-down occurs gradually, the impact on certain communities could be more troublesome. A small but significant number of areas have benefited substantially from the Cold War economy. Some have specialized in the production of ships and submarines (e.g., Bath, ME; Groton, CT; Newport News, VA), some in tanks (Lima, OH), and others in aircraft and missiles (St. Louis, Wichita, Seattle, Los Angeles), electronics (San Jose, Boston, Fort Worth, Okaloosa County, FL), and defense services (Washington, DC).

For example, the western Massachusetts town of Pittsfield is home to a GE Aerospace facility that makes defense-related electronics equipment. In 1986, GE employed 7,800 of the region's 41,000 workers. Pittsfield's economy has struggled as GE's employment dropped to fewer than 3,000 in 1991. Unemployment reached almost 13 percent in 1991.[23] The number of employed workers declined by 3,000 from 1990 to 1991.

Southeastern Connecticut is similarly defense-dependent. Located on Long Island Sound at the border of Rhode Island, the region is the home of General Dynamic's Electric Boat, other defense firms, and military installations. In 1990, some 120,000 people were employed overall in the region. Electric Boat's Groton facility employed approximately 17,000, while an additional 2,208 civilians and 13,950 military personnel were at the Navy's Submarine base and the Naval Underwater Systems Command (NUSC). NUSC is losing 900 positions through realignment, and Electric Boat could eliminate as many as half its positions, depending on future submarine contracts. United Nuclear Corp. (UNC), which made nuclear reactors for submarines, employed 1,200 people. UNC will close by 1992,

Though it is not possible to pinpoint which or even how many communities are at serious risk in the defense build-down, data on DoD prime contract awards by county provide some rough approximations. In 1989, 271 of the Nation's 3,137 counties got awards worth more than the national average, per employed person, while 142 received awards worth more than two times the national average. (See table

[22]Data from OTA calculations of defense employment. Based on William Kauffman's (*Glasnost, Perestroika, and U.S. Defense Spending*, Washington, DC: Brookings Institution, 1990) estimates of the decline in employment through 1995, percentage job losses were calculated for military, civilian, and private industry positions. These estimates assume defense cuts evenly affect each State's share of defense employment. In fact, depending on the weapons systems cut and the bases closed, the employment impact will probably be uneven.

[23]U.S. Bureau of Labor Statistics, *Employment and Earnings* (Washington, DC: May 1991).

Table 6-3—Defense Dependency by Size of County, 1989

Prime contract defense dependency[a]		County employment: Under 50,000	50,000 to 250,000	Over 250,000	Total
Low	Number of counties	2,526	220	59	2,805
	Millions of workers	24.4	22.7	31.4	78.5
Medium	Number of counties	84	30	15	129
	Millions of workers	1.1	3.6	12.8	17.6
High	Number of counties	97	26	19	142
	Millions of workers	1.3	3.1	10.1	14.5

[a]Low counties have fewer prime contract awards per employed worker than the national average; medium have more than the national averge and less than twice the national average; and high have more than twice the national average.

SOURCE: Unpublished data supplied by Department of Defense, Office of Economic Adjustment, 1990. The total number of counties is less than the actual U.S. total because of missing data.

6-3.) The 271 above-average counties had 32.1 million workers, or 27 percent of the employed U.S. labor force, while the 142 most dependent counties encompassed 14.5 million workers, or 12.5 percent of the employed labor force.

The extent and speed of the build-down will affect the extent of community distress. If the build-down proceeds at 4 to 5 percent per year, the number of seriously affected communities will likely remain manageable, if the national economy recovers and begins to grow. A steeper build-down of 6 to 7 percent per year would affect more communities. A rapid build-down at, say 10 percent for one or two peak years, could affect still more.

FACTORS AFFECTING ECONOMIC DISTRESS

Compensating Economic Growth

In the short run, cutting the defense budget will eliminate jobs. However, in the moderate and long term, some compensating job growth will occur, assuming that either public or private investment takes up the slack.[24] For illustration, Leontief estimated in 1965 that after a 20-percent reduction in defense spending, about half the States would gain employment because compensating economic growth would more than offset any defense losses, while compensating growth would reduce the severity of defense job losses in the remaining 25 States.[25] To the extent compensating growth occurs in the national economy, States affected by defense cuts, and to a lesser extent, communities, will be helped.

Speed of Cuts and Advance Notice

The effects of defense cutbacks will be eased if the cuts occur over a number of years. Gradual cutbacks make it easier for laid-off workers and idled resources to be absorbed through local economic growth. In fact, employment is often phased down gradually as contracts for military systems are completed. For example, the layoffs at United Nuclear Corp. in Connecticut are occurring in stages, with 500 employees laid off in 1990, 400 in 1991 and the final 300 in 1992. As a result, the impact on the local economy is moderated and UNC has time to try to develop new, nondefense business at the plant.[26]

When military bases close, soldiers are transferred and civilian positions are eliminated in stages, so that by the time of closure many positions have already disappeared. Advance notice of 2 to 5 years

[24]Brian W. Cashell, "Defense Spending Cuts: Implications for Deficit Reduction and the Economy," Congressional Research Service, U.S. Congress, Jan. 5, 1990; Michell R. Garfinkel, "The Economic Consequences of Reducing Military Spending," *Federal Reserve Bank of St. Louis Economic Review*, vol. 72, November/December 1990, pp. 47-59; C. Alan Garner, "The Effect of U.S. Defense Cuts on the Standard of Living," *Federal Reserve Bank of Kansas City Economic Review*, vol. 76, January/February 1991, pp. 33-47; and Lori Taylor, "Reduced Defense Purchasing: Anticipating the Impact on State and Industry Employment," *Federal Reserve Bank of Dallas Economic Review*, November 1990, pp. 17-27.

[25]Wassily Leontief, et al., "The Economic Impact—Industrial and Regional—of an Arms Cut," *The Review of Economics and Statistics*, vol. XLVII, No. 3. August 1965, pp. 217-241; see also John H. Cumberland, "Dimensions of the Impact of Reduced Military Expenditures on Industries, Regions and Communities," in *The Economic Consequences of Reduced Military Spending*, Bernard Udis (ed.), (Lexington: Lexington Books, 1973); Lori Taylor, op. cit; and Roger H. Bezdek, "The 1980 Economic Impact—Regional and Occupational—of Compensated Shifts in Defense Spending," *Journal of Regional Science*, vol. 15, No. 2. 1975, pp. 183-198.

[26]UNC has matched funds it received from the State of Connecticut to hire a consultant to identify alternative businesses that the company might conduct at the facility.

Box 6-A—Lockheed Maintenance of Boeing 747s at Norton Air Force Base

In August 1990, Lockheed Corp. signed a lease with the Air Force and the Inland Valley Development Agency (IVDA) to use two hangars at Norton Air Force Base for a maintenance service for Boeing 747s. Norton, located in San Bernardino, CA was one of the 86 military facilities selected in the first round of base closures.

Lockheed Aircraft Service Co. has been in the business of maintaining commercial airlines since 1938. With the rise of the commercial repair and maintenance market in the last decade, Lockheed opened new facilities in Greenville, SC and Tucson, AZ. Recently, the company saw an opportunity to get into maintenance of 747s for Japan Airlines.

At the time Lockheed was planning the new facility for this purpose, Congressman George Brown, who represents the San Bernardino area, urged the company to consider using Norton, which was rumored to be closing. When the closure was announced, Lockheed approached the Air Force about using the facility. From Lockheed's perspective, Norton was ideal. Its hangars were large enough for 747s and required only minimal upgrading. The high-cost southern California location was not a detriment because 747 maintenance requires highly skilled workers, who are well paid.[1]

What Lockheed needed first was an agreement with the Air Force on joint use of the facility. Air Force regulations on the use of bases by outside contractors are dauntingly complex, but Lockheed was finally able to sign a 50-year lease that involved the Air Force and later the IVDA, which had been formed by local communities to develop the base once it is closed. The agreement allowed Lockheed to use two hangars immediately, and another two after the base closes in 1995. Lockheed will pay an average of $2.1 million per year for at least the first 10 years and will invest $20 million in the new facility.

Several problems delayed the commencement of the operation. First, Lockheed found that the hangar floors would not support the weight of 747s and had to put down a new floor. Then it turned out that the soil underneath the hanger was contaminated by solvents, so Lockheed entered into discussions with the Environmental Protection

before closure makes it easier for people to get replacement jobs and communities to get a head start on their economic development and base reuse efforts. For example, in San Bernardino, CA, where Norton Air Force Base is scheduled to close in 1994, Lockheed Corp. operates a commercial aircraft maintenance service that by October 1991 employed 200 people.[27] (See Box 6-A.) Virtually all of the communities affected by the first round of base closures have begun to plan for base reuse and local economic development.[28]

Local Economic Conditions

The health of a State or local economy greatly affects the extent of distress caused by defense cuts. If cutbacks occur in an urban area with a healthy nondefense sector, little economic development assistance may be necessary.[29] For example, Long Island, home to Grumman Corp. and a number of other defense contractors, has experienced defense cuts, but its relatively strong and prosperous economy has helped absorb some of the impacts.[30] While smooth adjustment to reduced defense spending is not assured, the overall health and diversity of the Long Island economy will go a long way toward easing the problems. Similarly, because the economy of Antelope Valley, CA (70 miles north of Los Angeles) was relatively healthy, it was able to absorb the 1986 loss of 6,000 Rockwell jobs upon completion of the B1-B bomber program. Since the area has become in part a bedroom community for Los Angeles, the impacts of the layoffs were minimal.[31] In fact, Los Angeles County as a whole grew faster than any other California county in the

[27]David Fondler, "Lockheed Attracts First Norton Client," *Inland Valley Daily Bulletin*, Sept. 12, 1990, p. C7.

[28]Data provided by the Office of Economic Adjustment, DoD.

[29]U.S. Department of Defense, Office of Economic Adjustment, *Economic Adjustment/Conversion* (Washington, DC: Office of Economic Adjustment, July 1985), app. K.

[30]Long Island grew faster in the last decade than any other area in New York State and its personal income per capita is in the top 1 percent of all communities in the United States. Employment in 1989 was at a historic high, although due in part to cutbacks in defense firms and the national recession, it had shrunk 5 percent (60,000 jobs) by 1991. However, it still exceeded 1986 employment levels. Unemployment in June 1991 was 6.2 percent, slightly below the national average. See Martin Melkonian, "Cutbacks in Defense Spending: Outlook and Options for The Long Island Economy," Business Research Institute, Hofstra University, February 1989, p. 1; also Bureau of Labor Statistics, *Employment and Earnings* (Washington, DC: 1991).

[31]However, some workers did have to commute up to 70 miles for their new jobs in Los Angeles and Long Beach.

Agency on cleanup. The soil was removed and is being cleaned on another part of the base. This entire process delayed the project by about 1 year.

By October 1991 Lockheed had hired 200 workers and had begun work on the first 747. IVDA officials expect that Lockheed will have hired a total of 1,500 workers by the end of 1992. The company has indicated that it would like to hire locally as much as possible, giving special preference to people losing jobs on the base. However, because of company requirements that many of the workers have commercial aircraft repair experience and FAA certification, the IVDA officials expect that only about one-third of the workers can be hired locally, most of them for less technical jobs. Lockheed also expected to draw subcontractors to the area. A variety of firms doing avionics repair, aircraft refurbishing, and engine repair have shown interest in locating on or near the base.

The Lockheed reuse project is only one part of the overall expected reuse activity for Norton. The IVDA plans to obtain the airport itself at no cost (through the public benefit clause that governs the disposal of Federal property) and operate it as a civilian operation for air cargo. In addition, it is proposing to develop the balance of the Norton base acreage (400 acres) and 1,500 acres around the base with manufacturing and office space, and hopes to create 20,000 jobs. This would be more than double the 10,000 civilian and military positions that were on the base before closure.

The preparation is going more slowly than the IVDA would like. The Air Force has refused to discuss the sale price of the base until the environmental impact studies are completed in September 1992. Moreover, it is not clear when the Air Force will vacate different parts of the base. Without this information, efforts to do interim leasing, find a developer, and begin reuse have been delayed. At least one major developer has cut off negotiations because of the uncertainty about the date of land availability, price, liability, and environmental cleanup. If a sale is finally agreed upon, IVDA will issue bonds to finance the purchase of the base.

[1]Interview with John Dailey, Director of Public Relations, Lockheed Aircraft Service Co., July 1990.

1980s, with growth in Antelope Valley faltering only in the 1990-91 recession, which hit construction hard.

In contrast, when a number of demand shocks including defense cuts occur simultaneously in the local economy, significant decline can occur. Such a scenario describes the decline of the Seattle economy following the Vietnam War. Not only did defense aircraft spending decline, but the space program shrank, and the commercial aerospace market also collapsed in a cyclical downturn.[32] This triple whammy caused massive layoffs, the effects of which rippled through the area economy. New England today is in a similar if less severe situation, where defense cuts have further depressed a regional economy already weakened by declines in computers, traditional manufacturing, financial services, and real estate.[33] When the direction of the local economy is down, defense cuts deepen and lengthen the decline.

Some of the more defense-dependent States today have relatively strong economies to cushion the blow from reduced defense spending. Unemployment rates in 7 of the 13 most defense-dependent States were below the national average in 1991, even after most of these States suffered some defense cuts. Some of these State economies were growing; from 1986 to 1990, 7 of the 13 had growth rates equal to or greater than the national average (table 6-4).[34] Defense cuts may lower the rates of growth in these States, but they are in a better position to weather cuts than defense-dependent States with a record of slower growth.

The economies of many defense-dependent metropolitan areas are also relatively strong. Twelve of the top 15 metropolitan areas in defense contracts per employed worker had lower unemployment rates than the national average in 1990. Six had faster than average labor force growth from 1986 to 1991. (See table 6-5.) Of the 14.5 million workers living in counties highly dependent upon defense in 1989, 68

[32]U.S. Department of Defense, Office of Economic Adjustment, *Economic Adjustment Committee Report*

[33]Richard Barth, "Living by the Sword and Dying by the Sword: Defense [illegible] New England's Economy in Retrospect and Prospect" [illegible]

[34]Some of this growth may have been due to the influx of defense dollars [illegible] U.S. defense spending has been declining since 1985.

Table 6-4—Economic Conditions of the Most Defense-Dependent States, 1991

	Defense-related jobs as share of total State employment (percent)	Unemployment rate July 1991 (percent)	Annual employment growth 1986-1990 (percent)
Alaska	13.1	7.3	1.0
Hawaii	12.1	2.8	2.9
Virginia	10.4	6.0	2.7
Connecticut	6.5	6.8	0.4
Maryland	6.2	5.5	1.8
Utah	5.9	5.2	1.7
New Mexico	5.9	7.3	1.6
California	5.9	8.0	2.7
Washington	5.7	5.9	4.2
Colorado	5.6	4.5	1.5
Massachusetts	5.3	9.4	0.3
Arizona	5.2	5.5	2.8
Mississippi	5.1	9.5	1.8
U.S. average	4.2	6.8	1.8

SOURCES: Employment data from Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, September 1991. Total U.S. defense employment from Department of Defense, Office of the Comptroller, *National Budget Estimate for FY 1992* (Washington, DC: 1991). Allocations of defense employment by State by the Office of Technology Assessment.

percent lived in counties with low unemployment rates.[35]

The loss of defense industries in small communities with little economic diversity could be traumatic. A remote location can compound the difficulties. For example, after Glasgow and Lewiston Air Force Bases (AFB) in rural Montana and Edgemont Army Depot in rural South Dakota closed in the late 1960s and early 1970s, few of the lost jobs were regained because there were few other functions the towns could serve. Communities such as Oscoda, MI (Wurtsmith AFB), Leesville, LA (Fort Polk), and Limestone, ME (Loring AFB), all slated for base closings, are the kinds of small towns that are most vulnerable.

However, most defense spending occurs in large metropolitan areas, many of them with high land and housing costs, excessive pollution, heavy traffic congestion, and lack of open space. Boston, Long Island, San Jose, Washington, DC, and southern California typify such development patterns.[36] For example, southern California utility rates are as much as 50 percent higher than those in other States. Land prices are among the highest in the Nation. The 1990 average price for a single family home in the State was $210,000, more than double the national average.[37] Because of the high cost of living, labor costs are one-third more than in parts of Texas, Colorado, and Oklahoma.[38] Likewise, traffic congestion, water shortages, and air pollution not only lower the quality of life, but increase business costs, slow growth, and make it hard to attract skilled workers when they are needed (see table 6-6).

When defense spending is cut in such congested metropolitan areas, demands on strained resources lighten, which, over time, makes it easier for compensating economic growth to occur. Regional firms that produce for national and international markets find it easier to grow and export as labor and land costs stabilize or decline, putting overall costs

[35]"Highly defense-dependent" counties are those with more than twice the national average per employed worker in prime contract awards in 1989. Low unemployment rates were those below 4.5 percent (at a time when the national rate was 5.4 percent). Data on defense spending were provided by the Office of Economic Adjustment.

[36]For Long Island, see Martin Melkonian, "Cutbacks in Defense Spending: Outlook and Options for The Long Island Economy," op. cit; also Ann Markusen, et. al., *The Rise of the Gunbelt, op. cit.*

[37]Richard L. Stern and John H. Taylor, "Is the Golden State Losing It?" *Forbes*, Oct. 29, 1990, p. 87.

[38]Ibid. In 1991, average hourly earnings of workers in Los Angeles were $11.17 while in San Antonio, TX they were $8.19. In the nonmetro areas of Texas, the wage rates are even lower. Bureau of Labor Statistics, *Employment and Earnings*, (Washington, DC: May 1991).

Table 6-5—Economic Conditions of Metropolitan Areas Receiving the Most Prime Contract Awards

Metro area	Prime contract $ per employed worker, 1988	Unemployment rate July 1991	Annual employment growth 1986-90 (percent)
San Jose	$4,590	6.2%	1.0%
St. Louis	3,850	6.7	0.6
Washington, DC	2,863	4.4	2.0
Boston	2,863	8.2	0.0
Cincinnati	2,778	5.1	2.6
Dallas-Fort Worth	2,776	6.6	0.7
Nassau-Suffolk Counties	2,691	6.1	0.1
Hartford	2,666	6.3	0.7
Los Angeles-Long Beach	2,234	8.6	2.2
Anaheim	2,164	5.3	2.3
Seattle-Everett	2,127	4.7	4.8
San Diego	1,950	7.0	4.0
Denver-Boulder	1,949	4.3	0.5
Baltimore	1,701	6.2	1.5
Minneapolis-St. Paul	1,441	4.1	1.7
U.S. average	$1,060	6.8%	1.8%

SOURCES: Prime contract data from the Bruton Center for Development Studies, University of Texas at Dallas. Employment data from the Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, September 1991.

more in line with those of competitors elsewhere.[39] Keep in mind, however, that compensating growth takes time, and that some segments of the population will suffer reduced incomes during the period of adjustment. Also, defense cuts could cause another kind of loss in some local economies. For example, in Los Angeles, the cutbacks could aggravate the growing income inequality in the region. In the 1980s high-and low-paying jobs have grown in number while those in the middle have decreased. Because the majority of defense jobs in Los Angeles pay middle wages, defense cuts could worsen this income and opportunity inequality. Los Angeles is home to a large and rising number of immigrants, many possessing low-level skills. Without the good manufacturing jobs provided by defense (or other industries), opportunities for the poor and immigrants will become scarcer. The pattern of increasing disparity in pay may create a community polarized into haves and have-nots.[40]

In depressed or less congested metropolitan areas, defense cuts could have serious effects on the local economy as a whole. Cities like Baltimore, Buffalo, Cincinnati, and St. Louis already have labor surpluses, relatively low-cost housing, and less traffic congestion. Defense spending cuts could simply enlarge the supply of resources that are already under-used.

Many of these older industrial areas may face the additional drawback of layoffs that disproportionately affect blue-collar workers, who generally have a harder time than more highly educated workers in finding replacement jobs. For example, a study of defense cuts in Maryland estimated that Baltimore would have a harder time adjusting to defense cuts than the Washington, DC suburbs because the former's work force is heavily blue-collar.[41] The higher concentration of engineers and other white-collar workers in suburban Montgomery County, MD would ease community adjustment.

Considering the high cost of doing business in areas such as Long Island, Los Angeles, and Washington, DC, why have defense firms not already moved to lower cost locations? Indeed, some have. Lockheed Aerospace Division recently moved to Marietta, GA from its birthplace in Burbank, CA. Hughes and several other aerospace companies in Los Angeles have moved some small production

[39]Richard Barff, "Living by the Sword and Dying by the Sword: Defense Spending and New England's Economy in Retrospect and Prospect," op. cit., p. 24.

[40]Los Angeles Economic Roundtable, *Attachment 8: Employment and Wage Trends in Los Angeles County*, Feb. 22, 1991.

[41]Marie Howland, "The Costs of Job Loss for Stable Workers: Implications for Defense Cutbacks in Three Counties of Maryland," in *The Defense Budget and the Maryland Economy*, Bureau of Governmental Research, School of Public Affairs, University of Maryland, (College Park, MD: 1990).

Table 6-6—Metropolitan Areas Receiving Most Prime Contract Awards Per Employed Worker, 1989

Metro area	Prime contracts per employed worker	Annual cost of traffic congestion per capita, 1988	Median housing prices (thousands)
San Jose	$4,590	$650	NA
Washington, DC	3,863	570	$150
St. Louis	3,850	180	77
Boston	2,863	440	174
Cincinnati	2,778	150	80
Dallas-Fort Worth	2,776	410	89
Nassau-Suffolk Counties	2,691	370	161
Hartford, et al.	2,666	na	157
Los Angeles-Long Beach	2,234	620	213
Anaheim, et al.	2,164	620	242
Seattle-Everett	2,127	490	142
San Diego	1,950	260	183
Denver-Boulder	1,949	260	86
Baltimore	1,701	270	106
Minneapolis-St. Paul	1,441	180	89
U.S. average	$1,060	$290	$ 95

SOURCES: Prime contract data from the Bruton Center for Development Studies, University of Texas at Dallas. Employment data from Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, June 1990. Data on cost of traffic congestion from Texas Transportation Institute, *Roadway Congestion in Major Urbanized Areas 1982-1988* (College Station, TX: Texas A&M University, 1990). Data on housing prices from the National Association of Realtors, Washington, DC. All data are based on national averages for 1990 and reflect median home prices.

facilities to smaller cities, generally in the South and West.

Yet, despite the occasional relocations, southern California and other high-cost areas remain attractive, especially for defense R&D, management functions, and high value-added and skilled production. Los Angeles in particular is a vast regional complex oriented to defense production where the major contractors, suppliers, consultants, universities, skilled technical workers, research centers, and government installations provide a rich interdependent environment that makes it difficult for any one firm to leave.[42] The same considerations apply in Boston, Long Island, and Washington, DC.[43]

These areas possess strong agglomeration economies (savings that firms experience from locating near a concentration of activities related to the firm) and are likely to possess an advantage in weathering defense cuts.[44] For example, Scott and Gauthier found that when defense and space expenditures (missiles and aerospace) were increasing, other areas gained more employment than southern California.[45] But in times of decline, southern California's defense missile and aerospace industry did better.

MILITARY BASE CLOSINGS AND REALIGNMENTS

From 1991 to 1997, 173 military installations are slated for closure or realignment (reduction in personnel). On December 29, 1988 the first Commission on Base Closures and Realignments released its list of 86 domestic military installations that DoD will close from 1991 to 1995; the commission recommended reducing personnel at 5 additional bases.[46] The 1991 Defense Base Closure and Realignment Commission recommended clos-

[42]Allen J. Scott and Donald J. Gauthier, "The US Missile and Space Industry: Genesis, Growth and Locational Structure, with Special Reference to Southern California," Department of Geography, University of California -Los Angeles, 1991; also Ralph Vartabedian, "Aerospace Moves: Hidden Costs Often Negate Gains," *Los Angeles Times*, Mar. 3, 1991. p. A21.

[43]Ann Markusen, et al., *The Rise of the Gunbelt*, op. cit.

[44]Edwin S. Mills, *Urban Economics* (Glenview, IL: Scott, Foresman and Co., 1980); also Nancy Ettlinger, "Development Theory and the Military Industrial Firm," in *The Pentagon and the Cities, Urban Affairs Annual Reviews*, A.M. Kirby (ed.), vol. 40, fall 1991.

[45]Allen J. Scott and Donald J. Gauthier, "The US Missile and Space Industry: Genesis, Growth and Locational Structure, with Special Reference to Southern California," op. cit.

[46]U.S. Defense Secretary's Commission on Base Realignment and Closure, *Base Realignments and Closures: Report of the Defense Secretary's Commission* (Washington, DC: 1988).

ing an additional 34 bases and realigning 48 more. When Congress did not adopt a joint resolution in opposition to either commissions' recommendations, the Secretary of Defense was required to take action. In 1993 and 1995, future commissions will make additional, but probably fewer, recommendations for base closures.

The impacts from military base closings should be relatively mild. First, the 173 installations scheduled to be closed represent less than 4.5 percent of the 3,800 DoD installations in the United States. Second, the local multiplier effect from base closures is usually lower than for defense industry cutbacks.[47] Third, because most military personnel, many base civilian workers, and their family members and dependents are normally transferred to other bases, the impact on local unemployment rates is less than from contractor cutbacks (i.e., they do not swell the numbers of the local jobless).[48] Fourth, compared with defense industry cutbacks, communities usually have greater lead time to plan for base reuse and other economic development activities. With the exception of Pease AFB in New Hampshire, which closed in February 1991, all Round One closures were announced at least 4 years in advance. Lead time for Round Two closures is generally less, with nine facilities scheduled to close in September 1993, 2 years after announcement. But eight will not close until 1994, and 16 will remain open until 1995 or after.

Finally, communities are often left with valuable real estate (e.g., land, buildings, air strips, housing) or open space, the use of which can help ease economic adjustment.[49] Cameron Station in Alexandria, VA, Fort Sheridan in Chicago, the Presidio in San Francisco, and Fort Meade in Maryland are all examples of installations on the closure list that can provide the host communities with open space or developable land. According to Henry Howard, deputy city manager of Alexandria, VA, the city has been hoping for years that Cameron Station would be closed, even though 4,700 jobs will be lost.[50] The city is anxious to use the land for housing and commercial development and to get the land back on the city tax rolls, from which the base is exempt. Valued at $140 million, the land has strong development potential.

Because it is still early in the process, few civilian reuse agreements have been signed. However, successful reuse can mitigate the impacts of closure. One advantage to closing bases through commissions, with Congress confining itself to one yes-or-no vote on *all* the commissions' recommendations, is that decisions to close bases are final. Most communities do not spend valuable time and energy fighting the actions, as they did in earlier closures. Now they get on with the hard work of economic development.[51] All of these factors make base closures less traumatic than defense contractor cuts that, on the face of it, affect the same number of job holders.

Few of the base closures will have significant employment impacts on the local communities. Of the 91 facilities selected for closure in the first round, 52 are stand-alone housing units with virtually no employment impacts, and another 16 will displace fewer than 10 jobs each. The second round closures are more significant, but many are in large cities where the impacts are likely to be less than in small towns. For example, while approximately 4,000 positions will be eliminated at the Naval Air Station

[47]Defense contractors normally pay higher wages than military bases, where most of the personnel are active duty service members. Second, military personnel purchase much of their goods and services on the base, and the employment generated is of military and civilian personnel who are more likely to leave the area when the base is closing. Third, defense contractors often support a web of subcontractors within the region. Donald Hicks, *Leveraging the Nation's R&D and Defense Investments in the Metroplex Regional Economy*, (Dallas, TX: Regional Technology Program, North Texas Commission, July 1988.) These factors mean that the number of additional jobs created by defense spending is higher for industrial contractors than for bases. Edward J. Malecki and Lois M. Stark, "Regional and Industrial Variation in Defense Spending: Some American Evidence," in Michael J. Breheny, *Defense Expenditures and Regional Development* (New York, NY: Mansell Publishing Ltd., 1988); John Rees, Bernard L. Weinstein and Harold Gross, *Regional Patterns of Military Procurement and Their Implications* (Washington, DC: The Sunbelt Institute, 1988).

[48]DoD found that on average 20 percent of civilian workers displaced from military bases retire, 60 percent relocate and only 20 percent enter the local labor market. Commission on State Finance, *Defense Spending in California: Impact on California* (Sacramento, CA: California State Legislature, 1990), p. 43. See also Darwin W. Daicoff, "The Community Impact of Military Installations," in *The Economic Consequences of Reduced Military Spending*, Bernard Udis (ed.) (Lexington, MA: Lexington Books, 1973).

[49]The National Association of Installation Developers, composed of organizations that have taken over closed military bases, holds an annual conference and provides information on how best to reuse closed military bases.

[50]Many of these positions are being transferred to Fort Belvoir, located about 20 miles away in northern Virginia.

[51]U.S. Department of Defense, Office of Economic Adjustment, *Economic Adjustment/Conversion*, op. cit.

at Moffett Field south of San Francisco, the closure will eliminate no more than 0.5 percent of the total jobs in the area because the local economy is so large. Cities such as Chicago, Denver, New York, Sacramento, Seattle, and Washington are all large enough that base closures will probably have little impact on the local economy (see table 6-7).[52]

In some communities, however, the impacts are potentially large. Bases constitute a significant part of the local economy in places such as Oscoda, MI (Wurtsmith AFB); Leesville, LA (Fort Polk); Blytheville, AR (Eaker AFB); Aroostook County, ME (Loring AFB[53]); and Monterey, CA (Fort Ord).[54] More than 11 percent of Monterey County's employment is dependent on Fort Ord, while Wurtsmith AFB supports over 20 percent of the jobs in Michigan's Iosco County, the base closing area that is at the top of the list in defense dependence. The impacts in some particular towns may be higher. In Champaign County (IL), population decline resulting from the closure of Chanute AFB may reach 9 percent, while the decline in the village of Rantoul, where the base is located, could be greater than 50 percent.[55] The effects on local businesses and the city government could be disastrous.

To minimize the impacts, prompt disposal and reuse of base property are critical. If title to the base is transferred to new owners at least 1 year before the actual closure, development can be set to begin immediately after closure. However, this process often does not work smoothly. Signs of delay are already visible in Round One of the current base closures. This is not a new problem. When the General Services Administration (GSA) was responsible for base disposal in the 1960s and 1970s, many communities criticized the agency for delays and unrealistic demands in negotiated sales.[56] DoD is now responsible for transfer of the bases to be closed. But, except for DoD's Office of Economic Adjustment (which is responsible for helping communities facing base closures), DoD personnel are perhaps not fully aware of the importance of prompt disposal to community economic health.

Several factors suggest there are still serious obstacles in the way of rapid transfer of property at a reasonable price. First, before offering the property to State and local governments, DoD must offer the property to other Federal agencies and have it screened for possible use by the homeless. The entire process can take considerable time. It is further slowed by a Department of Housing and Urban Development (HUD) policy that prohibits screening of property for use as homeless shelters until 18 months or less before vacancy and requires 3 months for review. The result is that DoD is often unable even to approach State and local governments until about 1 year before closure.

Second, and more serious, are the environmental problems at some bases, which threaten to delay civilian reuse and make it more costly. Most DoD facilities have environmental problems; some may be beyond remediation. Sources of pollution include hazardous wastes from machinery use and the handling of fuel, solvents, and explosives. Of 61 major bases to be closed in the first two rounds, 15 are on the Environmental Protection Agency (EPA) Superfund list of hazardous waste sites most in need of cleanup. At least 52 bases have some contaminated areas, totaling over 935 sites.[57]

For bases due to be closed, the problems of environmental degradation are especially urgent. These problems can greatly limit the options available; they pose health hazards to people who might work in new facilities on the closed base, and they scare off companies that might otherwise set up new operations there. Companies are worried not only by

[52]A study by the Arms Control and Disarmament Agency in the 1960s found that metropolitan areas made the transition following base closure with relative ease.

[53]For more information on the impacts of the closure of Loring, see Daryl A. Hellman and Gregory H. Wassall, "Estimating the Economic Impact of Military Bases and Base Closings: Loring Air Force Base, Maine," *The New England Journal of Business and Economics*, vol. 8, No. 2, spring 1982, pp. 5-24.

[54]It is important to note that the purpose of the analysis is not to identify particular communities that are likely to have more difficulty in responding to the closure of bases. More detailed information would be needed to do this. However, the information here does allow an estimation of the number of bases that will experience more significant impacts.

[55]"Economic Impact Report of the Proposed Closure of Chanute AFB on the Village of Rantoul," Dan Spiegal, Department of Urban and Regional Planning, and Geoffrey Hewings, Department of Geography, University of Illinois, Urbana-Champaign, May 1, 1991.

[56]Roger Bolton, "Impacts of Defense Spending on Urban Areas," in *The Urban Impacts of Federal Policies*, N. J. Glickman, (ed.) (Baltimore: Johns Hopkins University Press, 1980, pp. 151-174.

[57]Defense Environmental Restoration Plan Annual Report to Congress, DoD, 1990.

Table 6-7—Military Base Closures and Realignments With the Greatest Economic Impacts

Base	County or *metropolitan statistical area*	State	Unemployment rate 1990	Job growth 1986-90	Total civilian job loss[a]	Loss as a percentage of local employment[b]
Wurtsmith AFB	Iosco	MI	8.8	4.9	2,127	20.9
Grissom AFB	Miami	IN	5.9	–1.0	2,306	15.9
NAS Chase Field	Bee	TX	9.1	0.0	1,573	15.3
Fort Polk	Vernon	LA	7.4	2.0	1,989	11.4
Eaker AFB	Mississippi	AR	13.1	1.2	2,173	11.2
Fort Ord	*Salinas*	CA	8.8	2.2	15,998	10.9
Loring AFB	Aroostook	ME	6.5	1.8	2,985	8.1
Castle AFB	Merced	CA	11.0	1.0	4,982	7.7
Myrtle Beach AFB	Horry	SC	6.5	2.4	3,966	5.7
England AFB	*Alexandria*	LA	6.4	–0.1	2,916	5.4
Fort Chaffee	*Fort Smith*	AR	7.5	1.5	3,377	3.9
Chanute AFB	*Champaign*	IL	3.9	1.9	3,039	3.4
Fort Devens	*Worchester*	MA	6.3	0.4	5,250	2.6
Pueblo Depot	Pueblo	CO	8.2	3.5	869	1.7
Pease AFB	*Portsmouth*	NH	4.2	2.9	2,150	1.6
NUSCD New London	New London	CT	3.7	–0.2	1,784	1.5
Sacramento			4.8	3.9	9,870	1.4
Army Depot	*Sacramento*	CA			6,653	0.9
Mather AFB	*Sacramento*	CA			3,217	0.5
Philadelphia			4.6	1.0	29,750	1.3
NSY Philadelphia	*Philadelphia*	PA			19,928	0.9
NADC Warminister	*Philadelphia*	PA			4,202	0.2
NAVSTA Philadelphia	*Philadelphia*	PA			3,899	0.2
Fort Dix	*Philadelphia*	NJ			1,185	0.1
Philadelphia Hospital	*Philadelphia*	PA			536	0.0
San Francisco			3.3	1.0	10,400	1.2
Presidio SF	*San Francisco*	CA			7,584	0.9
Hunters Point NS	*San Francisco*	CA			2,665	0.3
Hunters Point Annex	*San Francisco*	CA			129	0.0
Hamilton AAF	*San Francisco*	CA			22	0.0
Lexington Depot	*Lexington*	KY	3.0	3.1	2,284	1.2
Riverside			6.6	6.0	10,901	1.1
Norton AFB	*Riverside*	CA			6,978	0.7
George AFB	*Riverside*	CA			3,923	0.4
Bergstrom AFB	*Austin*	TX	4.6	1.1	4,248	1.0
Lowry AFB	*Denver*	CO	4.6	0.4	8,602	1.0
U.S. average			5.5	1.8		

[a]Civilian job loss is the number of civilian jobs lost directly at the base plus the indirect loss of jobs generated by military and civilian pay. Multipliers used for calculating indirect job loss were obtained from the Office of Economic Adjustment, DoD. Direct military job loss was not counted since these individuals are normally transferred to other locations and hence do not add to the local unemployment rolls.

[b]Because counties do not always include the total population in the local labor market, these figures may overstate the degree of defense dependency, particularly for the counties with small populations. However, the figures give a sense of relative defense dependency.

SOURCES: Unemployment data from Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* May 1987 and May 1991. Base closure data by the Defense Base Closure and Realignment Commission and by the Base Closure Office, Office of the Secretary of Defense, DoD; also *Base Realignments and Closures: Report of the Defense Secretary's Commission* (Washington DC: December 1988) and *Defense Base Closure and Realignment Commission: Report to the President, 1991* (Washington, DC: 1991).

the danger to their employees, but also by the financial risk of taking on liability for future cleanup costs.

Equally significant are the delays in reuse from environmental cleanup. When a toxic chemical is widely dispersed in small quantities, collecting the contaminated material and extracting it is a laborious job. For groundwater, the prevalent method of treatment is to pump the water to the surface and treat it to destroy or extract the pollutants. This can take decades. In some cases the rate of extraction from complex aquifers is slow and in others, the pollutants cannot readily be extracted because they don't flow with the pumped water.

In addition to technological obstacles are institutional ones. DoD is still in the early stages of assessing environmental problems at bases on the closure list. At the current rate of cleanup, few bases will be cleaned before they close. For example, of the 15 closing bases on the EPA national priorities

Table 6-8—Military Bases Scheduled for Closure on the EPA National Priorities List

Facility	Begin remedial investigation and feasibility study	Complete remedial investigation and feasibility study	Estimated date for completion of remedial action
Fort Devens	5/91	1996	3/98
Loring AFB	1/91	1997	6/99
Pease AFB	12/90	1994	3/97
NCBC	4/91	Negotiating	11/99
Aberdeen/Nike Facility	3/90	1995	N/A
Alabama Ammunition Plant	5/90	1994	Late 1996
Castle AFB	7/89	1995	2005
Fort Ord	7/90	1997	2003
George AFB	9/90	1994	2004
Hunters Point	9/90	1994	2000
Mather AFB	7/89	1994	2004
Moffett NAS	8/89	1997	2008
Norton AFB	6/89	1993	2003
Sacramento Army	12/88	1996	1998
Williams AFB	9/90	1994	11/96

SOURCE: Stephen Lipmann, background analysis for the Office of Technology Assessment, Oceans and Environment Program, November 1991.

"Superfund" list, none are scheduled to be cleaned up before late 1996 and many not until early in the next century, years after the date of closure (table 6-8).

Adequacy of funds for cleanup is still another problem. Local community representatives at the closing bases are concerned about this matter. At Chanute AFB in Illinois, for example, 800 buildings, many of which are important to redevelopment plans, must be checked and treated for asbestos all at once—an expensive proposition.[58] The government of the nearby town of Rantoul is pleased with the Air Force's speed in tackling this problem and also in identifying, and in most cases removing, the underground storage tanks that pepper the base. But they are not reassured to know that the work will proceed only as uncertain funds allow.

In 1984, Congress established the Defense Environmental Restoration Program (DERP) to clean up the mess at military bases.[59] A separate appropriation, the Defense Environmental Restoration Account (DERA), is the source of funds for cleanup. The account spent $601.3 million in fiscal year 1990, and is funded at $1.1 billion in fiscal year 1991. DoD estimates of the total costs of DERP have risen from $9 to $14 billion in early 1990[60] to $30 billion,[61] and other estimates range much higher.[62] DERA funds can be used for bases closed during the second round, but a separate Base Closure Account (BCA) is the exclusive source of funds for environmental restoration projects at bases closed in the 1988 round. BCA funds, for which Congress authorized $100 million in fiscal year 1991, can also be used for Round Two closures.

The major environmental laws that regulate the disposal and cleanup of dangerous material were in place and DERA established before the possibility of wide-scale military base closures had arisen. Neither deals explicitly with the implications of the base closures. In consequence, the goals of ensuring the prompt reuse of a base sometimes clash with the priorities dictated by environmental laws.[63]

One of the most important issues is whether DoD can dispose of part of a base while retaining for further environmental work other parts that are still contaminated. Without this dispensation DoD will be hard pressed to sell many of the facilities it is closing, as most have waste sites within their often extensive boundaries that are unlikely to be cleaned up before closure.

[58]Mike Little, lawyer for the Village of Rantoul, IL, personal communication, June 25, 1991.

[59]Defense Environmental Restoration Program, *Annual Report to Congress for Fiscal Year 1990* (Washington, DC: Department of Defense, February 1991), p. iv.

[60]Ibid., p. 30.

[61]"Toxic Cleanup Stalls Transfer of Military Sites," *New York Times*, June 30, 1991, p. 1.

[62]Keith Schneider, "Military Has New Strategic Goal in Cleanup of Vast Toxic Waste," *New York Times*, Aug. 5, 1991, p. A1.

[63]Bob Carr, EPA Enforcement Division, personal communication, July 13, 1991.

Section 120h of CERCLA/SARA, the relevant passage of the Superfund law, is unclear on this point of "parcelling" land.[64] EPA claims that to read it as forbidding any division of the property into clean and unclean for transfer may be overly strict, but the military services are wary of running the risk of being taken to court by anyone wishing to hold up the closure and transfer of bases on these grounds.[65]

Environmental problems are in fact obstructing the process of base closure and transfer at a number of bases.[66] Pease AFB in New Hampshire has attracted particular attention because it is the first of the bases on the closure list actually to be closed and the reuse process has gone further than elsewhere. A State body, the Pease Development Authority, has been set up to act as the agent of transfer and has been negotiating with Deutsche Airbus, a German aircraft company and partner in Airbus Industrie, which wants to use Pease AFB for aircraft maintenance operations, the same purpose for which the military used it. The base is contaminated with solvents, pesticides, paint strippers, and fuel on about 100 of its 4,400 acres.[67]

Deutsche Airbus wants a parcel of 50 acres that provides access to the runway and contains a large hangar crucial for its plans. Some of the land in this parcel is known to be contaminated and some is thought to be clean, although this is not certain.[68] The deal has been held up by uncertainty over the legal propriety of transferring contaminated ground. Originally the expectation was that the property would be sold, but this was deemed impossible with the environmental investigation still underway. The next approach, a "parcel within a parcel," with the transfer only of uncontaminated parts of the 50 acres, including the area of the hangar, and lease of the rest, ran into problems when the Air Force discovered contamination near the hangar. The latest approach is just to transfer the hangar building and to lease the land, including that under the hangar, until the cleanup is done. (Box 6-A describes a similar solution for Norton AFB in California.) An agreement was under negotiation in late 1991, and there were signs that it would succeed. However, if the Air Force cannot allow reuse of Pease AFB until cleanup, the reuse will very likely be delayed until the next century.[69]

Many factors determine the economic impact on particular localities of cuts in defense spending. The size of city, the speed and extent of spending cuts, the nature of the military spending, and the health and structure of the local economy all combine to make the impacts of the defense build-down highly variable from place to place. Table 6-9 outlines best and worst-case scenarios for communities affected by defense spending cuts; particular places may be weak in some factors but these drawbacks may be offset by strengths in other factors. For example, Los Angeles is at a disadvantage because it is more highly defense dependent than many areas. However, the regional concentration of skills, experiences, and brain power—agglomeration economies—could work to offset the disadvantages.

MITIGATING THE COMMUNITY IMPACTS OF REDUCED DEFENSE SPENDING

Economic development efforts have the potential to lessen adverse impacts of defense cuts on communities. Because reductions in defense spending affect communities in much the same way as cutbacks or closures of any industrial activity, it is useful to examine how economic development programs established for more general purposes have worked.

Governments use a wide range of policy tools to promote economic development (box 6-B). Some focus directly on business development, with policy

[64]Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) require that any deed for the transfer of property owned by the United States to any other person or entity contain "a covenant warranting that all remedial action necessary to protect human health and the environment with respect to any such substance remaining on the property has been taken before the date of such transfer." The covenant must also warrant that the United States will take "any additional remedial action found to be necessary after the date of such transfer." Superfund Amendments of 1986 Sec. 120 (Federal Facilities, (h)(3)(B)(i)).

[65]Information provided by EPA Enforcement Division, July and August 1991.

[66]Congress has established an Environmental Response Task Force to make recommendations by October 5, 1991 concerning ways to improve interagency coordination of environmental response actions at military installations.

[67]DERP, Report to Congress 1991.

[68]EPA Enforcement Division, op. cit.

[69]Information provided by OEA, July 1991.

Table 6-9—Factors in Commmunity Economic Impacts From Defense Cuts

Best-case community	Worst-case community
Size of the cut is small relative to the local economy	Size of the cut is large relative to the local economy
Cuts occur slowly	Cuts occur quickly
Community has ample notice	Community has no notice
Cuts occur in military bases	Cuts occur in private defense industry
Cuts occur in plants where defense is a small share of production	Cuts occur in plants with no civilian production
Growing national and regional economies	Stable or declining national and regional economies
Growing local economy	Stable or declining local economy
Cuts occur in large, metro areas	Cuts occur in smaller places
The local economy was congested	The local economy was not congested

SOURCE: Office of Technology Assessment, 1991.

tools that include business financial assistance, small business incubators, technology transfer, technical assistance, manufacturing extension services, and export assistance. Other policy tools support infrastructure and other public improvements that will lead to economic development, including industrial and research parks, site conversion, and tourism development. Still other efforts focus on increasing the skills of the work force, including technical and on-the-job training. Finally, economic development agencies can market their communities, using such means as industrial recruitment and trade missions, to bring in new businesses or expand the markets of area firms.

The New Economic Development Environment

Because the last major round of defense cuts occurred in the 1970s, many look to the experiences of communities affected then to draw lessons for today. However, major changes in the environment for economic development have intervened so that lessons should not be applied uncritically.

Since the early 1970s, the U.S. economic environment has become harsher, making it more difficult for many communities to replace lost jobs. Formerly, economic development problems were usually isolated, affecting particular towns or poor areas. But in the past two decades, the U.S. economy has increasingly faced tough international competition, lower levels of economic growth, declining manufacturing employment, structural decline of many industries, and large trade and budget deficits. All these combine to make the current economic environment much less forgiving than it was before the first oil shock in 1973.[70] For example, the average unemployment rate from 1965 to 1972 was 4.75 percent; during the economic growth period of 1984 to 1990, unemployment averaged 6.2 percent.[71] Manufacturing employment increased throughout the 1970s, reaching its peak in 1979 but falling 9.4 percent since then.

Changing fortunes of regional economies also influence the effects of the defense build-down. Recent difficulties of particular industries have had significant regional economic consequences. For example, the fall in oil and gas prices contributed to a regional recession in the West South Central area. The earlier decline in lumber and wood products had serious consequences for the Pacific Northwest. The difficulties in steel, autos, tires, and other durable goods industries slowed growth in the Midwest and Middle Atlantic States (although this region is likely to fare better in the defense build-down than others because it is less defense-dependent). Currently, the regional recession in computers, microelectronics, finance, and banking in the Northeast is compounding the difficulties of adjusting to defense cuts there. These extra strains in the national and regional economic environments may make successful adjustment to reduced military spending more difficult than it was in the 1960s or 1970s.[72] Regional strains mean that more communities now compete for new

[70]U.S. Congress, Office of Technology Assessment, *Paying the Bill: Manufacturing and America's Trade Deficit* (Washington, DC: U.S. Government Printing Office, June 1988).

[71]Calculations made from data in U.S. Department of Labor, Bureau of Labor Statistics *Employment and Earnings*, various issues.

[72]Floyd and Robertson found that the strong economy of the Coastal Plains region in the southeastern United States greatly facilitated the adjustment to losses of large numbers of military personnel in the region from 1967 to 1972. Charles F. Floyd and Terry D. Robertson, "The Impact of Military Force Reductions on the Coastal Plains Region," *Growth and Change*, vol. 6, No. 2, 1975, pp. 3-8.

Box 6-B—Selected Types of Economic Development Programs

Capital

Industrial revenue bonds
Direct loans
Loan guarantees
Interest subsidy programs
Pension fund investments
Venture and seed capital
Foreign trade zones
Enterprise zones
Tax credits and deductions
Grants and incentives
Export financing
Tax abatements and concessions
Tax increment financing

Technology

Research centers
University research grants
Business research grants
Technology transfer programs
Industrial extension services
Industrial network support
Flexible manufacturing centers
Manufacturing service centers

Labor

Employee training/retraining
Technical training
On-the-job training
Primary/secondary school reforms
Math/Science high schools
Dislocated worker centers

Management

Community and site profiles
Entrepreneurial training
Management assistance
Procurement assistance
One-stop business center
Plant visitation programs
Labor management committees
Quick response teams
Employee buyout assistance
Business councils
Ombudsperson

Land

Land write-downs
Industrial parks
Research parks
Speculative buildings
Incubators
Physical infrastructure improvements
Land banking
Building rehabilitation
Site conversion

Marketing

Advertising and marketing
Recruitment missions and offices
Trade missions
Tourism promotion
Export assistance
Export trading companies
Procurement outreach programs

business and new jobs.[73] The intense competition makes it that much harder for any given community to attract new economic activity.[74]

Finally, communities that in the 1970s could depend on the Federal Government for significant economic development support must now rely much more on themselves and their State governments. The Federal Government now spends significantly less on economic development than it did 15 years ago. States and cities have taken the lead in the 1980s, but budget difficulties are reducing their capacity to act in the early 1990s.

The experience of four defense-dependent communities studied by DoD's Office of Economic Adjustment illustrates the differences between the two periods.[75] Federal efforts played a large role in

[73]Alan Gregerman, *Competitive Advantage: Framing a Strategy To Support High Growth Firms*, (Washington, DC: National Council for Urban Economic Development, 1984); see also Robert Guskind, "Games Cities Play," *National Journal*, March 18, 1989, pp. 634-640.

[74]For example, in 1988, an estimated two-thirds of the States devoted over 25 percent of their economic development efforts to industrial attraction, while one-third devoted over 50 percent to it. *1988 State Economic Development Expenditure Survey*, (Washington, DC: National Association of State Development Agencies, 1989); see also Roger Wilson, *State Business Incentives and Economic Growth: Are They Effective? A Review of the Literature* (Lexington, KY: The Council of State Governments, 1989).

[75]Office of Economic Adjustment, DoD, *Economic Adjustment/Conversion* (Washington, DC: July 1985), app. K.

helping three of the communities adjust to defense cuts in the early 1970s. One of these was Wichita, KS, where, in response to defense cutbacks at the Boeing aircraft company, a Federal Interagency Economic Adjustment Committee team of 22 professionals traveled to the site and wrote a report detailing 48 development actions that could improve the local economy. The Federal Government then spent $20 million between 1971 and 1975 to implement the recommendations. That translates into $53 million in 1991 dollars—more than the extra $50 million that Congress provided in 1990 for all economic development assistance to defense-affected communities over the next 3 years.[76] The main recommendations for Wichita in the 1970s were to develop the Kansas Coliseum, implement a drainage improvement project, and put in place sewer and water improvements. Wichita's unemployment rate fell from 14 to 6.5 percent the year following the layoff, but in the process approximately 20,000 people, including 7,000 technical workers, moved to other areas.[77]

In contrast, when the 1,000-employee Fairchild facility closed in 1984 in Hagerstown, MD, the Federal Government's role was minimal. Beyond a small planning grant from the Federal Economic Development Administration (EDA), the community and the State were responsible for economic development. The effort was successful. One of the two Fairchild facilities was bought by Rohr Industries, which currently employs approximately 500 people in bonding of composites for use in military aircraft. Fairchild donated the second facility to the State, which sold it to a private developer. The building is now a multipurpose air/industrial park that employs about 350 people. The State played a critical part in attracting Citicorp to Hagerstown, where the company now employs 1,500. Maryland's large and successful role in this community reflects the increased importance of State economic development in the 1980s. The Hagerstown story is quite typical of the time; it illustrates the contrast between the dominant Federal role of the 1970s (as in Wichita) and the stronger State and local roles of the 1980s after the dramatic decline in Federal funding for economic development. (See table 6-10.)

Economic development funding was only part of the Federal contribution toward helping communities respond to defense cuts in the 1970s. Many communities relied on Federal grants for highways, sewer and water systems, airports, municipal construction, and other infrastructure. These funds have become scarce today as Federal grants in aid to State and local governments declined from $133 billion in 1978 (in 1988 dollars) to $92.5 billion in 1988.[78] As John Lynch, a former OEA official, argues: "Today, there are few remaining community adjustment tools at the Federal level for dealing with major economic dislocations—even for reinforcing State plant closure adjustment efforts."[79]

Federal Programs To Assist Defense-Dependent Areas

Some Federal programs that States and cities can turn to for economic development support remain, although most are poorly funded. Also, as noted, Congress authorized an extra $50 million for defense-related community adjustment efforts to be spent by EDA through the Title IX Sudden and Severe Economic Dislocation Program in fiscal years 1991-93. As of November 1991, however, the funds were not yet available for EDA to spend.

DoD's Office of Economic Adjustment

The Federal agency most responsible for organizing a Federal response to community disruption brought about by military cutbacks is DoD's Office of Economic Adjustment (OEA). OEA was created in 1961 "to assist in meeting those unemployment and other economic problems of communities affected by the termination of military bases." Currently, it helps communities develop plans for adjusting to defense industry cutbacks as well as military base closures. It also staffs the President's Economic Adjustment Committee (EAC). The EAC, formed in 1970, is an interagency organization of 18 Federal departments and agencies that is chaired by the Secretary of Defense and staffed by OEA. EAC

[76]Defense Authorization Act of 1990, Public Law 101-510, Sec. 4103.

[77]Office of Economic Adjustment, *Economic Adjustment/Conversion*, op. cit.

[78]*Significant Features of Fiscal Federalism, 1989 Edition, Volume II* (Washington, DC: Advisory Commission on Intergovernmental Relations, August 1989), p. 18; also Peter K. Eisinger, *The Rise of the Entrepreneurial State* (Madison, WI: The University of Wisconsin Press, 1988), p. 68.

[79]John E. Lynch (ed.), *Plant Closures and Community Recovery* (Washington, DC: National Council for Urban Economic Development, January 1990), p. 3.

Table 6-10—Federal Funding for Economic Development, 1978 to 1990
(millions of 1990 dollars)

Program	Funding 1978	Funding 1990	Percent reduction
Economic Development Administration	$ 957	$ 216	79%
Economic Adjustment Program (Title IX)	137	24[a]	82
Department of Housing and Urban Development			
Community Development Block Grants	6,373	2,914	54
Urban Development Action Grants	728	0	100
Total Community and Regional Development[b]	$14,800	$6,398	57
Small Business Administration	6,327	928	85

[a]The regular appropriation for the Title IX program in 1990 was $24 million and for the Sudden and Severe Economic Dislocation program within Title IX, $12 million. These amounts were augmented by a special appropriation of $24 million to help communities damaged by Hurricane Hugo.
[b]Total includes other economic development programs not listed above. It excludes disaster relief and insurance.

SOURCE: Office of Management and Budget, Executive Office of the President, *Budget of the United States*, (Washington, DC: 1979, 1991).

meets intermittently to discuss problems related to community impacts of defense spending changes and to coordinate Federal responses to these, when appropriate.

During the 1980s much of OEA's work was helping communities adjust to expansions of DoD activity. Its role in the 1990s will be the opposite, helping communities cope with economic disruptions caused by base closings or major DoD procurement reductions. During the late 1980s, OEA had a small annual budget of about $4 million. Its budget in the 1990s has been increased to deal with increased defense cuts. It received $7.4 million in fiscal year 1991 and $6 million has been allotted for fiscal year 1992, of which about $4.7 million will be granted to communities.[80]

Communities become eligible for OEA services in cases of a base closure or major realignment or when a reduction in DoD spending will result in the loss of 1,000 or more full-time DoD and contractor employee positions over a 5-year period. OEA funds planning studies (its grants average about $70,000), provides technical assistance, and acts as a liaison with the 18 member agencies of EAC (chiefly, the Departments of Labor and Commerce) and with State agencies. Because the planning grants are relatively small, OEA is able to provide at least minimal assistance to most communities affected by defense cuts.

OEA is staffed by competent professionals who appear to understand local and regional economic development, and it generally operates with enough flexibility to get the job done. For example, when Secretary Cheney announced the cancellation of the A-12 fighter program on a Thursday, on the following Monday an OEA representative was in Fort Worth (where a division of General Dynamics is located) meeting with the mayor and other local leaders to discuss the problems and see how OEA could help. If the agency were mired in red tape it could not have been so responsive.

Nevertheless, it is not clear that OEA's location within DoD is helpful. Some communities have complained that instead of serving as an advocate for their interests within DoD, OEA represents DoD's interests. Another complaint is that OEA tends to put the process of base closures in an overly optimistic light. In addition, because of its low profile within DoD, OEA has a hard time obtaining its share of the Department's resources. As more bases close, this issue may become more troublesome.

OEA's role vis-a-vis the White House Economic Adjustment Committee is unclear. Because it comes to the meetings as a representative of one among several Federal agencies, OEA has little authority to get other agencies to toe the line. It must rely on persuasion to get agencies to come forth with resources. In some cases, this has proven difficult.

Finally, OEA limits its assistance to planning efforts only. In a few cases where it has attempted to do innovative small-scale demonstration projects, DoD's legal counsel has limited its efforts. While OEA planning assistance is important, many communities have a critical need for funds to implement

[80]Office of Economic Adjustment, DoD, December, 1991.

plans. Indeed, planning money is sometimes overabundant while implementation goes unfunded. For example, Rantoul, IL received funds from OEA and private sources to fund three separate reuse and economic development plans for the closing Chanute AFB. Community officials say they know what is needed and would rather have been able to spend some of this money on efforts to create jobs.

Economic Development Administration, Department of Commerce

Communities seeking economic development assistance to compensate for the loss of the military market may draw on the resources of the Economic Development Administration (EDA), especially the Title IX Sudden and Severe Economic Dislocation (SSED) program. Areas that have had economic dislocations due to plant closings, layoffs, or base closings are eligible for grants to develop and implement an adjustment strategy, if the economic dislocation exceeds certain job loss thresholds for the area. Other EDA programs fund public works, technical assistance, and economic research. While funding is limited, these programs can be useful to defense-dependent communities.

EDA awards about 20 SSED strategy grants and an equal number of SSED implementation grants each year. SSED funds have supported a variety of efforts including economic development strategies, access roads for industrial plants, industrial parks, business revolving loan funds, and business incubators. In recent years, strategy grants have ranged from $25,000 to $200,000 and averaged $65,000; implementation grants have ranged from $25,000 to $2 million and averaged slightly more than $630,000. A minimum of 25-percent local share, cash or in-kind, is required. Funding for the program in fiscal years 1990 and 1991 was $12.3 million each year.[81]

In the Defense Authorization Act for fiscal year 1991 (enacted in October 1990), Congress authorized an additional $50 million for defense-related community adjustment efforts for the SSED program, to be made available over the next 3 years. However, as of November 1991, more than 1 year after the authorization, DoD had not transferred the money to EDA.[82] Once transferred, the money will remain available for obligation until September 30, 1993. Eligible communities are those experiencing an actual or threatened DoD-related work force reduction that meet regular SSED eligibility standards.[83]

To determine how well the SSED program is working and is likely to work for defense-affected communities, OTA interviewed a number of economic development and EDA officials and called officials of seven communities that had received SSED grants in the last 5 years. Their comments indicate that, as currently structured, the EDA program has some problems that threaten to reduce its usefulness.

Distressed communities often wait a long time for EDA funds. Because prompt response is a critical factor in community recovery to economic dislocation, delays can pose a significant problem.[84] EDA is not oriented to prompt response. In 1990, the median time between a community's proposing a project and EDA approval of the grant was 198 days.[85] However, the mean time was 292 days, indicating that some proposals took much longer. Five of the seven communities experienced delays of over 18 months between the time of application to EDA and funding. The worst delay involved a small city that experienced a series of plant closings in the early and mid-1980s. Because the city was not at first aware of the Title IX program, officials did not contact the regional EDA office until 3 years after the first layoffs. Thus, after waiting for over 1 year

[81]The Title IX program also received a special 1-year augmentation of $23.9 million to respond to Hurricane Hugo in 1990.

[82]DoD initially dragged its feet in transferring this money. More recently, differences of opinion between DoD and Department of Commerce legal counsels on technicalities have held up the transfer of funds. Department of Commerce lawyers argued that EDA did not have explicit legal authority to accept funds from DoD. The Defense Authorization Act for fiscal years 1992 and 1993 explicitly confers this authority.

[83]For communities not in Metropolitan Statistical Areas, the dislocation must amount to the lesser of 2 percent of the work force or 500 jobs if the unemployment rate exceeds the national average. Where the unemployment rate is below the national average, the thresholds are higher, at 4 percent or 1,000 jobs. For communities in Metropolitan Statistical Areas, the dislocation must amount to the lesser of 0.5 percent of the work force or 4,000 jobs if the unemployment rate exceeds the national average and 1 percent or 8,000 jobs where the unemployment rate is below the national average.

[84]Paul Dempsey, "EDA Title IX Community Adjustment Experience," in John Lynch, (ed.), *Plant Closures and Community Recovery* (Washington, DC: National Council for Urban Economic Development, 1990).

[85]The response time for projects related to Hurricane Hugo was somewhat shorter, with the median time of 148 days. (Data from the Economic Development Administration, U.S. Department of Commerce.)

for a response to its proposal, the city had to wait another 20 months to receive a small strategy grant. The EDA regional office then took another 11 months to approve the community's plan. The city then applied for the follow-on EDA implementation grant, but after waiting 14 months was turned down, in part because it was unable to target the funds to the workers dislocated nearly 5 years earlier, and in part because economic conditions had improved somewhat. The entire process took almost 8 years from the initial layoffs.

SSED funding delays have several causes. First, the approval process is cumbersome. Communities must first contact their State EDA representative and then their regional EDA office. The performance of regional offices appears to vary significantly. While some are staffed with experienced people, others have had staffing problems that delay responses. Moreover, communities complained that some regional offices saw their role as simply reviewing proposals rather than facilitating and streamlining the application process. Not only does this cause delays and elicit rounds of rejections and resubmittals, it leaves communities without needed technical assistance. For example, one small city has used its SSED grant to establish a revolving loan fund for local businesses needing capital to expand. However, city officials are unsure how best to operate the fund. While EDA has given them extensive "guidance" on the rules, they have been left to fend for themselves on determining how to make sure the fund benefits the local economy.

The approval process in the national office is usually better than at the regional level, but still encounters delays. According to one EDA official, regional offices formerly had greater authority over project selection, and the process was then less cumbersome. Over time, the Washington EDA office has become more involved in approvals and delays have become more common. According to one EDA official, the Inspector General's office in Commerce has sometimes sent back applications three and four times over small details.

EDA's requirement that communities develop an adjustment strategy before receiving an implementation grant can also delay the process. Communities come to EDA in crisis and need to get things underway quickly. While the community officials interviewed by OTA agreed that the process of developing strategies is helpful, some have already developed their strategies before coming to EDA. Moreover, in some cases the Office of Economic Adjustment has already provided funds for strategy development. If EDA is not flexible in its requirement to develop EDA-funded plans first before proceeding to implementation, funds will be wasted and needless delays will occur.[86]

EDA has demonstrated the capacity to respond quickly. In a pilot project, the agency once used a strike team approach similar to OEA's to respond to a plant closure in Arkansas. EDA officials flew to the town and within 3 days approved a grant. However, because EDA as an organization is not attuned to rapid response, the pilot-project approach has not been implemented in everyday practice.

EDA officials concede that some particular regional offices have problems in responding to communities, which they are working to correct. However, they also argue that the SSED program is not a quick response program and that therefore funding delays are not a serious problem. They suggest that SSED is not intended to help dislocated workers get jobs in the area they live in, nor is it intended to help distressed communities maintain former levels of economic activity. Rather, its purpose is to ease communities' problems of adjustment to economic distress.

When EDA assistance does arrive, communities are sometimes hindered from undertaking innovative economic development approaches. EDA appears more comfortable with traditional projects such as industrial parks. This may help explain the fact that the most delays occurred in projects that were least traditional (e.g., science parks, tourism strategy, plant modernization). EDA's roots are in the 1960s and 1970s, when it was formed to help the long-term development of lagging rural regions by use of traditional tools such as infrastructure development and industrial attraction. As the focus of economic development has shifted to distressed communities, EDA has been slow to integrate newer approaches, including "best practice" efforts such as technology centers, entrepreneurial development, and manufacturing modernization.

[86]In the one defense-related grant so far, EDA has provided a small $37,000 grant to the Southern Mississippi Planning and Development District to begin implementing an OEA-funded strategy to deal with cutbacks at the Army Ammunition Plant in Piccuine. The grant will pay for the collection of information related to marketing property in the area to outside firms.

Finally, repeated threats by the Reagan administration through the 1980s to eliminate EDA clearly aggravated the agency's problems. The uncertain and politically difficult environment contributed to reduced morale, lower staff quality, inadequate staffing levels, poor operation and administration of the program; and it led to the pursuit of low-risk policies.

Even if EDA were to improve its response time and acquaint itself more thoroughly with modern economic development efforts, its limited funding means that it can help only a fraction of the communities in need. EDA funds only 20 communities a year. Given the much larger number of distressed communities (some related to defense cutbacks, many others not), it appears that the demand for EDA funds could rise significantly. Even with the additional $50 million Congress provided to help defense-affected communities, the demand for funds is likely to exceed supply, particularly if the defense build-down proceeds more rapidly and economic growth continues to be sluggish.

Within present budget limits, one way to mitigate the mismatch of need and supply is to limit the number of communities applying. In effect, EDA does this. The agency has not used the plant closing information generated by the WARN legislation to market its programs to communities in need. Furthermore, by making it known that funds are unavailable, EDA officials discourage communities from applying in the first place. A more helpful way to ration EDA services would be to raise eligibility requirements so that only the neediest communities receive funds. Current threshold requirements of job loss still enable a large number of communities to qualify for assistance. Even communities with strong economies that might recover without public intervention often qualify.[87] Many communities that are more truly in need go without assistance due to lack of funds.

Despite the problems, EDA funds do help communities recover. All the community officials interviewed by OTA stressed how important EDA funding was to their recovery efforts. However, this appreciation was tempered with the desire for EDA to be run more efficiently.

Other Federal Programs

Another source of funds for community economic development is Community Development Block Grants, administered by the Department of Housing and Urban Development (HUD). The program allocates grants to entitlement communities (cities with more than 50,000 population) and to States for distribution to nonentitlement communities. Funds ($2.9 billion in fiscal year 1990) can be used for a variety of purposes including housing rehabilitation, energy conservation, public services and facilities, business financing, and commercial revitalization. Many communities have used the funds to set up revolving loan funds for businesses. However, new rules mandating that 60 percent of the beneficiaries must be low and moderate income (increased from 50 percent) limit its usefulness as an economic development tool.[88]

Several other Federal programs can provide some assistance. Services provided by the Department of Commerce to businesses include Export Promotion Services, the Small Business Administration's (SBA) financing programs, and Small Business Development Centers, mostly located on college campuses, which provide counseling on particular management problems.[89] The Farmers Home Administration (Department of Agriculture) also provides Business and Industrial Development Loans and Grants to assist economic development in rural areas.

State and Local Programs To Assist Defense-Dependent Areas

While the Federal Government's role in subnational economic development has declined significantly, State and local efforts have dramatically expanded in both scope and sophistication. Until the late 1970s, most States and cities equated economic development solely with industrial recruitment. In the 1980s, State and local governments added a wide

[87]To qualify, the dislocation must meet a minimum threshold requirements in terms of jobs lost. Thresholds are double in communities with unemployment rates below the national average.

[88]The rule requires that over a 3-year period, a total of at least 60 percent of the beneficiaries must be low and moderate income individuals. HUD is proposing increasing this to 70 percent.

[89]These centers can provide adequate advice to novice entrepreneurs attempting to start "mom and pop" small businesses, but often lack the know-how to provide more sophisticated advice to entrepreneurs attempting to start manufacturing or technology-based service firms. As a result, their usefulness as an economic development tool is limited.

range of economic development tools that go beyond recruitment to include new business development, industrial expansion and modernization, and technology development.

One indication of the increased State commitment to economic development is the rise of department of commerce budgets in the States. From 1982 to 1990 they increased almost fivefold, from an average per State of $6.7 million in 1982 to $32.5 million in 1990 (in 1990 constant dollars).[90] State incentive programs (tax, capital, and land subsidies, and technical assistance) increased in number from 840 in 1966, to 1,213 in 1976, to 1,633 in 1985.[91] In addition to expanding in scope, the sophistication of the new State and local efforts far exceeds those of the 1970s. For example, in 1983, OTA found that 22 States had developed 38 technology programs.[92] By 1988, 45 States had developed over 250 programs.[93]

Local economic development efforts have also increased significantly in the 1980s. Today almost half of 322 large and small American cities surveyed have revolving loan funds for business, over one-third provide entrepreneurial assistance to new business, and over one-half advertise for new industry.[94] Larger cities (above 200,000 population) and economically distressed cities employ economic development tools more extensively.[95]

This expansion has led some to conclude that State and local efforts are sufficient to deal with defense dislocations, even with reduced Federal efforts. This is dubious. First, while accurate figures on State and local spending for economic development do not exist, it appears that this spending has not filled the gap left by the withdrawal of Federal support—especially since much of the increased spending by State and local government was in response to higher levels of need.[96]

Second, many of the Federal efforts were devoted to community development; they provided distressed communities with funds to develop industrial parks, renovate buildings, and build infrastructure. The States have limited funds for these activities. They are more interested in business expansion and development.[97]

Third, capacities and efforts vary significantly among States and cities. Some spend generously on highly sophisticated economic development programs. Others spend much less. In the absence of accurate data on State spending for economic development, expenditures by State economic development agencies are a proxy measure of the variance among States. For example, per capita State spending on economic development is $28.00 in Alaska and only $2.50 in Mississippi.[98]

The current fiscal crises of many States have made matters much worse. One reason for the expansion of State economic development budgets in the 1980s was that State revenues were growing. According to the National Association of State Budget Officers, at least 28 States face revenue shortfalls in 1991,[99] and many are having to sharply curtail spending on economic development programs.

Nevertheless, several States have recently begun tentative efforts to respond to the build-down. Because the location of defense spending is not well understood, a number of States are conducting studies to assess the importance of defense spending

[90] *1990 State Development Agency Expenditures and Salary Survey* (Washington, DC: National Association of State Development Agencies, 1990).

[91] Peter Eisinger, *The Rise of the Entrepreneurial State* (Madison, WI: University of Wisconsin Press, 1988), p. 19.

[92] *Census of State Government Initiatives for High-Technology Industrial Development* (Washington DC: U.S. Congress, Office of Technology Assessment, May 1983).

[93] Robert D. Atkinson, *State Programs for Technology Development* (Washington, DC: National Association of State Development Agencies, 1988).

[94] Ann O'M. Bowman, *Tools and Targets: The Mechanics of City Economic Development* (Washington, DC: The National League of Cities, October 1987).

[95] Ibid.

[96] DoD's report on economic adjustment to defense cuts states: "' . . . It does not appear, however, that State resources and responsibilities have increased sufficiently to compensate for a reduced Federal role in response to defense-related dislocations. [not only for economic development, but for related activities such as sewer, water, transportation, public facilities]." Office of Economic Adjustment, DoD, *Economic Adjustment/Conversion* (Washington, DC: July 1985, app. K.)

[97] Interview with Miles Friedman, Director, National Association of State Development Agencies, February 1991.

[98] State expenditures from National Association of State Development Agencies, *1988 State Economic Development Expenditure Survey* (Washington, DC: 1988). There are some problems with comparing economic development budgets since some States include some expenditures as economic development while others do not. However, the range of these figures is indicative of how much expenditures can vary.

[99] David Broder, "Is This the Year States Finally Get the Hill's Attention?" *The Washington Post*, Jan. 6, 1991, p. C7.

in their economies and the needs of defense contractors in converting to civilian production.[100] States hope they can then target development programs to defense firms and defense-dependent communities. In particular, many States are interested in using existing programs to help small and medium-size defense contractors gain civilian markets.[101] However, not all States have made efforts. In fact, several of the most defense-dependent States have done little to respond to the build-down.

What Communities and States Can Do To Stimulate Economic Development

Organizing and Planning for Economic Development

Economic development is more than simply putting particular programs in place. Communities do not always easily or directly speak with one voice. In many communities the proliferation of actors, interests, and personalities with "turf" and ego concerns outweigh the "common weal."[102] Without the critical preparatory work of developing leadership and encouraging groups to work together, conflicts often undermine productive activity.[103]

Bringing the key players together into a coalition is easier in some communities than in others. For example, in Salt Lake City, a community task force was set up the day the closure of Fort Douglas was announced, and the task force agreed that the University of Utah should receive the land. In other cases, attaining community consensus is more difficult. For example, there is considerable disagreement over the future use of George Air Force Base, in San Bernardino County, CA, and this has slowed reuse efforts.

In some areas community economic development organizations already exist, making the job easier. For example, the pre-existing St. Louis Regional Growth Association has taken primary responsibility for coordinating economic development efforts in St. Louis. In other cases, such as southeastern Connecticut, economic development organizations had to be created from scratch.

Virtually all communities affected by defense cuts, either base closures or defense industry cutbacks, are able to get at least some technical and financial assistance from OEA to organize and plan. An important aspect of OEA's assistance is that the agency works to build a coalition of key players before providing a community with a planning grant.

Planning is the next step. It is essential in dealing with base closures, since communities must develop a reuse plan for the vacant property and buildings. Many of the bases to be closed in the first round have developed base plans with the help of OEA. Possible uses cover a wide range. For example, options for a portion of the 55,000-acre Jefferson Proving Ground in Madison, IN include a golf course and surrounding housing cluster, a shopping mall, and a foreign trade zone. Depending on the size of the impact, communities may also develop an overall economic development plan. For example, Rantoul, IL, home to closing Chanute AFB, developed both a base reuse plan and an overall economic development plan using grants totaling $234,700. More often than before, OEA now also provides planning grants in response to defense industry cutbacks. The St. Louis Regional Growth Association received $100,000 from OEA for planning in response to the loss of 9,000 jobs at McDonnell Douglas.

The next step after organization and planning is implementation. Among the several ways to do it are recruiting new businesses to the area; encouraging the expansion of existing businesses in the area (including, when feasible, the conversion of defense contractors); and promoting the formation of new businesses.

---

[100]Included are Colorado, Connecticut, Florida, Kentucky, Maine, Maryland, Minnesota, New York, Ohio, Pennsylvania, Rhode Island, Tennessee, and Washington.

[101]In addition to individual State efforts, the National Governors' Association has established a Defense Adjustment Task Force made up of six States, DoD, and other Federal agencies. The task force will identify successful State initiatives and industry conversion efforts for detailed investigation. It will also help four States design, implement, and evaluate economic conversion policies and programs. The National League of Cities is conducting a similar project for cities.

[102]Interview with Goetz Wolff, Resources for Employment and Economic Development, Los Angeles, personal communication, September 1991; see also Terry F. Buss and F. Stevens Redburn, *Shutdown at Youngstown* (Albany, NY: State University of New York Press, 1983) for a discussion of the problems that arise when conflicting organizations and individuals are engaged in economic development.

[103]EDAW, Inc., *Planning Civilian Reuse of Former Military Bases*, prepared for the Office of Economic Adjustment, Office of the Secretary of Defense (Washington, DC: June 1990).

Attracting New Industry: Industrial Recruitment

When faced with the loss of a major employer, one solution is to convince new companies to move in. Industrial recruitment efforts have long been the main recourse for State and local economic development agencies. Often these agencies organize an industrial attraction group to go out and beat the bushes for new business—traditionally manufacturing facilities, but now also corporate headquarters and service industries. To make their communities or States more attractive, economic development agencies often provide a variety of subsidies and incentives, including lower business taxes, tax abatements, low-cost financing, free training, free land and buildings, and other schemes to reduce business costs.

On the face of it, industrial attraction may seem a ready-made solution to the problems of defense-related job loss. For some areas, especially those with little other existing industry to build on or without much potential for self-reliant growth (such as from tourism or small business development), recruitment may in fact be the best strategy. A well-conceived and executed marketing plan can pay off. This is especially true in the case of certain base closings where large amounts of developed land, buildings, and facilities are available at low cost. Examples include Norton Air Force Base, which will be home to a Lockheed operation to repair and maintain planes, and Pease Air Force Base, which Deutsche Airbus is negotiating to use for a similar operation.

Despite the popularity of "smokestack chasing," it has serious drawbacks. First, relocations and openings are far fewer than the communities pursuing them. While data are sketchy, it appears that between 1969 and 1975 there were approximately 1,100 manufacturing relocations per year, on average. Some 630 relocated outside their immediate area, and of these, about 200 relocated to another State.[104] In 1984 there were approximately 1,200 major manufacturing sitings in the United States.[105]

The supply of footloose firms is more than matched by the large number of desirous communities and States, among which the competition is fierce.[106] An estimated 7,500 economic development organizations are competing for new business.[107] For example, Illinois was up against 82 other proposals in its unsuccessful efforts to attract a major United Airlines maintenance facility to Chanute Air Force Base in Rantoul.[108]

Economically distressed areas are not the only ones bidding for firm relocations. Places that are quite well off also compete. For example, Fairfax County, VA, a prosperous middle-class suburb of Washington, DC, launched an aggressive recruitment drive in the late 1970s even though the area was growing steadily.[109] These efforts succeeded. The number of firms relocating to the area rose and the population increased.[110] However, the Nation benefited little since economic activity was simply transferred to an area that was already strong economically. Locally, the growth brought with it such familiar problems as high housing prices and transportation congestion. Fairfax County is not alone in this practice. Other well-off communities around the Nation have also joined in the recruitment game. For example, Indianapolis beat out prosperous Fairfax county, as well as a host of other communities, in its bid for the new United Airlines maintenance facility.

Because so many locales have joined this "buffalo hunt," the chance of landing a firm are even lower for communities that are truly in need (for example, small towns where a military base that is the major employer is closing). Aggressive recruitment by well-off communities aggravates the imbal-

[104]James Miller, "Manufacturing Relocations in the United States, 1969-1975," in Richard B. McKenzie, *Plant Closings: Public or Private Choices?* (Washington, DC: Cato Institute), p. 27. While the data used in this study may not provide a fully accurate representation of relocations, it does provide a rough estimate of the numbers.

[105]North Carolina Department of Economic Development, "North Carolina's Blueprint for Economic Development: A Strategic Business Plan for Quality Growth," 1988.

[106]See Roger Wilson, *State Business Incentives and Economic Growth: Are They Effective? A Review of the Literature*, op. cit.

[107]Alan Gregerman, *Competitive Advantage: Framing a Strategy to Support High Growth Firms*, op. cit.

[108]United Airlines decided to locate the facility in Indianapolis. Office of Airport Affairs, United Airlines, August 1991.

[109]Gregerman, op. cit. p. 64.

[110]Most recently, the county and the State convinced General Dynamics to move their corporate headquarters from St. Louis to northern Virginia. As part of the inducement to locate there, Virginia provided GD with $400,000 in subsidized training.

ance between supply (firms willing to establish new facilities) and demand (places doing the recruiting). As expected, when demand outstrips supply, the price that communities must now pay in the bidding wars to attract firms has risen.[111] An example of high-priced incentives is the package Illinois offered to United Airlines to get the company to locate its maintenance facility in Rantoul. It was worth over $150 million. Indiana and the city of Indianapolis came up with more, $294 million, to win the United facility. Moreover, communities are often led to believe that if they do not come up with expensive inducements even firms already established in their area will leave.[112]

The problem of incentives is particularly onerous when they benefit foreign industrial competitors. While exact figures are not available, it is estimated that between 1978 and 1988 U.S. States and cities gave foreign automobile firms close to $1 billion in inducements.[113] (See table 6-11.) These large incentives did not induce the firms to locate in the United States, since that decision had already been made.[114] Nor did they benefit seriously economically depressed communities since Japanese auto plants generally located in relatively prosperous areas.[115] These subsidies did provide a windfall to foreign competitors at the expense of U.S. firms and they did erode local tax bases that might have been used for education or public infrastructure.[116]

Note that in Japan, the Ministry of International Trade and Industry (MITI) and the Ministry of Finance use their finance and approval powers to coordinate and limit local prefecture subsidies to foreign firms.[117] Of course, one reason national government ministries are able to do this is that they have greater authority over local decisions than the U.S. Government has. With the coming of EC92, the European Community intends increasingly to limit and coordinate subsidies given to non-EC firms.

The U.S. Government not only does little to remedy the problem of runaway incentives, but in some ways encourages it. Supposedly, Federal economic development funds cannot be used directly to recruit industry from one location to another, but it happens in practice. Firms often relocate to EDA-funded, below-market-rate industrial parks, or receive training for their new workers financed by the Job Training Partnership Act (JTPA). Federal policy also encourages local competition over the location of Federal facilities, especially science and technology projects.[118]

Most studies of location factors find that incentives are not important in determining the location of firms.[119] More important factors are access to

[111]Robert Guskind, "Games Cities Play," *National Journal*, Mar. 18, 1989, pp. 634-640; Larry C. Ledebur and William Hamilton, "The Great Tax-Break Sweepstakes," *State Legislatures*, September 1986, pp. 12-15; Paul Peretz, "The Market for Incentives: Where Angels Fear to Tread?" *Policy Studies Journal*, 5, February 1986, pp. 624-33.

[112]For example, in response to a threat to leave Illinois, the State and local government gave Sears Roebuck over $110 million in concessions in 1990 to relocate from downtown Chicago to the suburbs. It may be doubted that Sears would actually have left the Chicago area since that is home to its large work force, but the threat was enough to convince State and local government to pay. Ibid.

[113]Norman Glickman and Douglas Woodward, *The New Competitors* (New York, NY: Basic Books, 1989), pp. 230-231. The cost of these incentives has increased significantly over time. Researchers at the University of Kentucky found that the dollar amount of subsidy per worker rose from $20,000 at Nissan, to $50,000 at Fuji-Isuzu, to as high as $108,000 at Toyota.

[114]Ibid.

[115]For example, the Mitsubishi/Chrysler plant located in Bloomington, IL, which at the time had one of the lowest unemployment rates in the State. The State then proceeded to designate the area an enterprise zone. Other Japanese car companies located in less affluent but still relatively healthy communities. For example, in 1980 the unemployment rates for Rutherford County (Nissan) was 74 percent of Tennessee's, Union County's (Honda) was 71 percent of Ohio's, and Scott County's (Toyota) was 64 percent of Kentucky's rate.

[116]Ann H. Elder and Nancy S. Lind, "The Implications of Uncertainty in Economic Development," *Economic Development Quarterly*, vol 1., No. 1, February 1987, pp. 30-40.

[117]Clyde Prestowitz, *Trading Places* (New York, NY: Basic Books, 1989), p. 369.

[118]For example, 21 States prepared detailed, costly studies for their bids to land the Superconducting Supercollider. Graham Jones, Executive Director, New York State Science and Technology Foundation, remarks made at the 16th Annual AAAS Colloquium on Science and Technology Policy, "State Science and Technology Initiatives in a Time of Fiscal Crisis," Washington, DC, Apr. 12, 1991.

[119]Blair and Premus suggest, "There is little evidence that a region or community can attract industry from other regions by offering locational subsidies since comparable bundles of industrial incentives are now available in most States and regions." (John P. Blair and Robert Premus, Industrial Location, *Economic Development Quarterly*, February 1987, p. 84.); see also Roger W. Schmenner, *Making Location Decisions* (Englewood Cliffs, NJ: Prentice Hall, 1982); also Michael Kieschnick, *Taxes and Growth: Business Incentives and Economic Development* (Washington, DC: Council of State Planning Agencies, 1981); M. Wasylenko, "The Location of Firms: The Role of Taxes and Fiscal Incentives," in Roy Bahl (ed.), *Urban Government Finance: Emerging Trends* (Beverly Hills, CA: Sage Publication, 1981) pp. 155-190; William Wheaton, "Interstate Differences in the Level of Business Taxation," *National Tax Journal*, 36, 1983, pp. 83-94.

Table 6-11—Selected State and Local Incentive Packages

Firm	State/city	Incentives ($ millions)
Foreign car companies:		
Toyota	Kentucky	$ 373[a]
Mitsubishi	Illinois	170[b]
Mazda	Michigan	120[a]
Isuzu/Fuji	Indiana	86[c]
Volkswagen	Pennsylvania	86[c]
Nissan	Tennessee	66[c]
Honda	Ohio	16[c]
Total		$ 917
Non-manufacturing industries		
United Airlines Maintenance Facility	Indiana/Indianapolis	$ 294
Chase Manhattan Bank	New York City	235[a]
Sears	Illinois	110
National Broadcasting Co	New York City	98[a]
Citicorp	New York City	97[a]
Drexel Burnham Lambert	New York City	85[a]
Shearson Lehman Hutton	New York City	74[a]
Burlington Air Express	Toledo, OH	50[a]
Presbyterian Church USA	Louisville, KY	30[a]
Burlington Air Express	Fort Wayne, IN	15[a]
Total		$1,088

SOURCES:
[a]Robert Guskind, "Games Cities Play," *National Journal*, Mar. 18, 1989, pp. 634-640.
[b]Ann H. Elder and Nancy S. Lind, "The Implications of Uncertainty in Economic Development," *Economic Development Quarterly*, vol 1., No. 1, Feb. 1987, pp. 30-40.
[c]Norman Glickman and Douglas Woodward, *The New Competitors* (New York, NY: Basic Books, 1989).

markets, skilled workers, and low labor costs. If a community lacks these key attributes, its chances of recruiting firms, regardless of the incentives it provides, are small. At best, incentives are tie-breakers that may influence a firm to choose between two equal communities in the same region.[120]

In short, the competition for investment attraction makes it harder for defense-dependent communities to succeed in economic development. When everyone is offering the same subsidies, communities truly in need of new industry have a harder time. When such places do get a new industry, it is sometimes at an exorbitant cost that they can ill afford and that undermines the provision of public services and infrastructure.

Assistance for Existing and New Businesses

Another option for States and localities losing defense jobs is to support the expansion of existing businesses and the creation of new ones. Most new State and local economic development initiatives in the 1980s have been directed toward this growth-from-within strategy.[121]

The pr rams are many and varied. Business financing programs help firms obtain start-up and expansion capital. Tax break and regulatory reduction programs try to lower costs. Business assistance programs help entrepreneurs and managers do a better job of managing their firms. Technology centers and grant programs increase firms' access to new technologies. Industrial extension services help companies adopt "best practice" technologies, and worker training programs teach skills needed to use the technologies effectively. Export assistance helps businesses obtain new export markets. Small business incubators, industrial parks, and research parks provide space for companies to develop and expand. Education and training programs upgrade the knowledge and skills of the work force so that businesses can grow and expand.

Defense-dependent communities can use these programs not only to generate new economic activity but also to help defense contractors and

[120]Norman J. Glickman and Douglas P. Woodward, *The New Competitors*, op. cit., p. 228.

[121]Peter Eisinger, *The Rise of the Entrepreneurial State*, op. cit.

subcontractors move into commercial markets, retool production facilities, and develop new products. Such proactive efforts to help contractors convert can, if they succeed, lessen the ill effects of defense cuts on communities and workers. (See ch. 7 for further discussion.)

The growth-from-within strategy is probably best suited for medium-size and large cities with a diversified economic base. The competitive advantage of most metropolitan areas affected by defense spending cuts, such as Boston, Los Angeles, Long Island, Philadelphia, San Jose, and Washington, DC, lies not in their ability to attract new industry but in developing and expanding those in place.[122] However, Federal economic development programs do not distinguish among different types of economies, and are as likely to make a grant for a new industrial park to Los Angeles as to a small community in rural Mississippi.

While the growth-from-within strategy has many advantages over recruitment, it also has its limitations, especially as currently designed and operated.[123] Often, the programs are very small relative to the scale of the problems. For example, in response to substantial defense cuts in southeastern Connecticut, organizers in the area are developing SEATECH, a 10,000-square-foot small business incubator that is expected to house 10 startup businesses in marine-related and environmental protection businesses. However, the area has lost at least 2,000 defense jobs in the past 5 years, and is likely to lose thousands more in the next 5 years. While it is a step in the right direction, an incubator that produces 20 to 100 jobs in 5 years is not enough.

More generous funding for economic development would help, but existing funds could go farther if they were better targeted to activities that lead to economic growth. Most economic development programs serve any kind of industry, rather than targeting those that bring money into the community. Areas losing defense dollars need to generate economic activity that either sell goods or services outside the local economy (bringing in new dollars) or replace goods or services flowing from elsewhere into the local area.[124] The businesses that bring money into a community are often referred to as the basic or export sector, while firms that rely on local spending (e.g., retail) are referred to as non-basic.

Basic sector firms, meaning ones that sell to regional or even larger markets, are valuable replacements for declining or closing defense activities.[125] These are usually goods-producing industries (agriculture, forestry, mining, and particularly manufacturing) and some kinds of business services. Employment in non-basic sectors generally will increase only if overall community income increases; economic development assistance to non-basic firms may do nothing more than displace other locally owned firms. Retail and other local service firms do sometimes "export" their services from the region, mostly by selling to customers from elsewhere who come to community to make their purchases, and thus bring in new dollars; for example, where tourism is important, this may be true. However, by and large, the impact of these firms on local economic development is small.

Many economic development programs make no distinction between basic and nonbasic firms, and provide assistance to all kinds of businesses, including restaurants, retail stores, repair shops, and a host of other non-basic industries. In 1990 only 13 percent of the 700 SBA Small Business Development Centers' counseling cases were manufacturing firms.[126] Some of the largest recipients of federally tax-exempt industrial revenue bonds in the early 1980s were large nationally owned fast-food restau-

[122]Norton and Rees argue that large cities have little competitive advantage in attracting branch manufacturing plants. Rather, their advantage is in the development of new industries and R&D-based activities. R.D. Norton and John Rees, "The Product Cycle and the Spatial Decentralization of American Manufacturing," *Regional Studies*, vol. 13, 1979, pp. 141-151).

[123]For example, see Doug Ross and Robert E. Friedman, "The Emerging Third Wave: New Economic Development Strategies in the 90's," *The Entrepreneurial Economy Review*, vol. 9, No. 1, Autumn 1990.

[124]Matt Kane and Peggy Sand, *Economic Development: What Works at the Local Level* (Washington, DC: National League of Cities, December, 1988); Glen Pulver, *Community Economic Development Strategies* (Madison, WI: University of Wisconsin-Extension); Eva Galambos, *Making Sense out of Dollars: Economic Analysis for Local Government* (Washington, DC: National League of Cities, November, 1978); and Avrom Bendavid-Val, *Regional and Local Economic Analysis for Practitioners* (New York, NY: Prager Publishers, 1983).

[125]Edward Morrison, "Small Business: A Strategic Perspective," *Economic Development Commentary*, Spring 1985.

[126]Small Business Administration, 1991.

rants and discount department stores.[127] Nearly 40 percent of the firms receiving SBA 503 loans through Certified Development Companies (CDCs) are wholesale or retail firms.[128]

Some economic development planners argue that all firms help a local economy in one way or another and that it is inappropriate for government to pick particular industries for development assistance.[129] Even granting this point, it is clear that the impact on a local economy of, say, a computer manufacturer, is greater than that of a grocery store. A hard and fast rule cannot be applied, but a greater awareness of the importance of basic or export firms and of knowledge-intensive firms would improve the effectiveness of local economic development programs.[130]

A third point is that economic development programs are not always organized to meet the needs of business. In the rush to create programs addressing a broad range of business needs (e.g., financing, technology, management, export assistance), governments have set up separate programs for each of these goals. While they often provide valuable services, they could be made more easily accessible to business users.

The average firm has to be highly adept at locating the right agency at the right level to find the help it needs. Knowing where to look and how to apply can be a challenge for all but the most intrepid businessperson. When firms need assistance in more than one area (e.g., financing, exporting, and worker training), the maze becomes even more complex. Public programs rarely operate as locally based, full-service one-stop shops.

When firms do find the right kind of assistance, it is often provided by business generalists rather than by specialists who know the problems of a particular industry. When sectoral specialization is lacking, service providers are unable to develop in-depth, comprehensive knowledge about particular industries' market structure, technology needs, and worker skill requirements. The generalist approach may serve novice entrepreneurs attempting to open retail stores, but it falls short when it comes to working with manufacturing or technology-based service firms operating in intensively competitive markets.

Finally, the main content of many economic development programs misses the mark, failing to address the problems that keep firms from expanding. Often, they are oriented more to giving firms money than helping them solve problems that would lead to increased competitiveness. Most public economic development programs provide incentives to firms to relocate or expand; they include property and inventory tax breaks, low interest loans, zoning waivers, subsidized training costs, free or low-cost land, and free infrastructure. These subsidy programs remain more pervasive than others that provide direct services to manufacturing industries.[131] These costly business subsidies are not aimed at improving business efficiency, innovativeness, or competitiveness.

The outline of a new model for economic development is emerging in some States and cities, partly in response to the limitations discussed above. This model has much in common with some European efforts.[132] An example is the Technological Institute near Copenhagen (one of 31 technology services centers in Denmark), that assists small and medium-size industrial firms in using advanced technologies.[133] The Institute not only conducts applied R&D relevant to particular industries but also provides a wide range of services to its clients. These include market research into new industrial markets, assess-

[127]Tax-exempt revenue bonds allowed a company to obtain financing at lower rates since bondholders interest was federally tax exempt. Congress has since limited industrial development bonds (IDBs) to manufacturing firms.

[128]U.S. Small Business Administration.

[129]For example, see Roger Vaughan, Robert Pollard, and Barbara Dyer, *The Wealth of States* (Washington, DC: Council of State Policy and Planning Agencies, 1985).

[130]For discussion of the value of knowledge-intensive issues to the national economy, see U.S. Congress, Office of Technology Assessment, *Competing Economies: America, Europe, and the Pacific Rim*, OTA-ITE-498 (Washington, DC: U.S. Government Printing Office, October 1991).

[131] Timothy J. Bartik, *Who Benefits from State and Local Economic Development Policies*, (Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 1991); also Ann O'M. Bowman, op. cit.

[132]See Joseph Cortwright, "Old World, New Ideas: Business Assistance Lessons from Europe," Report to the Joint Legislative Committee on Trade and Economic Development, State of Oregon, April 1990; also Stuart Rosenfeld, "Technology Innovation and Rural Development: Lessons from Italy and Denmark," A Report of the Rural Economic Policy Program, Aspen Institute for Humanistic Studies/Ford Foundation/Wye Institute, Washington, DC, December 1990.

[133]Diane Palmintera, Innovation Associates, Inc. *Best Practices in European Innovation Development* (Washington, DC: U.S. Department of Commerce, Economic Development Administration, December 1989).

ment and consultancy on technical and management problems, demonstration of new technologies, financial consulting, and referral. Most of the services that a manufacturing firm needs are thus integrated in one place. Because a quasi-independent nonprofit organization runs the Institute, problems of competition among government agencies and bureaucratic inflexibility are lessened. The Institute's strategic focus on small and medium-size manufacturing firms and its development of deep and specialized knowledge about specific sectors are extremely useful to its clients. Because over two-thirds of the Institute's budget comes from the firms it serves, the program is three times larger than it would be without private funds. This industry involvement reflects both the high quality of Institute services and the interest of firms in using the services.

The lesson of the Danish Technological Institute and other programs like it is that industry needs drive program design. The most effective programs target basic sector industries, in most cases, goods-producing industries. They provide services in integrated, one-stop "industrial service centers." When possible, services are organized along sectoral lines (e.g., focusing on auto suppliers, wood products firms, metal working shops, aerospace companies, textile firms). They are most effective when run by intermediary, nongovernment organizations. In most cases the centers are located independent of universities and close to the businesses they serve.

A few programs based in part on this model have been put in place in the United States. For example, Oregon recently established and partly funded the Wood Products Competitiveness Corp., which will be governed by a board of industry officials. It is expected to provide a wide range of services to Oregon's secondary wood products producers, including marketing, training of workers and managers, manufacturing modernization, R&D, financing, and promotion of cooperative industrial networks. Service providers certified by the Corporation work with individual firms and groups of firms. Industry controls the program and shares the costs. The State hopes to extend this model to other key basic sector industries. Oregon will help firms in each of the key industries to cooperate in research consortia, joint training programs, market development activities, and the like.

Another example is the Florida Technology Coast Manufacturing and Engineering Network, which focuses directly on defense producers. It was organized to help defense producers cooperate to gain new contracts, develop new products, and share information. Located in Fort Walton Beach in the Florida Panhandle, the area is home not only to the largest air base in the world, Eglin AFB, but also to a number of defense producers. Most of the defense companies have been laying off people in small numbers gradually over the last few years.

In 1990, in response to the expected defense build-down, defense producers showed increasing interest not only in bidding more successfully for fewer defense contracts, but also in getting more commercial work. At the instigation of the Economic Development Council of Okaloosa County and the Okaloosa Community College, a network of over 32 firms, most of them defense-dependent electronics firms, was formed.[134] One of the keys to the network is team bidding for both DoD and non-DoD contracts. The companies bid on products that none can produce on its own but several can handle as a group. Although the network is too new to show measurable results, organizers hope the teams will win several defense and commercial contracts. They also anticipate that the network will help firms develop new products and transfer technology among themselves.

EFFECTIVENESS OF ECONOMIC DEVELOPMENT EFFORTS

It is clear that a wide range of programs exist at the local, State, and Federal level to help stimulate economic development in the face of defense cuts. What is not so clear is how effectively these programs can respond to economic dislocation in a reasonable period of time. Empirical research on the effectiveness of economic development efforts is spotty at best.[135] To be sure there is plenty of anecdotal evidence, but individual successes cannot

[134]Economic Development Council of Okaloosa County, FL, "Technology Coast Manufacturing and Engineering Network."

[135]Tiebout, in a 1966 article discussing the possible impacts of defense cuts on California, summarized the state of knowledge then: "When the proverbial chips are down, the real question is: What does one do to soften the blow or shifts on a community? What steps can be taken by the local area, the State, and the Federal government? Here the comfortable world of research must, in part, give way to some speculation and value judgments. And of course no easy or simple answers pop out. Charles M. Tiebout, "The Regional Impact of Defense Expenditures," in Roger Bolton, *Defense and Disarmament, The Economics of Transition* (Englewood Cliffs, NJ, Prentice Hall, 1966). The situation is much the same today.

necessarily be generalized. The evidence on community economic development policies in response to plant closings is even slimmer. While the Office of Economic Adjustment has studied the economic recovery from base closures, there is little comprehensive information on how communities have responded to plant closures or layoffs.[136] Nevertheless, 20 years of experience have something to teach us. Informed opinion and the experience of some communities that have suffered significant economic blows and made strong attempts at recovery offer useful guidance. The following sections draw upon two main sources of information: first, empirical data on community responses to base closure and second, the experience of one community (Jackson, MI) that went through severe economic dislocation in the early 1980s.

The Local Economic Response to Base Closings

In contrast to the paucity of empirical findings on community adjustment to defense contractor cutbacks, there is considerable information on what happens when communities experience military base closures. For over 10 years, DoD's Office of Economic Adjustment has studied the impacts on communities of military base closings. Although OEA's findings understate the level of economic distress caused by base closures, the record on base reuse is nonetheless generally positive. Communities have used bases as economic development resources, and in most cases their efforts have paid off in net gains in employment.

OEA concludes that from 1961 to 1990, new jobs (158,104) at 98 bases more than replaced the loss of DoD civilian jobs (93,424) at the former bases. The bases have been put to a wide variety of uses: 42 bases are being used as municipal or general aviation airports, 75 are home to industrial and office parks, and more than 73,000 students are enrolled at post-secondary educational institutions located on former bases.

However, OEA underestimates the negative impacts of closures. First, when calculating the loss of employment in communities, it looks only at lost civilian DoD jobs. OEA omits DoD contract employees and the impact on the community of purchases by military personnel and by the base itself. Some 137,000 military personnel were relocated in the 98 base closings.[137] While it is appropriate not to count military jobs when calculating direct job loss (the people involved were transferred to other bases), the loss of spending ripples through the local economy causing secondary economic impacts and lost jobs. If these effects are added, using a conservative multiplier of 1.4 for base procurement and military personnel expenditures, the figures for lost jobs in communities experiencing bases closures in the last 30 years rise by more than 54,000, from about 93,000 (OEA's estimate) to 148,000.[138] Given that 158,104 jobs were created there was still a net gain, but a much smaller one.

These average increases in employment also obscure the fact that there was great variance in results. While the Benicia Arsenal (CA) recovered over 2.5 times the 2,300 lost civilian jobs, Brookly AFB and Mobile Air Material Area in Alabama recovered only one-quarter of the 12,000 lost civilian jobs. The Truman Annex in Key West, FL gained back about 10 percent of its 568 lost jobs.

Moreover, it took a long time for new uses of the bases to generate enough jobs to make up for the lost employment. Of the 98 bases examined by OEA, the

[136]John E. Lynch, *Plant Closures and Community Recovery*, op. cit. p. 1.

[137]OEA states: "In many instances, the loss of military personnel (up to 5,600 military in the case of Amarillo, Texas) may have significantly affected the community's regional economy. Military personnel, however, are not recorded in the local employment or work force statistics. The relocation of military personnel (136,823 positions in nearly 100 community projects) represents a regional income loss but not as *direct* employment loss to the area. For this reason, successful transition should in large part be measured against whether the DoD civilian job loss in the community has been replaced by new jobs and economic activity on the former base facility." *Civilian Reuse of Former Military Bases: 1961-1990*, Department of Defense, Office of Economic Adjustment, p. 2. But, while military jobs cannot be considered a direct job loss, they do represent an indirect job loss.

[138]This multiplier is drawn from Joseph Cartwright and Richard M. Beemiller, *The Regional Economic Impact of Military Base Spending* (Washington, DC: The President's Economic Adjustment Committee, Department of Defense, Office of Economic Adjustment, November 1980) and from the multipliers used by OEA in their analysis of Round Two base closures. Note also that multipliers vary depending on the activity on the base. In addition, several factors make the employment multiplier associated with base closings smaller than with contractor cutbacks. In order not to exaggerate the impact of reductions of military personnel, a more conservative multiplier of 1.4 was used here. (A multiplier of 1.4 means that each DoD jobs support 0.4 additional jobs.)

Box 6-C—Case Study: Closure of the Kincheloe Air Force Base in Chippewa County, MI

The experience of Chippewa County in Michigan's Upper Peninsula is often cited to show that economic development after a base closure can be accomplished, even under the most difficult of circumstances.[1] However, closer examination shows that while County leaders did an excellent job, the experience was not an unqualified success. Even its limited success would be hard to replicate today because far less Federal money is available to support base reuse. Finally, the county's biggest infusion of new jobs came, not from new private business, but from new prisons built by the State of Michigan.

When the Department of Defense (DoD) closed Kincheloe AFB in 1978, the county faced a severe economic crisis. Chippewa County had a population of 32,416, of whom 25 percent were military personnel and their dependents. The base closure meant not only a loss of the $36-million payroll and 737 civilian jobs, but also a major loss in population as over 3,000 military personnel were transferred from the area.

The Upper Peninsula is a geographically isolated, sparsely populated, mostly rural area in a harsh climate (170 inches of snow in 1989). Eight percent of employment in the three-county area is in manufacturing, with tourism, government, and services accounting for the rest.

In response to announcement of the base closing, county leaders created the Chippewa County Economic Development Corp. (EDC), a nonprofit municipal corporation responsible for planning and implementing the economic development effort. Since no private developer was interested in the base, EDC's initial task was to make a long-term commitment to the financial requirements of operating the facility.

The effort was underwritten with funds from a variety of sources. From 1978 to 1982, Chippewa County put up $2.2 million in cash and in-kind services—a substantial sum for a county whose annual budget was a little over $3 million. The State provided approximately $1.3 million to the Base Conversion Authority[2] for management of the base for the first 4 years. The Federal contribution was still more substantial. The county received $300,000 from DoD's Office of Economic Adjustment (OEA) to formulate an economic development plan, plus a $4.1 million EDA Title IX grant to set up an industrial revolving loan fund and to convert military facilities to civilian use.[3] The Department of Housing and Urban Development (HUD) provided three grants totaling $650,000 to renovate utilities and buildings for industrial use, and the Federal Aviation Administration and the Michigan Aviation

[1]Most of the following material was drawn from Letitia L. Oliveira, "Digging Out From Hard Times: Economic Recovery in Michigan and Pennsylvania," contractor report prepared for the Office of Technology Assessment, Aug. 17, 1990.

[2]The Base Conversion Authority was established by the Governor and included the heads of the Departments of Commerce, Labor, and Corrections, the State Office of Management and Budget, a representative of the Governor's office, and six local leaders. It managed the base facility from 1978 to 1982, when it was not legally possible for another organization to manage it. The Base Conversion Authority used approximately $800,000.

[3]Kathy Noel, Executive Vice President, Chippewa County Economic Development Corp., personal communication, Aug. 2, 1990; and William L. Laubernds, personal communication, Aug. 8, 1990, cited in Oliveira, ibid.

mean year of closure was 1970.[139] By 1981, there were not yet enough jobs on the bases to replace those that had been lost.[140] In other words, it took more than 11 years, on average, for the bases themselves to generate replacement jobs. Some of the communities did generate other new jobs through general local economic growth not related to base reuse.

Another caveat; it is risky to extrapolate the experience of communities that suffered closures in the 1960s and 1970s to closures in the 1990s. As noted above, and as the experience of Chippewa County illustrates (box 6-C), in the past communities could rely on a large infusion of Federal dollars. Between 1975 and 1980 the Economic Development Administration provided $57.5 million to 31 base redevelopment projects.[141] In 1991 dollars this amounts to about $110 million. Over the past 20

[139]This was calculated from: U.S. Department of Defense, Office of Economic Adjustment, *Civilian Reuse of Former Military Bases, 1961-1990*, 1990. The mean year was calculated using a weighted average of year of closure and number of civilian jobs lost.

[140]Data for 1981 was based on data in Department of Defense, Office of Economic Adjustment, *Civilian Reuse of Former Military Bases, 1961-1990*, op. cit.

[141]"Report of the Task Force on Military Base Re-Use," Business Executives for National Security Education Fund, Inc., Jan. 5, 1989.

Commission provided $2.4 million to convert the airport to civilian use. Total State and Federal funding to the area for redevelopment exceeded $14.6 million (1991 dollars). In addition, the Air Force donated the base to the county. It was a large gift. The total real property value of the 3,600 acres, 175 commercial and industrial buildings, and 1,383 living units on the base was estimated at approximately $105 million.[4]

The EDC, which now owns and manages the industrial park and airport, organized land, buildings, labor, capital, training, and other incentives into a single package and marketed it to firms they wanted to attract, including cold weather testing facilities, small divisions of big companies, and companies receiving defense contracts (which were growing during the defense buildup). Firms could go to one place, the EDC, for information about sites and facilities, training programs, and financing assistance available from other agencies. EDC marketed the area using direct mailings and selective advertising, and gave special attention to generating nationwide media articles.

This energetic effort yielded only modest success. EDC was able to recruit 28 small manufacturing facilities, but by 1991 all but 10 of the facilities had closed or moved away. The remaining 10 firms employ 320 people. A much bigger contribution to the county's economy came from Michigan's $800-million prison expansion program, under which five medium or mixed-security prisons were located in Chippewa County. These prisons now provide 1,400 jobs.

With the help of the new prison and manufacturing jobs, the county's unemployment rate dropped from 15.7 percent in 1980 to 6.4 percent in 1989. The number of people employed in the county actually rose from 10,500 in 1976, before the base closed, to over 14,000 in 1989, and the population also grew, albeit slowly.[5]

Chippewa County owes a good deal of its recovery to effective local leadership and to the creation of a single local organization to oversee economic development. However, without outside resources, recovery would have been limited. Michigan's decision to locate five prisons in the county was the key factor in the recovery. In addition, the importance of State and Federal funding should not be overlooked. John Campbell, Executive Director of the Eastern Upper Peninsula Planning Commission, noted, "The ($4.1 million) Title IX grant was the most critical component. Otherwise we wouldn't have gone any further."[6]

Altogether, Federal redevelopment funds, including a total of $6.5 million from EDA, amounted to $11.5 million (1991 dollars) and the State provided $1.75 million. Today, Federal funds for community economic development are scarce. The EDA special fund for defense-dependent communities is $50 million; just five Chippewa Counties would exhaust that fund. Finally, the Air Force donated its base and buildings to the county. In the present round of base closings, the services are allowed to sell their bases to the highest bidder. If Kincheloe were closed today, the Air Force might well demand payment for it.

[4]John Campbell, Executive Director, Eastern Upper Peninsula Planning Commission, Sault Ste. Marie, MI, personal communication, Aug. 2, 1990, cited in Oliveira, op. cit.

[5]Laubernds, op. cit.; and William Laubernds, "Overcoming Geographic Isolation: Chippewa County, Michigan," John Lynch, (ed.), *Plant Closures and Community Recovery* (Washington, DC: National Council for Urban Economic Development, January 1990).

[6]Campbell, op. cit.

years the Federal Government has spent more than $500 million to help communities affected by base closures.[142] Even though State capacities to respond to economic dislocations have grown since the 1970s, it is not likely that their support offsets the decline in Federal support. In addition, communities received bases in the 1960s and 1970s at a fraction of their assessed value. According to a Congressional Budget Office report, at 33 bases for which data was available, the sale price of the property was about 35 percent of the total value.[143] Today, DoD's interest in obtaining revenue from the transfer of bases makes it doubtful that the bases now being closed will be transferred as cheaply. Finally, the current awareness of environmental problems and the need for remediation mean that environmental cleanup will be a major factor in base closings in the 1990s. Present legal requirements could delay significantly the reuse of bases.

Communities Recovering From Economic Distress: Jackson County, Michigan

There is less information on community economic development after industrial cutbacks, whether

[142]Andrew Mayer, "Military Base Closures" U.S. Congress, Congressional Research Service, updated Nov. 1, 1990, p. 4.

[143]Ibid.

defense or nondefense related, than on the experience after base closings, although several richly detailed case studies are available.[144] The story of one community—Jackson, MI—can provide a number of lessons and insights. Located in the heart of the industrial Midwest, Jackson County illustrates the havoc wreaked on some communities by the combined forces of recession and the restructuring and decline of the U.S. automobile industry. It also sheds light on the possibilities, and the difficulties, of community recovery from devastating economic blows.[145]

Even with a growing national economy, unless the regional and State economies are also strong, recovery from serious economic loss is difficult. Committed local development efforts can help, particularly when assisted by a strong State program and a facility location policy that favors distressed communities (e.g., locating a State prison in Jackson). However, even when the local and State economic development efforts are "firing on all cylinders," recovery can prove difficult. In Jackson's case, it was only partial. Keep in mind, however, that Jackson suffered greater losses than all but the most defense-dependent communities are likely to undergo.

Between 1978 and 1982, unemployment in Jackson County (population about 150,000) more than doubled, reaching 16.1 percent in 1982. Within a 6-month period in 1983-84, Jackson experienced the closing of two major plants, Goodyear Tire and Rubber and Clark Equipment. The loss of nearly 1,800 jobs in these two plants, combined with the impact on suppliers, resulted in a total loss of approximately 3,000 jobs. Population declined by 6 percent between 1978 and 1985, as people left the area in search of work.[146]

A 1982 Chamber of Commerce survey of 240 manufacturing firms found that 80 percent of the industrial base was tied to the auto industry. Many suppliers had located in Jackson because it is close to Lansing and Detroit but its wage rates were lower by $4 to $6 per hour. That manufacturing base has survived, but it has changed considerably. Since the 1982 study, 60 percent of the firms with 50 or more employees have been acquired by multinationals, and Jackson has lost four of its six firms with over 300 employees.

Faced with such severe setbacks, local officials and business people organized to stop the hemorrhaging of their economy. The Chamber of Commerce surveyed local firms to understand the economic base of the community and to find out what local companies needed to keep them in the area. Together with the city and county governments, the Chamber organized the Jackson Alliance for Business Development, an economic development organization that has a 13-member board representing business, government, and academia.

Jackson focused a significant portion of its economic development efforts on industrial attraction. The Jackson Alliance identified community strengths in the automobile and food processing industries and put together a professional-looking package of information to market the community. Jackson's domestic and international recruiting efforts showed some results. The community attracted a British company making automotive valve springs (40 employees), two meat-processing plants employing 25 workers each, and a sugar-processing company. However, one of the meat-processing plants and the sugar plant recently went out of business, laying off their workers. More impressively, Jackson also recruited two new Japanese plants, Tokia Rika and Michigan Automotive Compressors (MACI). Tokia Rika announced its intention of locating in Jackson in 1991, employing 175 people, but had yet to open its plant in late 1991. MACI, a joint venture between Nippondenso and Toyota to make automobile air-conditioning compressors, was projected to employ around 600 people, but because of slow growth in the U.S. auto market had employed only 370 people in 1991.

To attract the MACI plant, Jackson provided generous incentives, including 10.5 acres of improved land that were worth $7.8 million as of 1990. Most of the incentives were financed through a newly created Local Development Finance Author-

[144]For example, see Terry F. Buss and F. Stevens Redburn, *Shutdown at Youngstown*, op. cit.

[145]Most of the following material was drawn directly from Letitia L. Oliveira, "Digging Out From Hard Times: Economic Recovery in Michigan and Pennsylvania," contractor report prepared for the Office of Technology Assessment, Aug. 17, 1990.

[146]Robert W. Carleton, Vice President, Community and Business Services, Jackson Community College, Jackson, MI, personal communication, June 6, 1990 and August 6, 1990; and Michigan Modernization Service and the Industrial Technology Institute, "Local Area Modernization Plan (LAMP) Draft Report: Jackson, Michigan," p. 8; cited in Oliveira, op. cit..

ity with a $6.2-million bond issue. The bonds are guaranteed by tax revenues resulting from improvements on the site (tax increment financing); they will be retired over 15 years. Projected annual tax revenues from MACI are $1.2 million, of which about $800,000 per year will be used to retire the bonds.

Besides trying to attract new firms, the Jackson Alliance helped existing companies expand by providing assistance in securing tax abatements, loans, and land at subsidized prices. Expansions of local companies added between 250 and 300 new jobs. Most of these firms were also helped by State programs, including worker training and tax abatements. A business incubator was established in November 1987 through a partnership between the city, the Jackson Alliance, and Jackson Community College. Since its inception, 25 firms have left the incubator and 19 of these (15 of them manufacturing) were still in business in 1991. These firms created approximately 100 jobs.

Other local organizations actively participated in rebuilding the economy. Under the leadership of Bob Carlton in the early 1980s, the Chamber of Commerce functioned more as an economic development organization than is typical of this body. Another active local group is the Jackson Area Quality Initiative (JAQI), a nonprofit, community-based organization that provides training in improving quality, productivity, and competitiveness. Through Jackson Community College, JAQI has offered intensive training in statistical process control for a variety of businesses. The training has produced results. After a first round of training, workers at Elm Plating were able to halve their downtime, and hit zero percent downtime on a consistent basis; recommendations coming out of the training have saved the company over $100,000.[147]

Jackson's recovery is incomplete, and as recent events have shown, is fragile. By 1989, unemployment was down to 6.9 percent, a percentage point higher than the national average, but with the 1991 recession, unemployment increased to over 11 percent.[148] In 1989, Jackson's population and work force were still slightly below 1979 levels (U.S. population meanwhile rose 12 percent and employment 16 percent). Wages in Jackson had dropped an average of $2 per hour.[149] And, the second largest infusion of new jobs in Jackson (after the Nippondenso plant) came from the expansion of the State penitentiary.

Part of the recovery was due to external circumstances. The United States experienced an extended period of economic growth from 1983 through 1989, which was reflected in the local economy. The auto industry, which benefited from this period of economic growth, from Japanese voluntary export quotas, and from Japanese investment in a new assembly plant (the Mazda plant in Flat Rock), has recentralized in Michigan. Finally, Jackson's convenient location between Ann Arbor and Lansing stimulated some growth in Jackson as a "bedroom community" for commuters and is likely to become an even more important factor in future growth.

Still, Jackson's situation must be measured against where the community would be if it had not taken steps to retrain its work force, improve efficiency of its manufacturers, and market the community to outside firms. Strenuous efforts by community leaders did contribute to the restoration of stability and a degree of prosperity, but did not repair all of the damage. It is worth repeating, however, that very few communities losing defense industries will face as massive losses as Jackson did in the recession and economic restructuring of the 1980s.

How Well Do Economic Development Policies Work?

The first step for a community affected by cuts in defense spending is to accept that cuts will occur and begin to develop positive strategies for adjustment. The literature is full of stories of communities whose response to a base closure or contract cutback was to put all their energies into stopping what was usually the inevitable. Because current declines in defense spending cuts appear to be long term and not easily reversed, it is all the more important for communi-

[147]"JAQI Success Stories," *JAQI Notes*, spring 1990, cited in Oliveira, op. cit.

[148]U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, vol. 37, No. 5, May 1990, p. 154.

[149]Tom Nicholls, Executive Director, Jackson Area Manufacturers Association, Jackson, MI, personal communication, June 6, 1990, cited in Oliveira, op. cit.

ties to accept the inevitable and initiate economic development policies.[150]

Interjurisdictional and institutional cooperation is just as important. Having too many competing economic development organizations and jurisdictions can severely limit success. Officials in several communities affected by defense cuts see lack of cooperation among communities as a potential threat to successful adjustment.[151] This problem was serious in southeast Connecticut, where fragmented approaches to economic development have been geared to a town rather than a regionwide effort. Current efforts to organize the Southeastern Connecticut Economic Development Coalition aim to overcome the problem.

Organizational cooperation and active local leadership are the basis but do not guarantee success. Obviously, commitment and dedication must be translated into well-designed and funded economic development programs. But even the best programs cannot fully prevent community economic distress. One reason is that most defense cuts occur without much notice (military base closings are the exception), while economic development programs take time to work and produce results. Take the case of Taunton, MA, an OEA-cited success story. In 1973, Raytheon closed its missile site radar plant in Taunton and laid off 1,400 workers. A cornerstone of Taunton's response was the development of the Myles Standish Industrial Park (funded largely by $3.25 million from EDA). Firms did locate in the park, but only gradually; it was not until the end of 1985 that they had created 1,400 jobs, the number lost in 1973. Although the economic development efforts could be considered a success, it took over 12 years for that success to come about.[152] Moreover, Taunton was aided by the growing prosperity of the Route 128 area in the 1980s, benefiting from the good fortune of the region. Many communities experiencing base closures took just as long to regain lost jobs.[153]

Economic development programs alone cannot turn around every community affected by the defense build-down. Many factors determine a community's growth potential. Location and access to markets, natural resources, skill level of labor force, entrepreneurial ability, corporate structure, industry mix, community leadership, growth of the regional and national economy, and luck all contribute. If defense cuts occur in communities with no innate advantage, economic development efforts may play only a marginal role.

Stepping back to look at the national picture, many communities will lose a small number of defense-related jobs. The impact will be mild and normal market forces will provide for full and reasonably swift adjustment. Of the communities that take a larger cut, some will suffer relatively little because of compensating positive factors. In less favored communities, active economic development policies will be reasonably successful in some. However, the time until recovery may be fairly lengthy, particularly if the community gets little advance notice of the cuts and if the national economic performance continues to be weak. Finally, a few areas will not recover completely or quickly, even though economic development policies may serve to lessen the depth and length of the distress.

---

[150]A strategy of preservation may have made a certain amount of sense in the past when defense budgets cutbacks came and went. For example, Vallejo, CA has lobbied to keep open the Mare Island Naval Base since the 1920s when the base was first threatened with closure. In many ways this was a successful strategy for the town, since it was able to keep employment at the base. However, the strategy was not without its costs. Being dependent on one employer (the Navy) meant that a more diversified, civilian-oriented economy has not developed. Judy Schneider and Wendy Patton, "Urban and Regional Effects of Military Spending: A Case Study of Vallejo, California, and Mare Island Shipyard," in Michael J. Breheny, (ed.), *Defence Expenditure and Regional Development*, op. cit. It could be argued that many other smaller, defense-dependent places are in similar situations. Certainly, defense dependency in southeastern Connecticut has closed off past development options and made it more difficult for the area to respond to today's defense cuts.

[151]OTA interviews with Los Angeles, southeastern Connecticut, and St. Louis officials.

[152]Department of Defense, Office of Economic Adjustment, *Economic Adjustment/Conversion*, op. cit., app. K, p. 28.

[153]Department of Defense, Office of Economic Adjustment, *Civilian Reuse of Former Military Bases: 1961-1990*, op. cit., p. 2.

Chapter 7

Defense Companies

Contents

	Page
INTRODUCTION	193
THE OUTLOOK FOR MAJOR DEFENSE COMPANIES	195
MAJOR COMPANY ADJUSTMENT PLANS	198
Shrinking in Size	199
Exporting Arms and Military Technology	200
Shifting to a Similar Commercial Product	201
Sales to Civilian Government Agencies	203
Spinoff Companies	204
Corporate Diversification	204
Conversion	206
BARRIERS TO CONVERSION	213
The Defense Company Culture	213
DoD Practices on Development Costs and Data Rights	214
MAJOR COMPANIES: PROSPECTS FOR CONVERSIONS IN THE 1990s	215
SMALL BUSINESS AND THE DEFENSE INDUSTRY	217
Adjustment Plans of Small and Medium-Size Defense Firms	221
Government Programs To Help Small Companies' Adjustment	223

Boxes

Box	*Page*
7-A. Top Defense Firms	197
7-B. Environment One: From Detecting Submarines to Monitoring Air Pollution	205
7-C. Aircraft Companies as Makers of Mass Transit Vehicles	207
7-D. GE Aerospace Conversion in the 1970s	211
7-E. Opportunities for Defense Contractors in Advanced Transport	218
7-F. Frisby Airborne Hydraulics: Conversion in a Small Defense Company	225

Figures

Figure	*Page*
7-1. National Defense Spending, 1940-1991	194
7-2. Prime Contracts for Hard Goods	194
7-3. Outlays for National Defense Functions, 1975-1991	195
7-4. Percent Government Sales of Major Defense Contractors, 1990	196
7-5. DoD Small Business Prime and Subcontracts	217

Chapter 7
Defense Companies

INTRODUCTION

Since 1986, U.S. defense companies have faced a shrinking market. But it took the collapse of the Soviet Union and the definitive end of the Cold War to bring home the fact that the days of defense spending at near-wartime levels were gone, and that companies were in for serious long-term adjustments.

In the buildup of the 1980s, defense spending as a percent of gross national product (GNP) never reached the heights of either the Korean or Vietnam Wars. However, in constant dollars, outlays during the 1980s buildup were greater than in the peak years of the Vietnam War, and total defense spending in 1986-89 was at least as high as in any 4-year period during the Korean and Vietnam Wars (figure 7-1).[1] Thus, defense dollars were fully as significant to the *companies* doing military business in the 1980s as in wartime years after World War II.[2]

Appropriations for defense started going down (in real terms) in 1986, dropping 13 percent in the 5 years 1985-90. Awards of new prime contracts also began to decline (even in current, nondeflated dollars) in 1986, with most of the drop coming in the sectors that had grown fastest during the buildup: aircraft and electronics and communication equipment (figure 7-2). Some declines in the defense budget had already begun as the military expansion collided with attempts to control the mounting Federal budget deficits. But with the end of communism in the Soviet Union and cessation of the Cold War, the prospect is for long-term cuts in defense spending that were hardly conceivable 2 or 3 years ago, and a new, far leaner environment for defense companies.

The 1991 defense budget, down over 10 percent in real terms from the year before, has already cut deeply. To stay within this budget, major programs that several defense companies expected to sustain them through the 1990s must come to an early end. A minor portion of the cuts might be accommodated by companies' streamlining their operations (e.g., centralizing maintenance and computer operations or reducing spare parts inventories). A substantial portion will come from military personnel reductions and base closings. But big bites will certainly come from DoD contract awards for production of items such as aircraft, missiles and space systems, ships, tanks, guns, and ammunition. Prime contract awards amounted to about $145 billion in fiscal year 1990, of which $124 billion went to private businesses (the rest went to educational and other nonprofit institutions).

Sharp cuts in these awards could threaten the stability, perhaps the existence, of some defense contractors. This raises concerns that a shrunken defense industrial base may not be able to meet national security needs in an uncertain new world of regional conflicts, smoldering national antagonisms, and a possible reappearance of large-scale conflict. OTA is addressing the national security concerns related to weakening or disappearance of defense companies in a companion assessment to this one.[3] This report considers issues relating to defense companies from the standpoint of the civilian side of the economy.

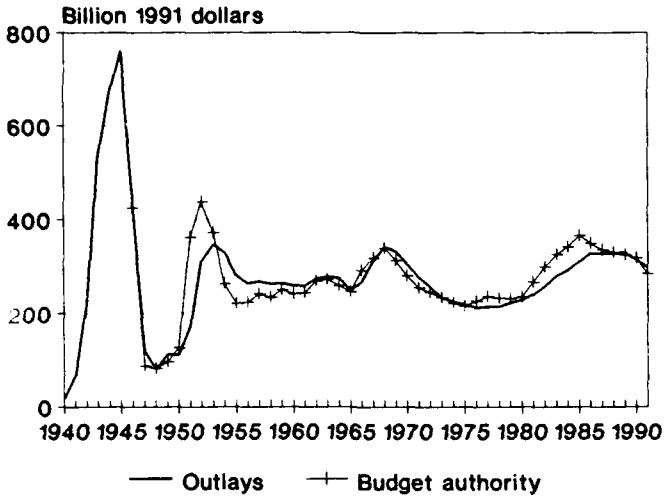
On the civilian side, worries about the survival of defense companies mostly come down to effects on jobs, communities, and technologies that could boost commercial competitiveness. Most immediate is the threat to jobs. The coincidence in 1990-91 of a recession and tens of thousands of layoffs from major defense companies made that threat real. A longer term worry is what may happen to defense-dependent communities that are deprived of their main livelihood. As of late 1991, none had yet become a ghost town, but a few were looking at a

[1]Defense budget authority reached its peak of the decade in 1985. Outlays—actual spending under several years' budget authority—peaked in 1989.

[2]Defense outlays for 1990 and 1991 exclude Desert Shield and Desert Storm. If the estimated costs of Desert Storm ($61 billion) were included, spending in 1991 might appear higher than at any time since 1946. However, much of the war's cost was defrayed by contributions from other nations. In addition, a portion of the "cost" was drawdowns from the huge Cold War inventories. Although a few items went into high gear production (Patriot and Tomahawk missiles), most were not replaced, so the effects on defense companies were less than it might appear.

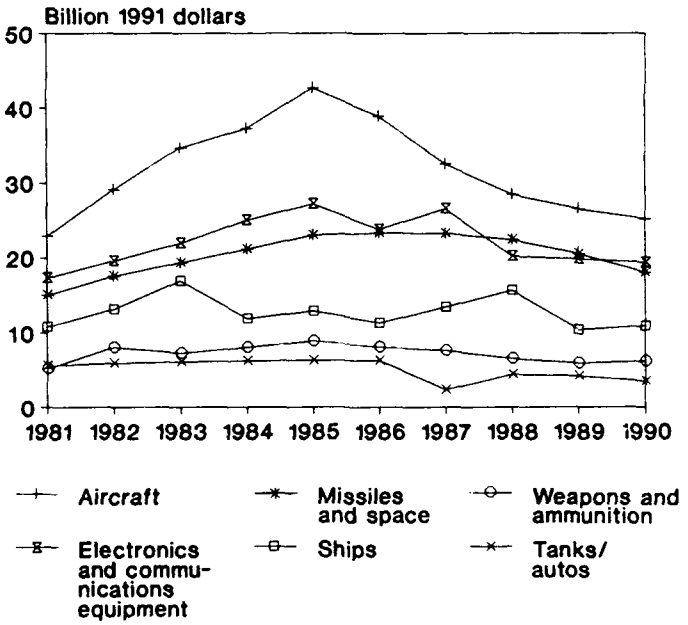
[3]An interim report of the companion assessment, U.S. Congress, Office of Technology Assessment, *Redesigning Defense: Planning the Transition to the Future U.S. Defense Industrial Base*, OTA-ISC-500 (Washington, DC: U.S. Government Printing Office, July 1991); the final report of this assessment, *Managing the Nation's Defense Industrial Strength in a Changing Security Environment*, is forthcoming.

Figure 7-1—National Defense Spending, 1940-1991



SOURCE: Department of Defense, Office of Comptroller, *National Defense Budget Estimate* (Washington, DC: 1980 and 1991); and President's Council of Economic Advisers, *Economic Report of the President* (Washington, DC: 1991).

Figure 7-2—Prime Contracts for Hard Goods



SOURCE: Department of Defense, Washington Headquarters Services, *Prime Contracts Awards, Fiscal Year 1990* (Washington, DC: 1991).

fairly bleak future, especially if further contract cancellations, big layoffs, or plant closings are added to those already occurring (ch. 6).

The other major worry about defense companies is that if they close up shop, valuable experience and technologies will go with them. Throughout four decades of Cold War, the Department of Defense (DoD) has been a huge source of funds for pushing advances in technologies. DoD spending is not an efficient or reliable instigator of technologies with commercial applications, but through sheer size it has been a very important one.[4] Defense companies accomplished much of the DoD-funded technology advance over the decades, often in research and development (R&D) projects but also in actual manufacture of leading edge, high technology products.[5] Some of the knowledge thus created can be transferred out of the companies involved (e.g., through publications, through licensing of patented processes or products, or perhaps through people leaving the company and enriching other companies or institutions with their technical knowledge). But some tacit knowledge that resides in the people who have developed the technologies does not travel so easily. It can dissipate when teams of people break up, labs close down, and divisions or whole companies disappear. This doesn't apply just to lab researchers or design engineers, but also to production engineers, foremen, and workers on the shop floor.

Thus the strategies that companies adopt in the face of declining defense spending matter not only to their own employees and shareholders, but also to their communities and to the Nation's reservoir of technology. This chapter opens a discussion but does not fully examine the wider effects of defense companies' adjustment strategies. The potential for redirecting technological resources—including those of defense companies—from military purposes to dual use or strategic commercial applications will be the subject of a second and final report in OTA's assessment of Technology and Economic Conversion. This chapter concentrates mostly on issues of jobs and community effects. A major question it raises is whether there are possibilities now, under present conditions, for companies to replace lost defense business with commercial business and in that way continue to provide jobs for workers and an economic base for communities. Previous chapters have discussed programs to help workers recover from loss of defense jobs and communities from loss

[4]A second and final report of this assessment will examine issues of dual use (military and commercial) technologies and industries. Past OTA assessments have also dealt with the dual use issue; see *Holding the Edge: Maintaining the Defense Technology Base*, OTA-ISC-420 (Washington, DC: U.S. Government Printing Office, April 1989).

[5]Universities and government-owned laboratories also conducted much of the DoD-funded R&D.

of defense business, but recovery from loss is inevitably harder than avoiding the loss—assuming that is possible.

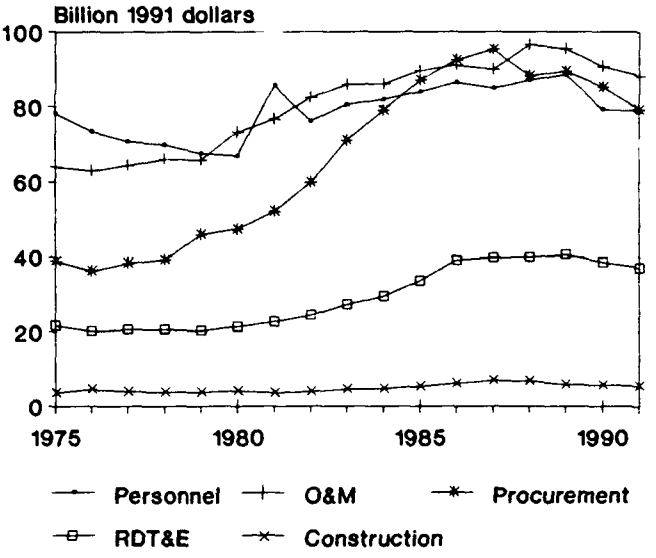
Many large companies in the defense business can expect to survive cutbacks, though perhaps at the cost of brutal downsizing. Many smaller companies face just two choices: get more commercial business or go under.[6] Not only the motivation but also the opportunities for switching over may be greater for small firms, which typically make parts and components, than for large prime contractors whose business is assembling big ticket items like tanks or missiles. Machine shops, for example, can often use the same tools and processes to make metal parts for trucks as for tanks. Small firms handle a significant share of DoD purchases of goods and services—probably about one-third of the total bought from private businesses over the last decade. Still, the two-thirds handled by large companies has the major impact on jobs and communities. The final report of this assessment will delve into the prospects for dual use production by the whole range of companies, large and small, and the potential contribution of dual use technologies and industries to the Nation's commercial competitiveness.

THE OUTLOOK FOR MAJOR DEFENSE COMPANIES

Defense contractors provide everything from food and clothing for military personnel to major hardware systems such as aircraft and submarines, construction of military facilities, and basic research on advanced concepts that may have future military value (e.g., materials science). Figure 7-3 shows defense outlays by major function. The only one in which defense contractors have no part is pay for military and civilian DoD personnel.

As noted, the weapons system experiencing the steepest drop in prime contract awards since 1985 has been aircraft. Consider the escalating blows to aircraft companies. When the Navy's T-46 trainer was canceled in 1987, 3,000 people lost their jobs and the manufacturer, Fairchild-Republic, was driven out of the business of making airplanes. That event foreshadowed the broader, deeper cuts of the early 1990s. For example:

Figure 7-3—Outlays for National Defense Functions, 1975-1991



NOTE: RDT&E refers to research, development, test and evaluation; O&M refers to operations and maintenance.

SOURCE: Office of Management and Budget, *Budget of the United States, Fiscal Year 1992* (Washington, DC: 1991).

- Secretary of Defense Cheney canceled the Navy's A-12 attack airplane in January 1991 because of delays and cost overruns, and although continuing research on an alternative was promised, 5,000 people at McDonnell Douglas and 2,000 at General Dynamics were immediately out of work, and actual production of a substitute receded uncertainly into the future.
- General Dynamics, having lost the A-12, was also slated to have DoD purchases of its Air Force F-16 Falcon fighter cut from 150 to 48, with the last buy in 1993. General Dynamics was, however, on the winning team (with Lockheed and Boeing) for the Advanced Tactical Fighter (ATF), a program projected to cost as much as $65 billion over 10 to 15 years.
- McDonnell Douglas, the other big loser in the A-12 decision, also lost out for the ATF and had no prospects for an Air Force fighter to replace its F-15 Eagle, for which DoD purchases were slated to end in 1991. It was left only with planned continuing buys of the Navy F/A-18 Hornet and the new Air Force C-17 cargo plane.

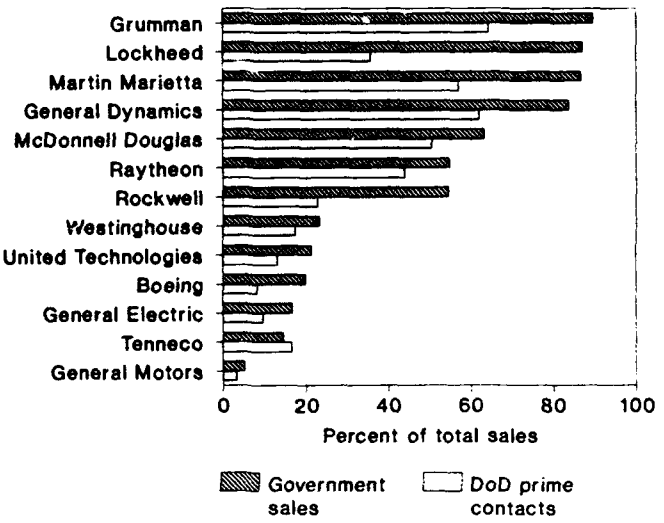
[6]The Small Business Administration defines a small business as one that is not dominant in its field of operations and with its affiliates does not have more than a specified number of employees (usually 500 to 1,000 in manufacturing, depending on the kind of product) or, for construction and service firms, a certain amount of annual sales.

- Northrop, another loser in the ATF competition, had nearly $5 billion penciled in for B-2 Stealth bombers in the administration's 1992 budget, but this proposal failed to survive passage through Congress, which voted in November 1991 to suspend B-2 purchases at the 15 already in various stages of production. This could be the death knell of the B-2, since further purchases depend on test results and approval by both the Senate and the House; the House has previously voted twice to end the B-2 program.

Since aircraft takes the biggest portion of DoD funding both for R&D and for procurement, the aircraft industry is taking the biggest dollar losses. But companies in other sectors will be hit just as hard—maybe harder. For some aircraft companies, there is at least some refuge in the commercial business, whereas the civilian markets for missiles, ships, and tanks are small to nonexistent (though foreign military sales for some of these items are large and growing). These stories are representative:

- In military land vehicles, DoD made its last buys of M-1 tanks and Bradley M-2 fighting vehicles in 1991, with production to end in 1993. Although research and development of advanced armored vehicles will continue, procurements are not expected to resume until late in the decade.
- As for ships, the last Trident missile-launching submarine will be funded in 1991; those planned for 1992 and 1993 are canceled, which means a loss in prospective procurements of $1.3 billion for the builder, General Dynamics' Electric Boat company of Groton, CT. And procurement of the SSN Seawolf attack submarine is slated to be cut from three a year to one a year. Electric Boat and Tenneco's Newport News Shipbuilding and Dry Dock Co. of Newport News, VA, had expected to share production of the Seawolf. They are tussling over which will get the remaining one per year, with General Dynamics threatening to close the Electric Boat submarine yard if it does not get all the Seawolf contracts and Tenneco vowing to cut its work force by half and get out of the submarine business if it does not get half the contracts.[7]

Figure 7-4—Percent Government Sales of Major Defense Contractors, 1990



SOURCE: Department of Defense, Washington Headquarters Services, *100 Companies Receiving the Largest Dollar Volumes of Prime Contract Awards, Fiscal Year 1990* (Washington, DC: 1991); and company annual financial reports.

Until defense appropriation bills pass the Congress and are signed by the President, it is impossible to know exactly what programs will be cut by how much, and just what kind of hit each company will take. What is certain is that cuts are deep, imminent, and real.

For some companies—those most dependent on defense sales—the prospect is more threatening than for others. Figure 7-4 shows government sales as a percent of total sales for a dozen of the top defense companies (ranked by dollar value of prime contract awards). Note that this is government sales, not DoD sales; data for the latter are unavailable for several companies. For some companies, nearly all government sales are to DoD, but others sell sizable amounts to other U.S. Government agencies (primarily the National Aeronautics and Space Administration (NASA), the Federal Aviation Administration, and the Department of Energy). Box 7-A, which describes the military products of the top 13 companies, identifies some of the companies that make large sales to government agencies other than DoD. Note also that DoD prime contract awards as a percent of a company's sales in a given year can be misleading because sales to DoD in any year include sales under contracts dating from earlier years. However, the figure on prime contract awards does

[7]Robert Holzer, "Navy's Seawolf Sub Award Threatens Future of Losing Shipyard," *Defense News*, Mar. 25, 1991.

Box 7-A—Top Defense Firms

McDonnell Douglas: Military aircraft (over 36 percent of 1990 sales) are the F/A-18 Hornet, F-15 Eagle, AV-8B Harrier, C-17 transport, T-45 Goshawk trainer, and AH-64 Apache helicopter. Missiles, space, and electronics (20 percent) include the Harpoon, SLAM, and Tomahawk missiles; Delta II rocket, and vision and C^3I (command, control, communication, intelligence) systems. Net sales in 1990 were $16.2 billion; DoD contract awards were $8.2 billion.

General Dynamics: GD's military aircraft division (36 percent of 1989 sales) produces the F-16 Falcon and is on the winning Advanced Tactical Fighter (ATF or F-22) team. The Electric Boat Division (17 percent of 1990 revenues) builds the Ohio Class SSN Trident submarine and has the first SSN-21 Seawolf class nuclear attack submarine contract. Land Systems (10 percent of 1990 revenues) makes the M1 Abrams tank. Missiles, space and electronics produce Tomahawk, Standard, Sparrow, and Stinger missiles; Atlas and MLV II launch vehicles, plus Centaur upperstages for Titan IV boosters; and a variety of electronic communications and test equipment. Net sales for 1990 were $10.2 billion; DoD contract awards were $6.3 billion.

General Electric: GE makes military fighter, bomber, and tanker aircraft engines. Aircraft engine division revenues were 13 percent of 1990 revenues, more than half of which is for commercial engines. GE Aerospace (10 percent of 1990 sales) produces the Aegis fleet air defense system; a variety of radar, guidance, flight control, and visual simulation systems; and communications satellites, GE Aeropsace is also flight control subcontractor to McDonnell Douglas on the C-17. Consolidated 1990 corporate revenues (including GE Financial Services) were $58.4 billion; DoD contract awards were $5.6 billion.

General Motors: The Hughes aircraft division is a supplier of Maverick, AMRAAM, and Phoenix missiles. It also produces targeting systems for the AV-8B Harrier attack jet and the TOW 2 missile, and has contracts for Army and Navy software systems for personnel and supplies. Revenues in 1990 were $103.3 billion; DoD contract awards were $4.1 billion.

Raytheon: Raytheon's Electronics Division (59 percent of 1990 revenues) has prime contracts for the Patriot, AEGIS, Hawk, and Sparrow missile systems. It is the second source after Hughes for the AMRAAM, Maverick, and Phoenix systems, and after General Dynamics for the Sea Sparrow, Standard 2, and Stinger missiles. The division also produces Aegis radar and fire control systems, and other radar, communications, computer, anti-submarine warfare (ASW), and electronic countermeasure systems. Its Beech Aircraft subsidiary will produce the Air Force's T-1A Jayhawk tanker/transport trainer aircraft. Revenues in 1990 were $9.3 billion; DoD contract awards were $4.1 billion.

Lockheed: In aeronautics (23 percent of 1990 sales), Lockheed heads the winning F-22 Advanced Tactical Fighter team, makes the F-117A Stealth fighter, C-130 Hercules, the P-3 Orion, and avionics systems. Lockheed also has a strong missile and space systems program (51 percent), producing spacecraft, satellites, and ballistic missiles. It is the largest Strategic Defense Initiative (SDI) contractor. Sales in 1990 were $9.9 billion; DoD contract awards were $3.6 billion.

(continued on next page)

provide some indication of what companies can expect in the future.

As figure 7-4 shows, some top defense companies count on government sales for more than half of their income; these include General Dynamics, Grumman, and McDonnell Douglas. Another group of large contractors, including Martin Marietta, Lockheed, Raytheon, and Rockwell International, also depend on the U.S. Government for more than half of their sales, but their customers include other agencies besides DoD. Still other large prime contractors are diversified commercially, relying on defense for less than one-third of their business; in this group are United Technologies (parent of the aircraft engine company Pratt and Whitney) and Boeing. One other group of large defense companies including General Electric, Westinghouse, General Motors, IBM, GTE, and ITT which are fundamentally commercial firms that maintain defense divisions.

Although defense dependence at the corporate level gives a good idea of the vulnerability of the company as an institution, it does not accurately portray the likely impacts from a company's loss of defense business on particular communities, or on workers in particular divisions or plants. Take

Box 7-A—Top Defense Firms—Continued

Martin Marietta: Martin Marietta is highly diversified within defense. The Electronics, Information and Missiles Group (42 percent of 1990 revenues) has contracts for some aspects of the Patriot, Hellfire, ADATS, Small ICBM, Minuteman, Pershing, and Peacekeeper missiles systems; navigation, target acquisition, and night vision systems, and ASW and radar systems. The Information Systems Group also has significant DoD contracts. Astronautics (53 percent) makes Titan IV rockets and NASA systems. Net sales for 1990 were $6.1 billion; DoD contract awards were $3.5 billion.

United Technologies: Flight Systems (including subsidiaries Sikorsky and Norden; 18.5 percent of 1990 revenues) leads the Army's winning light helicopter team, and produces UH-60A Black Hawk, Seahawk, Super Stallion, and Sea Dragon helicopters, plus radars, avionics, and environmental controls. The Pratt & Whitney Power Group (33.5 percent) produces aircraft engines, including engines for the F-22 Advanced Tactical Fighter. Sales for 1990 were $21.8 billion; DoD contract awards were $2.9 billion.

Grumman: Grumman Aerospace (72 percent of 1990 revenues) makes F-14 Tomcats, EA-6B Prowlers, E-2C Hawkeyes, and A-6 Intruders. Electronics (12.5 percent) is the lead contractor in the E-8 Joint STARS airborne surveillance and target acquisition system, and produces other aircraft electronics, computerized test equipment, and trainers. Revenues for 1990 were $4 billion; DoD contract awards were $2.7 billion.

Tenneco: Tenneco's Newport News Ship and Drydock Co. subsidiary (14.5 percent of total 1990 revenues) builds submarines and overhauls aircraft carriers for the Navy. While nearly all the business of the Newport News Division is in defense, Tenneco's other divisions are focused on commercial markets. Corporate revenues in 1990 were $14.5 billion; DoD contract awards were $2.+ billion.

Boeing: Boeing's military aircraft division (14.9 percent of 1990 sales) makes the Air Warning and Control System (AWACS) and E-6 submarine communications aircraft, B-2 structural components, and had contracts to update CH-47 Chinook helicopters, A-6s, F-4Es, and the P-3 Orion. It is teamed with Lockheed and General Dynamics on the F-22 Advanced Tactical Fighter, and with United Technologies on the light helicopter. It also makes avionics, electronic warfare support measures, C^3I systems, and missiles, and is developing the V-22 Osprey. Revenues in 1990 were $27.6 billion; DoD contract awards were $2.3 billion.

Westinghouse: Westinghouse's electronic systems division (24.7 percent of 1990 sales) does about 75 percent of Westinghouse's defense work. The division builds radar and electronic countermeasures devices for systems including the F-16 fighter and AWACS. The division has been expanding its non-defense markets with products such as mail-processing equipment and commercial airport radar systems. Corporate sales in 1990 were $12.9 billion; DoD contracts awards were $2.2 billion.

Rockwell International: Electronics (40 percent of 1990 revenues) makes avionics, aircraft communications, guidance and control, and CI systems. Aerospace (30.5 percent) was the B-1B lead contractor, does aircraft modification, and makes rocket engines. Rockwell also is NASA's largest contractor. Revenues in 1990 were $12.4 billion; 1990 DoD contract awards were $2.2 billion.

General Electric as an example. Even though GE is a huge defense contractor in dollar amounts, ranking third in value of prime contracts ($5.8 billion) in 1989, it ranked much lower in defense dependence, relying on government sales for only about one-sixth of its total corporate revenues in 1990. However, GE Aerospace is essentially a defense company. At the beginning of 1989, GE Aerospace had 46,000 employees; by April 1, 1991, employment was down to 38,000 and the company planned to eliminate another 2,000 positions by the end of 1992.[8] The diversification of the GE corporation as a whole does not provide much help to the local economy when the GE Aerospace plant in a small town like Pittsfield, MA closes down. In 1986, 7,800 of the Pittsfield area's 41,000 workers worked for GE Aerospace. By 1991, GE Aerospace employment was down to less than 3,000, with a loss of 3,000 jobs in just 1 year, 1990 to 1991.

MAJOR COMPANY ADJUSTMENT PLANS

Most large defense companies now realize that there will not be a new round of defense procurements on the lavish scale of the 1980s. While some

[8]Data provided by GE Aerospace division.

still expect that their special abilities will win them an outsize share of dwindling defense contracts, many are having to face the fact that their own piece of the pie will diminish at least in proportion to the smaller size of the whole pie, if not more. The big companies see their options along two principal lines, one which continues to concentrate on the defense business and the other broadening out more into the civilian economy.[9] In the first category, one option is simply to shrink in size: close plants, lay off workers, cut suppliers loose, and get down to a smaller core defense business. Another is to try to sell more to foreign military purchasers.

In the category of greater activity in the civilian economy, one alternative is to diversify at the corporate level through purchase of going concerns that already sell commercial products. Another option, in parts of the aircraft business and perhaps a few others where military and commercial end products have much in common, is to switch resources into making the commercial product. The potential for this kind of switch is probably greater with subsystems and components than with end products, though much depends on the companies' marketing abilities. Some companies, figuring they know how to deal with the government, are pursuing nondefense government agencies as customers for systems and technologies originally developed for the military. Not part of company plans, but an interesting possibility from the standpoint of technology transfer, is the startup company formed by a few entrepreneurs peeling off from large defense firms, to exploit technologies of military origin for commercial markets. The option that comes dead last, in the estimation of most large defense companies, is what is often termed conversion: that is, the company itself develops a new commercial product line that makes use of plant, equipment, work force, and technological know-how formerly devoted to military products, and lines up the financing and marketing needed to make large-scale production viable.

Shrinking in Size

Most companies are following more than one of the options outlined above, although they may single out one as their main strategy. General Dynamics Corp. (GD), second in DoD prime contract awards in 1990, perhaps best exemplifies the strategy of preserving core abilities in defense while shrinking radically in size. The company defines itself as a "pure-play" defense firm whose primary business is making major hardware systems—aircraft, missiles, submarines, and tanks. Since late 1989, when signs of a steep defense build-down became unmistakable, top officers of General Dynamics have made it clear that their principal strategy is to get smaller.

GD corporate employment peaked at 105,400 in 1987. It was down to 85,000 by fall 1991, and the company planned to shrink to 63,000 jobs by the end of 1994, even with some new defense contracts in hand. For example, the ATF award might keep employment at the company's Fort Worth plant above 10,000, but that would still be less than half the 22,000 employed there in 1990. Some entire plants will be closed, others drastically downsized. As noted, GD intends to shut down its big Electric Boat submarine yard in Groton, CT, if it does not win all the future Navy contracts for the new Seawolf attack submarine. Production of M1 tanks at GD's Detroit plant was scheduled to end in 1991, with nothing left behind but machining of some parts for the Lima, OH facility. At the same time GD employment is shrinking, so are investments. In 1990, GD's planned capital expenditures for 1990-93 were cut by $1 billion to $575 million, and planned R&D spending for 1990-93 was reduced by $380 million to half the level of the previous 4 years.

While getting smaller, GD also planned to increase dividends to shareholders and compensation to managers. The company increased profitability standards for new contracts, and adopted a plan to link executive bonuses to financial performance. The plan based bonuses for Chief Executive Officer William Anders and about 25 other top GD executives on the price of GD stock. Bonuses totaling approximately three times the officers' annual base

[9]Material in this section is drawn from annual reports of 10 leading defense companies, from interviews with company officials, and from articles in general and trade press.

pay were awarded in May and October 1991.[10] However, in November 1991 GD's board of directors voted to drop the plan and substitute a more traditional stock option incentive program.[11]

While shrinking is the major GD strategy, a minor theme is to look for modest increases in commercial business. The company expects its commercial missile launch service business to grow; orders for five new launches of communications satellites were taken in 1990. Also, GD is a subcontractor to McDonnell Douglas, making fuselages for that company's big new commercial jet transport MD-11. However, the company underscored its commitment to its core defense business when it announced plans in 1991 to sell its Cessna subsidiary. GD had bought Cessna, a maker of small aircraft for both commercial and military buyers, only 5 years earlier.

Finally, like a number of other big defense companies, GD is seeking opportunities to transfer military technology to nondefense government projects. Its first such venture was in magnets for the Superconducting Super Collider. Based on its expertise in cryogenic fluid-handling technologies, largely gained in the Atlas launch vehicle, GD was selected as the leader for the design and prototype test of preproduction magnets for this multibillion-dollar government project.

Exporting Arms and Military Technology

Virtually every big defense company wants to increase its military sales to foreign buyers. When asked for suggestions about government policy to ease the impact of the defense build-down, most company officials put relaxation of U.S. export controls on military items at the top of the list. Moreover, reliance on exports to bolster the U.S. defense industry has some support from the Bush administration.[12] Although this strategy holds little promise for strengthening commercial competitiveness or creating dual use abilities in U.S. industry, it has a strong appeal from the companies' point of view. There are two serious problems, however. First, the end of the Cold War has sent world defense purchases into steep decline, while overcapacity of production exists in many countries; military sales are a buyers' market. Second, the international arms business is "building up a dangerously armed world" in which potentially renegade or terrorist nations can use military equipment or technologies imported from the advanced industrial states to threaten or invade weaker neighbors.[13]

Most arms-producing nations collaborate with other nations in developing advanced weapons systems in order to reduce costs, and they also use exports of their latest equipment to reach economies of scale in production. In fact, some European arms producers, with the support of their governments, export half or more of their military output. In contrast, U.S. policy has long been to control military exports quite strictly, and to use them mostly to strengthen allies and oppose expansionary communism; the United States exports only about 10 percent of its military production. However, U.S. arms production is so huge that on a dollar basis American military exports in recent years were greater than those of all the other Western powers combined (nearly $12 billion a year on average from 1982 to 1986) and were second only to those of the Soviet Union. (Japan prohibits military exports altogether).

The situation in the United States is changing. In the last couple of years, direct commercial sales of military equipment to foreign buyers (which require

[10]Robert J. McCartney, "Defense Firm's Executives Reap Bonus Bonanza," *The Washington Post*, Oct. 9, 1991, p. F1. An executive did not receive the bonus immediately; instead half was set aside until the executive's 65th birthday and the other half until the expiration of the plan in 1994. Meanwhile, the executives were paid interest at above market rates on the deferred payment (13.9 percent in October 1991, compared to typical current rates of 7 percent on certificates of deposit), so long as the stock price stayed above the level that triggered the bonuses.

[11]Anthony L. Velocci, Jr., "General Dynamics to Roll Back Controversial Compensation Plan," *Aviation Week and Space Technology*, Nov. 18, 1991, pp. 68-69.

[12]". . . The long-term survival of a number of important domestic arms programs are tied to foreign sales," according to U.S. Department of State and Defense Security Assistance Agency, *Congressional Presentation for Security Assistance Programs*, fiscal year 1992, p. 6, cited in U.S. Congress, Office of Technology Assessment, *Global Arms Trade: Commerce in Advanced Military Technology and Weapons*, OTA-ISC-460 (Washington, DC: U.S. Government Printing Office, June 1991), p. 3. Moreover, some high-ranking U.S. military officers have departed from tradition to advocate foreign sales of U.S. military equipment—including M1 tanks and F-16 fighter aircraft—in order to support the U.S. defense industrial base and keep production lines open. Ibid., p. 13. Much of the material in this section is drawn from this OTA report.

[13]Ibid., pp. 16, 17. An example of foreign military sales that were used for purposes far from those intended by U.S. policymakers is found in Iran. The United States sold about $11 billion of military hardware to Iran from 1969 to 1979 and trained 11,000 military officers. These weapons and trained officers failed to save the Shah's regime, and were later used in the war against Iraq. The Soviet Union, France, and several developing countries were major suppliers of weapons to Iraq before the invasion of Kuwait.

approval but no participation by the U.S. Government) have greatly increased. In many of these deals, the sale of a tank or fighter aircraft, for example, is combined with sufficient transfer of the underlying technologies for indigenous production, under license, by the buyer nation. These were the terms of a proposed sale by McDonnell Douglas of its F/A-18 aircraft to Korea; that sale fell through when General Dynamics offered a lower price and more technology transfer for its F-16 fighter, but the GD sale is expected to include similar terms. U.S. firms making these sales argue that the most advanced technology is not transferred. "We don't sell the crown jewels," they say, arguing that yesterday's technology has a limited shelf life and marginal relative warfighting capacity. However, with the present sharp cutbacks in military procurement and development of many new weapons systems delayed for years, much of the equipment used by the U.S. armed forces until well into the next century could be based on yesterday's technology. Some of the most successful weapons demonstrated in the Persian Gulf War were designed in the 1970s or even earlier.

Despite a trend toward relaxation of controls on U.S. military exports, there are cross currents. It has been sobering to realize that Western allies of the United States furnished a large share of the Iraqi military machine—including its most advanced aircraft and missiles and components for missile guidance systems, nuclear weapons, and chemical weapons. Not only the large-scale export of weapons but also the worldwide proliferation of technologies and industries for building modern weapons are sources of increasing concern. U.S. policy is unclear. On the one hand, the Bush administration proposed in 1990 a sale of over $26 billion in U.S. weapons to various Middle Eastern countries (Congress has already permitted approximately $10 billion of that proposed sale[14]), the State Department has instructed U.S. embassies to help U.S. defense exporters, and the administration has proposed up to $1 billion in loan guarantees by the Export-Import Bank for purchase of U.S. defense equipment by NATO members, Australia, Japan, and Israel.[15] On the other hand, President George Bush proposed in May 1991 that major supplier nations exercise "collective self-restraint" in arms sales to the Middle East.[16] In Congress, there is a substantial interest in seizing the moment to create a system of multilateral controls over the global arms trade.[17]

Whatever the outcome of the policy debate, the prospects for greatly increased exports by the entire U.S. defense industry are dim. Foreign buyers may be lining up for certain American-made weapons systems that scored brilliant successes in the Persian Gulf War, and this could give a boost to some companies. But overall world spending for defense has plummeted, and the competition from other countries is stiff. Like DoD contracts within the United States, there is not enough export business to go around. It is not just a zero-sum game, it is negative sum.

Shifting to a Similar Commercial Product

The similarities between some military and commercial products are great enough that it should be possible to shift people, R&D resources, and even some production equipment from one to the other with relative ease. Aircraft is the prime example. Both of the U.S. producers of large commercial airplanes—Boeing and McDonnell Douglas—produce military aircraft as well, though the military side of the business is far more important to McDonnell Douglas than to Boeing (figure 7-4). Because of the lucky coincidence of a strong commercial market in the late 1980s and early 1990s, both companies have big backlogs and are shifting to a greater proportion of commercial work.

In the same way, the two U.S. manufacturers of large jet engines, GE Aircraft Engines and Pratt and Whitney, have tilted toward more commercial production. Not only that, all of the U.S. airframers that specialize in military aircraft are either already doing subcontract assembly work for Boeing's and McDonnell Douglas's commercial jets (e.g., fuselages, tail sections) or are planning to do so. At least one military airframer, Lockheed, has offered every commercial manufacturer in the United States and Europe anything from small parts to final assembly,

[14]Sen. John McCain "Arms Sales to the Middle East Since the Gulf War." *Congressional Record, Senate*, Nov. 19,1991, p. S16981.

[15]U.S. Congress, Office of Technology Assessment, *Global Arms Trade*, op. cit., p. 21.

[16]*The Washington Post*, May 30, 1991, p. A1.

[17]For example, in June 1991 the Senate Committee on Foreign Relations approved foreign aid and State Department authorization bills that would direct the President to convene the major weapons supplier nations to establish a "cartel" to ban the sale of chemical, nuclear, and biological weapons and ballistic missile delivery systems to the Middle East, and to curtail sales of advanced conventional arms.

but a possible deal with Airbus Industrie fell through because of the European member companies' desire to keep as much work as possible in Europe. Lockheed has, however, succeeded in expanding its division that does maintenance and rework of aging aircraft, including big commercial jets. It doubled its corporate capacity for overhaul and structural rework with a facility in Tucson that opened in 1989. And it has agreed to refurbish Japan Air Lines' 747 fleet in hangars at California's Norton Air Force Base, which was on DoD's 1988 base closing list and will soon be vacated by the Air Force. Moreover, Lockheed has a relatively small but thriving commercial business selling a civilian version of its C-130 Hercules military cargo plane; among its customers are oil companies drilling on Alaska's North Slope.

The shift from military to commercial production in aircraft is not without difficulties. The biggest impediments lie less in technology than in business practice. True, military aircraft are designed with different goals than commercial planes; in some military planes (especially fighters) the highest value is put on performance pushed to the limit, with cost secondary, while in commercial airplanes the top goals are safety and cost control, with performance important but a step behind. More significant than these differences, however, is the fact that defense contractors have one customer to deal with—DoD—and that customer imposes by law and regulation accounting and audit practices that are costly, cumbersome, and unknown to the commercial world.[18] Successful defense contractors are adept at working with these requirements, but that set of skills gives them no advantage whatever in the commercial side of the business, rather the opposite. More will be said on this subject later. For now, suffice it to say that some military airframers find that the cost structure in their military business makes it very hard to do large-scale commercial subcontracting.

Some companies do manage to work both sides of the street quite effectively. GE Aircraft Engines is the leading example; this GE division combines all aspects of its military and commercial business except for marketing, while still complying with DoD requirements. Boeing (airframes) and Pratt and Whitney (large jet engines) both keep military and commercial production much more separate. McDonnell Douglas is in something of a middle position, with most of its military and commercial production physically separated but with some interchange of managers and engineers. And despite the separate structure at Boeing, there is at least some opportunity to move people from the military to the commercial side (see ch. 4, box 4-C, which describes Boeing's retraining program in Wichita, KS for 176 military aircraft engineers).[19]

At the level of subsystems and components, integration of military and commercial production is often greater, and so is the opportunity to shift rather easily into more commercial work. For example, the aerospace division of Allied Signal Corp. makes a whole range of items for aircraft, including auxiliary power units and environmental control systems for large transports, engines for smaller aircraft, actuators, engine controls, flight control systems, wheels and brakes, avionics and cockpit displays. About half the company's business is military, and according to company officials it is not too difficult to shift to commercial work; people, accounting systems, facilities, and technologies are shared. Production is shared when possible, as when there are common parts (e.g., in heat exchangers, actuators, valves).

Even at the subsystem level, exchanges between the military and commercial sides of the business are not always trouble-free. For example, Rockwell Collins, a world leader in both military and commercial avionics, segregates the two sides of the business except for R&D—even though avionics is the one part of the aircraft sector in which technology flows most freely between military and commercial projects.[20] The reason is simply that military specifications (which often cover manufacturing processes as well as the product itself) and accounting requirements put too much of a cost burden on the commercial side. Despite the problems, Collins does assign engineers from its military side to

[18]For a discussion of DoD contracting requirements, the costs they impose, and the reasons they were adopted, see OTA, *Holding the Edge*, op. cit.

[19]Boeing's first major reduction of defense-related jobs in the current defense build-down was announced in October 1991; 2,500 jobs are to be eliminated in the MX missile and the Short-Range Attack Missile II programs, which will be ended following President Bush's decision to abolish several nuclear weapons programs.

[20]As leading examples of the technology flow, Collins officials cited ring-laser gyros (initially developed by the Navy), which accurately measure an aircraft's attitude, and the global positioning system (GPS) for satellite navigation.

commercial projects when they are needed, although some retraining for attentiveness to costs may be in order.

Altogether, despite the difficulties, the commercial aircraft business proved useful in tempering job loss and community disruption from the very sharp cutbacks in military aircraft procurement in the early 1990s. As a haven for some of the engineers, computer programmers, and technicians displaced from the defense sector, it helped to staunch dissipation of the technology embedded in people's minds. It should be noted, however, that these positive effects were fortuitous. It was good luck that the end of the Cold War coincided with an upswing in the cyclical commercial aircraft industry—strong enough, it seems, to have escaped any immediate dampening from either the Gulf War or the 1990-91 recession. Also, even a commercial industry with tens of billions of dollars in backlogs was by no means enough to avert serious displacement in some aircraft-dependent communities, i.e., Fort Worth, St. Louis, Long Island, and Los Angeles.

While the aircraft industry provides the most opportunities for direct transition from a military to a commercial product, there may be some smaller openings elsewhere. For example, AM General (a division of LTV Missiles and Electronics Group) announced plans in June 1991 to sell commercially its Persian Gulf War star vehicle, the Humvee (or Hummer, more formally the High-Mobility Multipurpose Wheeled Vehicle).[21] To be offered in three versions, priced from $40,500 to $44,000, the civilian Hummer got off to a well-publicized start with a $60,000-plus custom order from Arnold Schwarzenegger.[22]

Sales to Civilian Government Agencies

A first line of retreat for many companies losing military contracts is to go for more business with NASA. All of the leading defense contractors are involved in space technology, making missiles, launch vehicles, satellites, electronic control systems, or all of the above, and most have some NASA as well as DoD contracts in space applications. NASA's $14.3-billion appropriation for fiscal year 1992 was only a modest 2.5-percent increase over the 1991 level, but it included a 19-percent hike for the new space station *Freedom*, up to $2.03 billion. President Ronald Reagan had proposed building a new space station, to be launched by the end of the century, in 1984; from 1985 to 1991 Congress appropriated a total of $5.7 billion for the project. However, in recent years, estimates of the space station's cost skyrocketed, NASA scaled it down,[23] and scientists questioned its value. In fact, several scientific associations have opposed any further funding for the project. The generous FY92 funding for the project does offer opportunities for increased sales by some defense companies, though whether the project will eventually be fully funded is still not certain.

Several large defense companies are aggressively following a strategy of packaging their technologies in a form suitable for civilian government agencies, including several others besides NASA. Although there may be differences between DoD and civilian agencies, government sales are still a world apart from commercial marketing, and are what defense companies understand. Martin Marietta is a leading example of the strategy. Building on its defense work in C^3I (command, control, communication, intelligence), the company's Information Systems Group has set its sights on 15-percent growth annually from sales of information and data processing systems to civilian agencies. Already, Martin Marietta is the overall systems engineer and integrator for the Federal Aviation Administration's (FAA) $16-billion upgrade of weather and air traffic systems at U.S. airports, an effort involving several other defense contractors, including TRW and Norden Systems (a subsidiary of United Technologies). Martin Marietta has sold similar services in Canada, France, and Australia. The company is also supplying software for data processing to the Social Security Administration, data processing facilities to the Department of Energy's (DOE) Western Area Power Administration, remote data networking and processing services to the Agriculture Department's

[21]Jack Keebler, "$40,000-plus Hummer Goes Public," *Automotive News*, June 24, 1991, p. 4.

[22]The price to DoD for the Hummer is $26,000. Ibid.

[23]The cost of building space station *Freedom* was originally estimated at $8 billion; a 1990 estimate was nearly $39 billion. A scaled down and stretched out project would cost $30 billion by 1999, according to NASA, but the work on the station would not be complete—it could later be enlarged and enhanced. The U.S. General Accounting Office estimated the overall cost of building, launching, and maintaining the station in space for 30 years, through 2027, at $118 billion; a more recent estimate is $180 billion.

National Agricultural Statistic Service, and automated mail-sorting machines to the Postal Service.

This strategy is a fruitful one for technology transfer from military to civilian activities. It also holds promise for easing the transition for workers and communities, avoiding dislocation and disruption by continuing the same kind of activities in the same places with many of the same people.

Spinoff Companies

Sometimes, enterprising employees of large companies decide to form their own companies to exploit for commercial uses military technologies that the large company has developed but does not wish to bring to market. The value of this approach is in technology transfer. It usually does not save existing jobs or use existing plant and equipment, but if it succeeds it may create new jobs, energize local communities, and contribute to the Nation's industrial competitiveness.

Little has come to light about entrepreneurial spinoffs in the current defense build-down, and it may be too soon to judge the success of such efforts. However, examples from earlier periods of defense cutbacks illustrate how they can work. One such is the Schenectady, NY company Environment One, founded in 1969 by six engineers who left GE's General Engineering Lab to commercialize a technology that originated in an antisubmarine device. Box 7-B tells the story.

Assuming that there are enterprising people who want to start up a company based on military technology, such as the founders of Environment One, often the main impediment is getting enough financial backing. Obtaining necessary intellectual property rights could also be a problem in some cases. The large companies that were the seedbed of the technologies sometimes help startup companies get past these obstacles. For Environment One, GE was helpful in licensing its technology on affordable terms. A few years later, in the 1970s, GE tested the idea of a Ventures Group in which it supported small spinoff companies trying to commercialize technologies developed in GE's basic science Research Lab. (Not all the technologies were military in origin, but about 60 percent of the lab's funding at that time came from DoD). For the 5 years the program lasted, GE fostered the startup of eight companies, putting up enough funds to hold a 45-percent interest in each.

Eventually GE abandoned the program, but it did chalk up some successes. For example, Intermagnetics General was founded in 1971 as part of the Ventures Group by Carl Rosner, who had been head of GE's superconductivity research program. At that time, GE itself was unwilling to bet on the commercial potential of the technology, but supported Rosner's startup with 45-percent GE financing. Before long, Intermagnetics General bought out GE's share and afterwards grew from an initial investment of $7 million to a company of 450 people with annual sales of $50 to $60 million. Its main products are materials and magnets for the medical diagnostics industry.

Corporate Diversification

A defense company that faces big losses in military contracts can try to protect its corporate fortunes by buying firms that are already successful in making and selling commercial products. Thus the defense company does not have to learn unfamiliar management and marketing skills, but can rely on its new subsidiaries to keep on doing what they know how to do. There is a danger in this strategy. In the conglomerate vogue of the 1960s, many corporations (including but not limited to defense companies) acquired diverse strings of companies on the theory that if one line of business declined another would prosper and keep corporate profits on an even keel. The trouble with some of these conglomerates was that corporate managers got into businesses they did not understand and turned successful firms into failures or, more often, found that the subsidiaries fell below the profitability standards of the parent corporation.

In some cases, however, diversification has worked very well. An example is the Raytheon Co. based in Lexington, MA.[24] Raytheon is a top defense company, fifth in prime DoD contract awards in 1990, and the maker of the acclaimed Patriot missile as well as several other missile systems and components, radar systems, and electronic and communications equipment. Raytheon is also a major nondefense company; nearly half its sales are nonmilitary.

[24]Much of the material on Raytheon's diversification experience is drawn from Robert W. DeGrasse, Jr., "Corporate Diversification and Conversion Experience," in John E. Lynch (ed.), *Economic Adjustment and Conversion of Defense Industries* (Boulder, CO: Westview Press, Inc., 1987).

Box 7-B—Environment One: From Detecting Submarines to Monitoring Air Pollution

Environment One of Schenectady, NY, is an example of a successful spinoff from a major corporation, using technology originally developed for the military to produce commercial items.[1] In the mid-1950s the General Engineering Lab at GE (the advanced engineering lab, at that time separate from the pure science Research Lab) developed a submarine detection system for the Department of Defense using condensation nucleide monitoring to detect submicron particles. The principle is that of the Wilson cloud chamber, in which the presence of particles too small to detect optically is inferred by observing the beads of condensation they trigger in a small chamber of cold, low-pressure vapor.

GE's research engineers developed a device with a very small (2 inch by 5/8 inch diameter) chamber that could take a fresh sample of air every second and expand it rapidly to supercool it, and represent condensation by an analog voltage. This resulted in the ASR-3 antisubmarine device, capable of detecting the trail of diesel smoke particles left by a snorkeling submarine as far as 100 miles away. NATO used the device for submarine detection through the early 1960s. The same technology was applied during the Vietnam War for a "people sniffer" that could detect people hiding in foliage.

The group working on the technology in the General Engineering Lab realized that it could also be applied to monitoring air pollution, detecting smoke, and finding faults in polymers, which emit minute particles prior to failure. In view of the growing concern about pollution at the time, the engineers proposed that GE develop this aspect of the technology. GE chose not to, and in 1969 a team of six engineers, including Frank Van Luik, the present chief executive officer (CEO), left the lab to found Environment One, taking with them 20 lab workers. In an amicable arrangement with GE, the six entrepreneurs bought the patent for the particle detector and also the patent for an innovative grinder pump for home sewage treatment, which some of the six had developed. The price was $20,000 plus a royalty of 4.5 percent. GE was offered the chance to retain a 51-percent share in the company with the option of buying the rest back if successful, but declined out of wariness of potential antitrust violations.

The company began with a good technology base, but slender financing and no name recognition. Learning how to market its products was the biggest challenge, made more difficult by the disappointment of not having the GE label to instill customer confidence. With no financial backing from GE, the fledgling company had to rely on the founders' savings and startup money from a small private investor group that knew of the founders' work at GE, to take the company through the process of licensing the novel grinder pump and generally becoming known.

The company had sales of $12 million per year in the early 1990s. Its business remained largely in the manufacture of the two original product lines, with a small fraction (about 10 percent) in a measurement service. CEO Frank Van Luik attributes Environment One's survival to its concentrating on a few specialized products in which it excells technically.

[1]Information on the company, its products, and the technologies they are based on was provided to OTA by company officials, including CEO Frank Van Luik and George Skala, Senior Engineer, Incipient Fire Detectors and Generator Condition Monitors.

Raytheon's experience as a defense contractor goes back to World War II when it was a leading manufacturer of radar equipment. As early as 1946, when DoD canceled hundreds of millions in contracts with the company, Raytheon managers decided to diversify. Most of the early attempts (into television and germanium semiconductor production) failed to pay off, but by the mid-1960s a new CEO, Thomas Phillips, was ready to try again. By the late 1950s Raytheon had developed a commercial microwave oven, originated by a Raytheon engineer right after the war and based on military radar. But the expensive Radarange was sold mostly to institutions such as hospitals and restaurants. Not until 1965, after Raytheon bought the consumer-oriented Amana Refrigeration, Inc., did the company make a vigorous effort to bring the price down to a level households could afford. Amana was given the job of producing and selling microwaves to consumers.

Raytheon later bought two other major appliance subsidiaries, Caloric and Speed Queen and, mostly through acquisition, has entered such diverse fields as small aircraft (Raytheon owns Beech Aircraft), energy services, heavy construction equipment, and textbook publication. A few more of these ventures, besides the microwave oven, were based on genuine transfer of the parent firm's defense technology. For example, the sound-emitting device used by Raytheon's oil exploration firm, Seismograph Service Corp., sprang from the company's military work on

sonar. Beech Aircraft offers examples of technology transfer both ways: the Air Force made a big buy of Beech business jets for trainers; and the newest, still experimental, Beech executive jet is the Starship, made of advanced composite materials first used in military aircraft.

For the most part, however, Raytheon got into its commercial ventures through purchase, not internal development. Where there was internal commercial development of a military technology, the process was complex, both from the engineering and the management standpoints. Raytheon executives stress that although the company is about half defense and half nondefense, the two halves are separate. Explaining the reason for commercial acquisitions, a company executive said: "We knew almost nothing about commercial marketing."[25] The separation means that crossover of employees from the defense to the commercial business has been limited. In fact, when the Vietnam War was winding down in the late 1960s, Raytheon terminated 8,000 employees, or 15 percent of its work force—mostly in defense plants in the Boston area.[26] This suggests that while diversification can be a valuable strategy for the firm and its shareholders, it may not offer much to communities and workers affected by the defense build-down.

Conversion

Conversion, defined as redirecting an existing work force, some technologies, and possibly some equipment from military into commercial production, has taken place in the past with widely varying results. Conversion after World War II was massive, fast, and successful. But conditions then were very different from those of the 1990s. For one thing, in those pre-Cold War days military production was universally seen as a temporary diversion from normal business. In the auto industry, for example, tooling and machinery for making cars were put in storage after Pearl Harbor, but within weeks after war's end they were back in service and producing 1942 models. Conditions after the Vietnam War were more like those of 1990-91—a substantial reduction in defense spending combined with detente and a U.S. economy in recession.[27] Following Vietnam, several large firms tried conversion with results that are remembered in corporate history as unmitigated fiascoes that should never be repeated.

As the discussion and examples below indicate, there is a good deal of justice in that evaluation, but it does not tell the whole story. There were some modest successes, especially in technological innovations. There were also some large technological failures, as aircraft companies ventured into the unfamiliar but seemingly simpler businesses of making light rail cars and buses; it proved to be harder than it looked. While the companies' difficulties were compounded by shifting government policy, another very important factor was the different demands on managers in a commercial versus a defense business—especially control of costs, attention to product reliability, and marketing know-how.

Aerospace to Mass Transit

The best-known attempts at conversion in the 1970s (see box 7-C for details) were those of Boeing Vertol, Boeing's helicopter division, and Rohr Industries, a long-time manufacturer of nacelles (housings for aircraft engines). Both companies ventured into making light rail cars for trolley, elevated, and subway systems and both left the business after some costly losses. Grumman's ill-starred attempt to manufacture buses is an example of diversification rather than conversion, since it came about through purchase of a going concern, the Flxible Co., from Rohr. However, like the Boeing and Rohr stories, it illustrates the perils of taking on a complex new product without sufficient understanding of cost and reliability problems and without allowing time to test the new product in operation.

It is interesting to note that while neither Grumman nor Rohr solved the technological difficulties plaguing their mass transit vehicles before getting out of the business, Boeing did. The light rail cars that Boeing hastily put into service in Boston to comply with its contract—the cars that were such a notorious failure—were later improved and given lengthy tests under actual operating conditions in other cities. These improved cars performed suc-

[25]David Gumpert, "Raytheon Prospers Despite Big Slow Down in the Defense Industry," *The Wall Street Journal*, Mar. 5, 1971.

[26]DeGrasse, op. cit., p. 108.

[27]There are significant differences as well. Defense spending was a larger share of GNP in the peak Vietnam War years (9.2 percent in 1968 v. 6.5 percent in 1986). On the other hand, defense outlays in constant dollars were larger in the Reagan buildup, and the Nixon-Kissinger detente of the early to mid-1970s was fragile compared to the definitive end of the Cold War in the early 1990s. See ch. 1 for further discussion.

Box 7-C—Aircraft Companies as Makers of Mass Transit Vehicles

Boeing Vertol—A decline in military orders for the Chinook CH-47 helicopter in the late 1960s and early 1970s led Boeing's Vertol division (located in Delaware County, PA) to start work on light rail vehicles.[1] Boeing managers hoped to capitalize on the company's experience in systems integration, on company technologies they saw as superior to those of competitors in the light rail car industry, and on national demand projections for roughly 2,000 cars during the 1970s. Further, the facility Boeing Vertol planned to use, formerly owned by Baldwin Locomotive, was well suited to testing and shipping rail vehicles. Finally, Boeing thought it likely the Federal Government would offer subsidies for mass transit and, at least as important, would develop national standards for transit cars. Indeed, before getting into production, Boeing won contracts with the Department of Transportation's (DOT) Urban Mass Transit Administration (UMTA) to develop transit car specifications and standards.

In 1973, Boeing Vertol won its first production contract—an order to produce 150 cars for Boston and 80 for San Francisco of what was optimistically called the U.S. Standard Light Rail Vehicle (SLRV). UMTA had developed the SLRV specifications in the hope they would encourage economical mass production of transit vehicles—and UMTA had the means to urge cities to buy into the standards, since at that time it provided 80 percent of capital funds to local transit authorities. The two cities did specify some differences in requirements on the first order, but these were no more than variations on the same basic design. Boeing Vertol hoped other cities would order the standard vehicle and select options to tailor it to local needs.

The SLRV was in fact a new-generation trolley car, designed to be safer and more comfortable than cars then being made in the United States and Europe. But Boeing agreed to a compressed schedule for the Boston order, without building in time for thorough operational testing of the new design. In the rush to meet the schedule and avoid penalties, Boeing tore out unsatisfactory components and modified the cars on the production line. The first of the new vehicles began service in Boston in January 1977 and within weeks developed problems with brakes and other major components. In response, Boeing made over 65 design modifications in the first year of operation, but in the end had to settle without delivering the last 40 of the 175 cars originally ordered, and with losses of tens of millions of dollars on the contract.

Learning from the Boston experience, Boeing modified the trolley cars subsequently delivered to San Francisco, and they proved reliable. A 1974 contract with Chicago for 200 cars for its elevated system included a substantial testing period, and these cars too have performed well over the years. Nonetheless, Boeing decided to leave the transit market at the end of the 1970s. First, the transit market turned out to be more sluggish than had been projected. But also, by the mid-1970s UMTA was backing off from national transit car standards, leaving local transit authorities free to demand their own designs. The differences in each order increased costs. Perhaps most important, the upturn in defense spending in the last years of the Carter administration and the enormous increases in the Reagan years promised much bigger defense business (and probably many fewer headaches) than anything the transit business had to offer.

Even at its height, the transit car operation did not reemploy a large proportion of Boeing's idle defense workers or resources, although most of those used (75 to 85 percent of the engineers and 95 to 100 percent of the production workers) had previously been involved in the helicopter operation. Transit production never involved more than 550 people, compared with 4,300 still employed at the Chinook plant in the mid-1970s, and a high during the Vietnam War of 13,000. However, some of the production techniques and tools employed on the trolley line were borrowed from aerospace production.

Rohr Industries—Rohr's venture into mass transit was more ambitious and ultimately less successful than Boeing's.[2] It began in the middle 1960s, not in response to a defense build-down but as an outgrowth of a new company president's wish to "fill valid, rational human needs."[3] Rohr made a bid to San Francisco's Bay Area Rapid Transit system (BART) that was below expected expenses, in the hope of establishing a strong position in the market. The company believed it could apply its aerospace skills to advance the state of the art in mass transit.

---

[1]Much of the Boeing-Vertol story is drawn from Robert W. DeGrasse, Jr., "Corporate Diversification and Conversion Experience" in John E. Lynch (ed.), *Economic Adjustment and Conversion of Defense Industries* (Boulder, CO: Westview Press, 1987); and Linda Kravitz, "The Wages of Peace," contract report prepared for the Office of Technology Assessment, August 1990. Information about the SLRV was amplified by telephone interviews with Earl Weinstein of Allied Signal Aerospace.

[2]The principal source for this section is DeGrasse, ibid.

[3]Ibid., citing Roy J. Harris, "Shattered Dreams: Rohr Industries Grew Fast and Currently It's Shrinking Fast Too," *Wall Street Journal*, Nov. 5, 1976.

(continued on next page)

Box 7-C—Aircraft Companies as Makers of Mass Transit Vehicles—Continued

It undertook to develop a transit vehicle that was a "quantum jump" in sophistication and reliability. In 1969, Rohr won a contract to supply 450 rail cars to BART, and 3 years later contracted with the new Washington, DC subway system for another 300 cars.

Rohr found the task far harder than expected. Cars were delivered late both to San Francisco and to Washington, and once delivered the cars developed problems with brakes, doors, and car seals that persisted even after extensive modifications. Continuing financial losses and a change in Rohr's management prompted withdrawal from the rail car business in 1976.

Like Boeing, Rohr had tried to produce a new generation of rail cars without allowing enough time first for development and then for debugging. Again, like Boeing in Boston, Rohr had to modify cars that were already in service—an expensive proposition. Unlike Boeing, Rohr did not stay in the business long enough to iron out the technical problems but opted to cut its losses—especially since UMTA's failure to establish national standards for transit cars made forecasting the market very chancy.

Grumman—Grumman's excursion into mass transit was in buses, through purchase of the Flxible Co. of Loudonville, OH from Rohr.[4] Grumman did not attempt to use its own technology, equipment, or work force in the venture; the bus it launched was a Rohr design, representing another of that company's attempts to advance mass transit technology. Rohr had bought Flxible in 1970 as part of its diversification into transit. It sold the company to Grumman in 1978 when, shaken by losses in its rail transit business and having changed management, it abandoned the transit market. On Grumman's side, the purchase was a hedge against diminished expectations of Navy orders for its F-14 fighter (the Tomcat, which as it turned out had many lives, undergoing repeated modifications and lasting through 1991).

The new Flxible-Rohr-Grumman bus, dubbed the 870, ran into trouble almost as soon as it went into service. One of the New York buses collapsed when the A-frame supporting the body over the rear axle snapped. In quick succession, all the transit systems using 870s took the buses off the streets for inspection and repair. Checks revealed that four major components in the bus's chassis were likely to crack and give way altogether. In the end, Grumman agreed to retrofit all of some 2,900 buses it had built and to extend the warranty. In 1983, Grumman sold its bus company to the General Automotive Corp., and by 1988 had settled lawsuits with Chicago and New York transit authorities.

Grumman claimed that the 870 was the most thoroughly tested bus that Flxible had ever produced. But the 870, like the BART and Washington subway cars, was a new design. And the approach to testing was that of the aerospace industry, with a computer analysis followed by a test to destruction under extreme conditions, and then a drive test on a "torture track." What it did not have was a lengthy test on real city streets, complete with potholes; the only actual driving on city streets as part of the test was of a bus specially fitted with advanced measuring instruments operated by an engineer.

As noted, Grumman's bus enterprise was diversification through purchase, not conversion of its own resources to nondefense production. But three decades earlier, right after World War II, Grumman did undertake a conversion that succeeded, and became two subsidiaries of the company that are still thriving today.[5] The company found itself with excess aluminum manufacturing capacity after the war and looked for new uses for it, other than military airplanes. One was canoes; another was the bodies of large high-sided commercial trucks. The subsidiary making both products became Grumman Olson, which is still the largest producer of walk-in truck bodies, sharing the market with Union City Body Co., a GM subsidiary.

Another offshoot of Grumman's World War II aluminum production is Grumman's Long Life Vehicle (LLV) subsidiary, which makes Postal Service vehicles. Grumman won out against three other companies in a competition to make mail delivery vehicles that would stand up much longer than the previous steel-bodied jeeps. Grumman's aluminum vehicle, designed to last 24 years, won the Postal Service contract in 1986. The company will make 99,150 vehicles under the contract, and is now producing nearly 20,000 a year (using a GM chassis), with sales in 1990 of $391 million.

---

[4]Much of the Grumman story is drawn from David Young, "Putting the 870 Back Together," *Mass Transit*, May 1981.

[5]Material on Grumman Olson and Grumman LLV is drawn from the company's annual reports and from telephone interviews with Steve O'Brien, Director of Business Operations, Grumman LLV and J. Edward Waesche, Director of Operatons Analysis, Grumman Corporation, Bethpage, NY.

There is very little connection today between Grumman LLV and the Grumman aerospace company. The kinds of aluminum used in trucks and aircraft have diverged so greatly that the companies do no joint purchasing, and LLV is now big enough to stand on its own. On rare occasions, LLV might use an engineer from the parent company to solve a special problem in working with aluminum. But for the most part, the connection is only corporate.

Allied Signal Aerospace—This company is a maker of a wide range of equipment for both military and commercial aircraft. "If it flies in the Western world and doesn't have a beak, it has something on it from Allied Signal," company officials say.[6] The things the company makes include power units for large commercial jet transports, engines for smaller planes, actuators, wheels and brakes, flight control systems, avionics, and cockpit displays.

Like Rohr, Allied Signal foresaw an expansion of the demand for public transport and in the mid-1960s decided it could apply some of its experience in aerospace control technology to transit systems. Its strength lay in its electronic "chopper" switches, which were superior to the mechanical switches in use at the time for controlling transit cars. Allied Signal had developed several advanced control systems by the end of the 1960s and tried them out on the BART test track. On the basis of these tests, BART specified chopper controls in its Request for Proposals for design of the system.

Although Allied Signal failed to win the initial BART contract (Westinghouse got it), the company became the leading contractor for several experimental prototype rail vehicles for DOT's Office of High Speed Ground Transportation. And by 1973, it joined Boeing Vertol in production for the Boston/San Francisco order for Standard Light Rail Vehicles. The company's reputation grew, and at one point in the 1970s it was the supplier for every U.S. and Canadian light rail program requiring electronic controls.

Despite Allied Signal's technological success and its domination of the market for transit control systems over much of a 15-year period, the venture was barely self-sustaining financially. In 1988, Allied Signal sold its transit control business to the Swedish-Swiss firm Asea Brown Boveri. The lackluster financial performance was partly due to the fluctuating fortunes of mass transit in the United States. Not only did UMTA back off from developing a standard rail car, but Federal Government financial support for mass transit was cut back deeply during the Reagan years while defense spending skyrocketed. It was not just defense-based neophytes that left the business but also such well-established pillars of the American industry as Pullman, Budd, and GM. More and more of the business moved abroad, especially to Canada and Italy where governments do offer some support to mass transit and the industry that makes the vehicles.

Allied Signal officials offer another reason for the transit venture's lack of financial success. The ups and downs of the transit business meant that there were never enough orders to justify setting up a separate division, so the transit venture was conducted together with the company's aerospace business. The tendency in defense aerospace to elevate performance over cost control "infected" the transit business. Costs were geared to meeting the exacting demands of the military. But to win orders, the transit business had to lower the price to a point where it was hard to make a profit.

[6]Material for this section is drawn from OTA interviews with Allied-Signal Aerospace officials in Torrance, CA in April 1990 and telephone interviews in October-November 1990.

cessfully in Chicago and San Francisco, giving years of reliable service. They did not prove enough of a moneymaker to persuade Boeing to remain in the business, especially since Boeing's expectation of a national standard for light rail cars (which would have helped producers achieve economies of scale) came to nothing. Moreover, the defense buildup of the early 1980s offered plenty of profitable business to occupy the company's plant, equipment, and work force. At the same time that government spending for defense soared to wartime levels, Federal subsidies for mass transit systems shrank from a peak of $5.6 billion in 1981 (1991 dollars) to $2.9 billion by 1988.

A company that scored a clear technological success in a mass transit venture was Allied Signal. That did not, however, translate into financial success. As described in box 7-C, Allied Signal was the dominant North American producer of electronic controls for transit systems over a 15-year period in the 1970s and 1980s. Yet the venture did little better than break even, and was sold to a European firm in 1988. Part of the reason for the failure to make money was the instability of government support for

mass transit but another part, according to company officials, was the burden of producing in a defense business environment that paid too little attention to control of costs.

Shipbuilding to Multiple Options

Ingalls Shipbuilding of Pascagoula, MS, a division of Litton Industries, Inc., was able to put together several military and commercial alternatives when two major Navy contracts were winding down in the late 1970s, and there was little hope for new jobs because of the Carter administration policy to reduce Navy shipbuilding.[28] Company managers saw no single option that would produce enough business in the short term to keep the shipyard going and maintain its skilled work force, and in the long term enable the company to bid on future high technology Navy contracts. Ingalls first made itself into an overhaul and repair facility for Navy ships, which kept its outfitters busy. Then it went after commercial business with the offshore drilling industry, starting with overhaul and repair of drilling rigs and proceeding to license the design for a unique kind of deep water jack-up rig. The rig business employed Ingalls steel workers and succeeded well enough to capture 10 percent of the market from 1979 to 1982, keeping several thousand people employed. A venture into rail car assembly was less successful, not because of technical or marketing failure, but because demand for rail cars for grain exports fell far short of expectations in the early 1980s. Ingalls also pursued miscellaneous construction projects, such as making steel decks for bridges.

With all these various and modestly successful attempts at conversion, Ingalls employment was still cut in half (from 25,000 to 12,000) with the retrenchment in Navy ship construction. The Reagan administration's program for a 600-ship Navy put Ingalls back mainly in the defense business, with some increase in employment in the mid and late 1980s. In the 1990s, the company may well face the necessity for a more permanent transition to a mixed defense and commercial business.

GE Aerospace Conversion in the 1970s

In the early 1990s, the defense-oriented GE Aerospace group was committed to a strategy of focusing on military business and shrinking in size if necessary; employment dwindled from 46,000 in 1989 to 38,000 in 1991, and was expected to go lower. A quarter of a century earlier the Re-Entry Division of GE Aerospace tried a different strategy, embarking on a series of projects that sought to transfer technology, people, and products from military work into new nondefense business.[29] From 1967 to 1980, the share of DoD work in the division fell from 100 to 50 percent.

One motive for the strategy was to redirect GE's innovative technologies into important new areas as the Vietnam War wound down. Another motive, at least as compelling to the Re-Entry Division, was to win out (or at least survive) in the internal competition among GE divisions. In the 1960s, the Re-Entry Division, which had developed the heat shielding for intercontinental ballistic missiles in the 1950s, found itself competing for space and defense business with a new Satellite Division. Re-entry problems, fairly well solved, were now taking a back seat to the weaponry component in ICBMs and to rocket research generally. The Re-Entry Division was losing work but it still needed to meet the corporate revenue requirements for every GE division, and its director wanted to keep his talented team of engineers together.

The division, expanding into new fields that managers saw as socially useful and technically challenging, was renamed the Re-Entry and Environmental Systems Division. Ground rules for new projects in the division were that they should: 1) have government assistance, to reduce GE's costs and provide insulation from market uncertainties; 2) take full advantage of GE's Corporate Research Center and transfer as much technology as possible; and 3) concentrate on areas where GE had a significant technical advantage.

As described in box 7-D, at least one of the projects, manufactured housing, had a fair degree of success despite a turnabout in government policy that withdrew the assistance GE had counted on. Others were promising but were sold off at an early stage, or failed to meet GE's financial requirements but were taken up profitably by other companies. At

[28]The Ingalls story is based mostly on DeGrasse, op. cit.

[29]Information on GE Aerospace's conversion projects in the 1970s is drawn from OTA interviews and telephone interviews in October-December 1990 with GE officials, including Otto Klima, who was manager of the GE Aerospace Re-Entry Division during the years when the projects took place.

Box 7-D—GE Aerospace Conversion in the 1970s[1]

Manufactured Housing: A Modest Success

GE Aerospace chose low-cost manufactured housing as a promising project for conversion from military to nondefense business in part because the venture had some government support. From about 1968, a U.S. Government market existed—housing at Air Force bases. More government support was added the next year when George Romney, then Secretary of Housing and Urban Development, introduced Operation Breakthrough, a scheme to advance low-cost housing technology. As a former President of American Motors Corp., Romney believed that the mass production techniques of autos could be applied to housing. GE Aerospace was among 22 successful bidders (selected from 530 proposals) for awards of $300,000 to $500,000 to design and build housing modules.

GE Aerospace went so far as to produce a number of manufactured houses in west coast facilities. But its domestic modular production halted in January 1973 with the repeal of Operation Breakthrough's subsidies for low-cost housing using new technology (the repeal was one of a range of Federal cost-cutting measures). Without the subsidies, it was no longer feasible to transport bulky house modules as far as 1,000 miles from where they were made.

The collapse of the domestic market was not the end of manufacturing housing for GE Aerospace, however. It was operated successfully in Iran and Japan for several years, providing some payoff on GE's investment. In Iran, GE served as the government's engineering consultant in building a new town to support a copper mining project. The houses were built onsite using GE expertise to construct steel frames that supported traditional local materials, such as adobe. A fortuitous benefit of having designed housing modules suitable for U.S. rail transport was that the frames could stand up to Iranian earthquakes.

The Iranian venture was only marginally profitable. A joint venture with a Japanese partner proved more lucrative. The partner duplicated GE's factory in Japan, and GE made $6 million on the sale of 450 houses to Saudi Arabia. The modules were shipped in flotillas of ocean-going barges that could be cut loose when storms threatened and rounded up afterwards. With an assured market, production became so efficient that the houses were delivered 3 months early, netting an extra bonus for the partnership. Plans to sell the houses in Japan never materialized, however, because the Japanese housing market suffered heavily in the 1974 oil crisis. The operation came to an end in 1976.

A long-term benefit for GE turned out to be the international experience gained from working in Iran and Japan. Some people involved in the housing ventures put their experience to work in the Aircraft Engine Division (which is strong in international sales), and the chief engineer from Iran went into product support for commercial aircraft.

[1]Information for this box was provided by former and present officials of GE Aerospace.

(continued on next page)

least one, hydroponic farming, never got off the ground.

In 1981, with the Reagan administration defense buildup and many new opportunities for military contracts in GE Aerospace, enthusiasm for the conversion projects waned. At the same time, Jack Welch became GE chairman, and his credo is that if GE is not number one or number two in a business, then GE should not be in it. Also, GE's hurdle rate—i.e., the required rate of return on a new investment—is reputed to be the highest of any major U.S. corporation.

All of this has added up to a decision by GE Aerospace to undertake no more conversion attempts. Even those present and former GE officials who point to successful aspects of the 1970s program tend to believe that defense companies are ill-suited to meet the marketing and cost demands of the commercial sector. Another possible way of converting military technology to commercial products is outside the defense firm, perhaps with some form of government assistance to encourage the flow of technology into the startup companies.

Community-Based Conversion Efforts

In some cases of threatened closure of major defense facilities, community activists have tried to avoid the closure by proposing—or demanding—that the company undertake conversion through joint community-labor-management efforts. The reasoning is that because of the community's stake in economic stability and the workers' stake in jobs, they as well as company managers should be

Box 7-D—Aerospace Conversion in the 1970s—Continued

In the United States, there may be some more general long-term benefits to the public from Operation Breakthrough.[2] Although the goal of building whole houses like cars was never fully achieved, there were fruitful aspects to the program—in particular, cooperation with States to develop building codes appropriate for industrial housing, with the Interstate Commerce Commission to set reasonable transport rates, and with building trades unions to agree to manufactured housing. Moreover, some of the elements pioneered by GE in its modular manufacturing housing are reappearing in current energy-saving technologies for dwellings.

Spinoffs

Several of the conversion projects GE Aerospace undertook in the 1970s never came to fruition for GE itself, but were taken up successfully by smaller, flexible companies with lower overhead and lesser requirements for payback on investment. One example was an oil and water separator that involved no moving parts but was simply a series of carefully designed baffles that drew on GE's skill in fluid flow modeling. The product was just beginning to make money, although not much by GE standards, when it was sold.

Another example involves a more complex technology—too complex in fact for commercial success, in the form developed by GE. Bearing the intriguing name of cybernetic anthropomorphic manipulator (CAM), the device was a remote manipulator GE developed for the Navy, based on earlier GE work for the Army. The CAM allowed an operator to perform delicate tasks in a hostile environment, not only working with distant objects but also feeling and responding to their resistance to motion through a force feedback control mechanism. GE saw commercial possibilities for the device in undersea work for the oil industry, in a joint venture with Exxon; in handling 500-pound blocks of hot titanium in TRW's Cleveland foundry; and in building Wankel engines on an automated assembly line.

The project met various setbacks. Neither the TRW foundry nor the Wankel engine program survived the 1974-75 recession. Exxon found that the CAM's five degrees of freedom and force feedback mechanism were more sophisticated than needed for its undersea maintenance work, and GE soon sold the technology to a minisub company, which successfully developed a simpler and cheaper version. However, GE's version of the CAM did eventually, in a roundabout way, find application in the space shuttle. GE Aerospace provided it as a prototype to help NASA develop bid specifications for the space shuttle manipulator arm, but GE Aerospace did not win the production contract. SPAR of Canada, with the backing of its government for development costs, submitted the low bid, after which it subcontracted to GE Canada. All GE research and expertise on the CAM technology was transferred to GE Canada.

Still another technology that failed as a GE project but ultimately helped many small startup firms in the biotechnology field was nutrient reclamation. GE Corporate Research Laboratory engineers developed a genetically altered microbe that could recycle cattle manure into protein for animal feed. When moved from lab to ranch, the project failed because contaminants, including heavy metals, blown in from the desert made the process unworkable. Although GE had by this time abandoned the venture, it did win a patent for the microbe in a landmark Supreme Court decision in 1978. This provided a timely stimulus to several small firms that started up in the aftermath of the GE experiment. Only a large corporation like GE, with a powerful legal and patent staff, could have pursued such a case, and in this way it was responsible for entrepreneurial activity by others.

[2]Information on public benefits from Operation Breakthrough was provided by Henry Kelly, U.S. Department of Energy; David Moore, U.S. Department of Housing and Urban Development; and Professor Charlie Brown, University of Oregon.

involved in exploring alternative uses of a plant that is no longer in defense production.[30] The same reasoning has been applied to closures of major nondefense plants that are the source of a community's livelihood. In some of these cases, early warning that a firm planned to close, combined with assistance from government agencies and communities, have helped to change a company's decision to close a plant; in a few others, employees have bought out the company.[31] In many cases, however, the

[30]For an exposition of this view, see Ann Markusen and Joel Yudken, *Dismantling the Cold War* (New York, NY: Basic Books, forthcoming); Seymour Melman, *The Demilitarized Society Disarmament and Conversion* (Montreal: Harvest House, 1988).

[31]For a brief discussion of conditions in which government assistance or community efforts may help to save a troubled plant, see U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Adults*, OTA-ITE-250 (Springfield, VA: National Technical Information Service, 1986), pp. 209-213.

changes needed for plant survival are so great that closing down is the only reasonable option. Moreover, when a large U.S. company decides to close one of its plants for strategic reasons, that decision is usually not open to change. In the United States, there are neither the laws nor customs that exist in Europe and Japan impelling large companies to look for solutions other than worker layoffs to changing market conditions or company strategy.

If it is difficult for community efforts to keep a nondefense plant that is slated for closing in business (often without even a change in product line), the difficulties multiply with defense plants. Managing defense production is a world apart from managing commercial production (see the discussion below). Conversion of a defense facility means undertaking the design, production, and marketing of quite different products—a challenging feat even for managers with commercial experience. Even in Germany, which does have laws, institutions, and customs that encourage alternatives to layoffs in industries undergoing structural change, community planners are finding that it is difficult to convert defense companies or divisions directly into commercial production and sales. They are looking instead at alternatives where the government is the customer, for example, in environmental cleanup programs.

In the United States, there have been several energetic attempts by community activists, joined in some cases by labor unions, to encourage defense plants threatened with closure to convert to commercial production, but none so far has succeeded.[32] A bill in the 102d Congress that would require defense companies to establish alternative use committees to plan for economic conversion in case of closure of reduction was referred to several House committees; at this writing no action had been taken on the bill.[33]

BARRIERS TO CONVERSION

The Defense Company Culture

The main reason defense companies give for reluctance to venture into commercial production is the great differences in company practice and culture between defense and commercial business. Many studies and reports have called attention to the differences that make it difficult to combine defense and commercial business.[34] Defense companies have evolved over 40 years of Cold War into separate organisms. Most large defense contractors that assemble complex weapons systems or make major subsystems are geared to low-volume production of highly specialized, expensive equipment. In designing the equipment, the main emphasis is on technical performance and meeting DoD requirements. In contrast, many commercial products have to combine reliability and affordable cost with high-volume manufacture. Even in the aircraft industry—where the defense and commercial products have a good deal in common, many manufacturing processes are similar, and final assembly of both is a painstaking labor-intensive job—the differences are striking. In 1990, while Boeing was turning out about 12 per month of its all-time best-selling commercial jetliner, the 737, it was planning to complete work on just one B-2 bomber per month (the production cycle for a much reduced order of B-2s will be still longer).

It is possible to exaggerate the differences in design requirements and manufacturing processes between defense and commercial production. Some military items (e.g., small arms and ammunition) and many intermediate goods destined for military items (e.g., some kinds of semiconductors) are mass produced in much the same way as—sometimes together with—their commercial counterparts. In fact, the famous American system of manufacture, involving interchangeable parts made on machine tools, was invented in the 19th century partly in U.S. armories for the manufacture of guns. Nevertheless, there are enough differences in design goals and manufacturing practices to add up to some wide divergences between defense and commercial companies. The DoD practice of imposing rigid, detailed specifications and standards throughout procurement further exaggerates the differences, and has blocked technological progress for defense applications in fast-moving fields such as fiber optics and optoelectronics. Defense contracts may lock in technologies and applications that no one producing commercially is willing to build at reasonable cost.

Still more pervasive are different management practices. In large part, these are a response to

[32]Markusen and Yudken, op. cit.

[33]H.R. 441.

[34]See, for example, U.S. Congress, Office of Technology Assessment, *Holding the Edge*, op. cit.

detailed government supervision. Defense contracting is probably the most heavily regulated business in the United States. In addition to the usual environmental, health and safety, and fair labor regulations that apply to all firms, defense companies must comply with DoD reporting requirements and undergo extensive reviews and audits. Some firms refuse to do defense work because they find that putting up with the audits is more trouble than it is worth. The reason for such detailed oversight was the government's concern that taxpayers' dollars not be wasted and that defense contracting not be prey to favoritism or fraud. But the supervisory system developed under Federal law and DoD regulation is extremely costly, both to the government and to companies. It demands extra people and time on both sides; the Pentagon has over 25,000 auditors, investigators, and inspectors, and the companies must employ tens of thousands of their own auditors to respond to DoD's demands for information. All this generates large overhead costs, which are then passed along in higher prices to the government. Probably a leading reason why most companies doing both defense and commercial work keep the two sides separate is so as not to burden the commercial business with the overhead from the defense side. Many companies, or divisions of companies, that learn to work with DoD's demands for high technical performance, to meet confining and sometimes outmoded military specifications, and to live with detailed supervision, simply restrict most of their business to defense.

Finally, commercial marketing and distribution are alien to defense companies. DoD prime contractors have a very few buyers to deal with and no need for a distribution network. It was marketing and distribution capacity, at least as much as experience in cost-conscious, high-volume manufacturing, that made Amana indispensable to Raytheon when the company went into the business of making microwave ovens for households.

DoD Practices on Development Costs and Data Rights

If a defense company does see commercial promise in military technologies it has developed, certain DoD practices related to government-funded R&D could be a real hindrance to commercial development either by the company itself or by a startup company licensing the technology. At present, DoD regulations require that companies selling products based on technologies developed at the department's expense to non-U.S. Government customers must pay DoD back for a pro rata share of its development costs.[35] The law does not explicitly require this recoupment of development costs, except in the narrow situation of sales of major military systems to foreign governments[36] (the idea is that the foreign governments should not get a free ride at the expense of American taxpayers). And the recoupment requirement is contrary to the spirit of several other laws and an Executive Order that encourage granting companies intellectual property rights to technologies developed with Federal funds, as an incentive to commercialization.[37]

The Administration recently proposed new regulations that would limit this cost recovery somewhat.[38] DoD would not demand recovery of R&D costs from subsequent commercial sales in some cases of minor military procurements (roughly, those that cost DoD under $50 million in development cost and result in less than $200 million in total sales to DoD and other parties). Also cost recovery would be restricted to sales of products using at least 50 percent of the original military system; the threshold now in force is 10 percent. Many in industry consider the proposals an improvement, but still question the need for any recoupment beyond what the statute requires.

Another impediment to the commercialization of military technologies lies in the treatment of data that firms develop or use for contracts with DoD. The issue is the extent to which DoD can acquire, use, and pass on such data. DoD often needs the data

[35]48 C.F.R., Part 271.

[36]Arms Export Control Act of 1968, Public Law 90-629, as amended, sec. 21, codified at 22 U.S.C. 2761(e).

[37]These laws include the Stevenson-Wydler Technology Innovation Act of 1980, the Patent and Trademark Amendments Act of 1980, the Bayh-Dole Patent Amendments of 1984, the Federal Technology Transfer Act of 1986, the Omnibus Trade and Competitiveness Act of 1988, and the National Competitiveness Technology Transfer Act of 1989. The Executive Order is No. 12591 (Apr. 10, 1987). See the discussion in U.S. Congress, Office of Technology Assessment, *Making Things Better: Competing in Manufacturing*, OTA-ITE-443 (Washington, DC: U.S. Government Printing Office, 1990), pp. 184-194.

[38]56 *Federal Register* 55250, 55264 (Oct. 25, 1991).

for various purposes. At the most basic level, it needs enough data to perform in-house training, operation, and maintenance. In some cases, DoD might want to hire third parties to perform some of these functions, and would need to pass on some data for the purpose. To allow competitive follow-on procurements of additional units and/or spare parts, DoD needs to provide data to prospective bidders. However, a problem for commercialization arises here. DoD's sharing of data rights with third parties could stop a company from developing commercial applications of a military technology, since if the data are available to others, the value to the company of the commercial product is likely to be lessened or lost. In fact, some company officials have told OTA that the prospect of DoD sharing their technical data with other firms is one reason for separating the commercial and defense sides of their business; they do not want to endanger the confidentiality of technology they have developed for commercial products by using the data in military projects.

DoD has considerable discretion in negotiating rights in technical data, within a broad statutory framework.[39] DoD always takes at least "limited rights," for in-house use of the data for operation, maintenance, and so on, and on the whole industry does not complain about this. Companies do often complain when DoD seeks rights to use all the data for "government purposes." This includes sharing the data with other firms for competitive follow-on procurements as well as for outside maintenance contracts. In principle, DoD can demand that other firms keep the information secret and use it only for the procurement at hand. However, it is hard to ensure that competitors will restrict their use of key information. Finally, DoD sometimes demands "unlimited rights," which means that DoD can use or pass on the data for any purpose.

The technical data rights issue has been troublesome for decades. The pendulum has swung back and forth toward more or less rights for the government, and the law has grown quite complex, but so far there is no satisfactory solution that meets both the need for efficient procurement and the need to promote commercialization of government technology. Industry officials have asked to sit down with the government representatives to negotiate and draft regulations cooperatively, but the government has so far not seen fit to do this. In October 1990, the Administration proposed new regulations on technical data rights,[40] but these met with sharp criticism from industry and were withdrawn. The Defense authorization act, passed in November 1991, requires the establishment of an advisory committee with representatives from industry, government, and academia to draft revised regulations by June 1992.[41] Given the complexity of the issues, a cooperative effort may be the only way to get the problem solved.

MAJOR COMPANIES: PROSPECTS FOR CONVERSION IN THE 1990s

The obstacles to large-scale ventures by major defense contractors into commercial production are serious. Nevertheless, several companies had taken at least initial steps in that direction in the early 1990s, often beginning with sales to civilian government agencies.[42]

On the negative side, the differences between civilian and defense business are a daunting impediment to conversion. The record of defense companies that tried to make the transition in the 1970s—mediocre at best, technically embarrassing and financially draining at worst—is no inducement.

Prospects for conversion are still dimmer for a number of defense companies because they are carrying a high burden of debt. One reason is that many companies used debt to finance big expan-

[39]The governing statute is found at 10 U.S.C. 2320. DoD's governing regulations are found at 48 C.F.R. 227.4. The controversy is perhaps the greatest for data developed jointly at government and industry expense, for which the statute gives the least guidance.

[40]55 *Federal Register* 41788 (Oct. 15, 1990). The regulations would have applied to all Federal agencies.

[41]National Defense Authorization Act for Fiscal Years 1992 and 1993, Public Law 102-190, sec. 807. The act further provides that the Secretary of Defense must issue revised regulations by September 15, 1992, and that for every regulation recommended by the advisory committee that he does not adopt he must report his reasons to Congress.

[42]A 1991 survey of executives at 125 defense companies found that most were planning to at least study commercial markets, that one-half had tried a commercial venture in the past 5 years, and that of those, one-half reported a success. However, these commercial ventures apparently included acquisition of existing commercial enterprises as well as conversion (as defined here). David Hughes, "Survey on Defense Firm Commercial Efforts Shows Surprising Rate, Activity," *Aviation Week & Space Technology*, Dec. 9, 1991, reporting on a survey by the Fraser Group and DRI/McGraw-Hill of Lexington, MA and the Winbridge Group, Inc. of Cambridge, MA.

sions in the Reagan buildup and now don't have the defense business needed to amortize those investments. According to one estimate, total debt as a percentage of capitalization in the defense aerospace industry rose from 28 percent in 1981 to 34 percent in 1989, and several big companies are considerably worse off than the average. For example, both Grumman and Lockheed have debt-to-equity ratios of more than 50 percent.[43] Moreover, some companies have taken enormous losses on fixed price development contracts, in which they gambled hundreds of millions of their own money hoping to make it up by winning the production award. The losing team for the Advanced Tactical Fighter, Northrop and McDonnell Douglas, are reported to be out $750 million in their own funds on the project. General Dynamics, a member of the winning team for the ATF, still lost out in the A-12 cancellation, and is also saddled with long-term debt that rose from $18 million in 1984 to $636 million at the end of 1990. With these high debt burdens and with declining profits in the past few years, defense companies are not highly regarded in the stock market; aerospace stocks were selling at 5 to 8 times earnings in late 1990, versus 13 to 14 for all companies on the Dow Jones index.[44] Entering a risky new commercial venture takes money, which many of these big defense companies cannot easily raise.

The fact remains that many defense companies have military technologies they developed for military use that they recognize as possessing commercial, or at least nonmilitary, promise. The easiest move is into nondefense sales to governments. Westinghouse Electronics Systems, for example, has long supplied advanced electronic systems to DoD. Prompted by the defense build-down, the group is expanding in complementary civilian markets, including air traffic control and drug traffic interdiction (both having government purchasers) but is also reaching out to home security systems, which is a purely commercial market. The group's non-DoD market grew from 23 to 27 percent of sales in 1990, and is projected to reach 50 percent by 1995. Drawing on its experience in C^3I systems, Westinghouse is already a leading supplier of sensors for drug interdiction. TRW is pursuing a similar strategy. It has sold to the New York Stock Exchange a computer-based security system that guards access to the building and its various parts, such as the trading floor. Possible future customers for a TRW security system include embassies and airports.[45]

These examples, and others discussed above, make another point: defense companies that are interested in conversion have begun with products, as well as markets, that they know best. Two kinds of products that seem promising are information management systems and monitoring systems that rely on remote sensing devices. The latter might find application in environmental programs, as well as in security systems. Also, defense technologies that have achieved high performance in hostile environments might find uses by commercial companies that operate under similar conditions (e.g., in the deep sea, the desert, or the polar regions).

The same factor, product similarity, also makes it feasible for many companies in the aircraft business to shift from military to commercial work. None of the dedicated defense companies that do final assembly of military airplanes (Lockheed, Grumman, Northrop, General Dynamics) plan to become full-scale commercial airframers but, as noted above, all are doing subcontract work for the commercial companies or plan to do so. Some have gone into repair and rework of commercial aircraft on a fairly large scale. At the subsystems and components level, the opportunities to shift to the commercial side are still greater. For example, the Sundstrand company of Rockford, IL, a supplier of actuators, constant speed drive generators, and other hardware for aircraft, shifted from as much as 60 percent defense work to 25 percent in the 5 years 1985-90.

What major defense companies are now disinclined to do is embark on large-scale production of big hardware systems with which they have no familiarity—e.g., subway cars. The transit business was frustrating to aircraft companies in the 1970s not only because of their technological inexperience, and consequent false starts or failures, but also because of inconsistent government policy (i.e., the abandonment of uniform national standards for light rail car, and the decline in subsidies for mass transit

[43]Anthony L. Velocci, Jr., "Third-Quarter Results Mask Defense Industry Weakness," *Aviation Week and Space Technology*, Nov. 12, 1990, p. 20.

[44]Ibid.

[45]Glenn Zorpette, "Suppliers Are Challenged To Downsize Gracefully as They Seek To Diversify," *IEEE Spectrum*, vol. 27, No. 12, November 1990, p. 33.

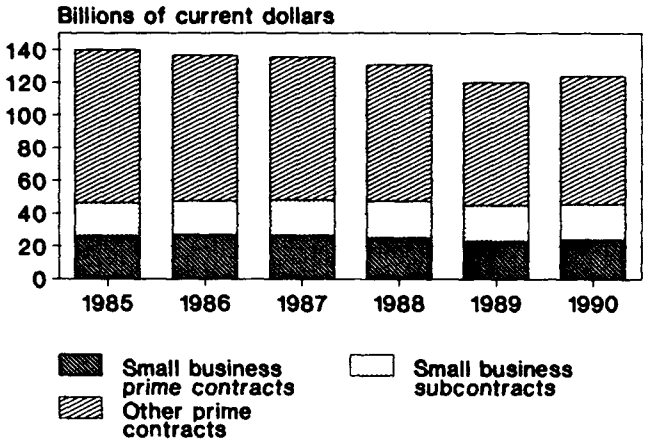
in the 1980s). However, there could be a new opportunity in the 1990s for some defense companies to use their technical expertise in developing certain challenging new transportation technologies, for example, electric vehicles. Support by States, especially California, for developing advanced transportation technologies makes the prospects more attractive. Box 7-E describes some of the possibilities.

SMALL BUSINESS AND THE DEFENSE INDUSTRY

Small and medium-size firms—collectively, "small business"[46]—are important players in defense production, accounting for over one-third of DoD purchases. Over the last decade, small business received $18 to $27 billion in annual DoD prime contract awards, or about 16 to 17 percent of all awards and 19 to 20 percent of awards to U.S. business firms.[47] Complete figures on subcontracts are not available, but reports by large firms to DoD indicate that small businesses have received $13 to $22 billion, or 37 to 40 percent, of military subcontract dollars over the last decade.[48] The sum of prime contract awards and subcontracts from large firms to small business was on the order of $46 to $48 billion per year in the 5 years 1986-90, and amounted to 35 to 37 percent of awards to U.S. business firms[49] (figure 7-5).

The small and medium-size firms selling goods and services to DoD or its prime contractors are a diverse lot. Under Small Business Administration (SBA) definitions, these firms might range from a 10-person machine tool shop, to a semiconductor producer with nearly 500 employees, to a manufacturer of missile engines with just under 1,000 workers.[50] SBA oversees several congressionally mandated programs that are meant to help small

Figure 7-5—DoD Small Business Prime and Subcontracts



SOURCE: Department of Defense, Washington Headquarters Services, *Prime Contracts Awards, Fiscal Year 1990* (Washington, DC: 1991).

firms compete for government contracts, both for procurement and for R&D.

Some small defense firms were started up for the purpose of selling to DoD, frequently by people who previously worked for large DoD contractors and understand the intricacies of the defense business. Often these firms are niche producers of sophisticated or specialized military goods and have little experience in commercial production and marketing. Some of them may simply close up shop if defense contracts or subcontracts dry up, but many are strongly motivated to survive by converting to commercial production. Other small companies that produce military goods, either as prime contractors or as subcontractors, already sell some of their output to commercial customers; many are looking to expand those sales.

Although information about small defense companies is limited, there is evidence that most have both military and commercial customers. For exam-

[46]A small business is defined by Small Business Administration regulations (FAR 19.101) as one that is independently owned and operated, is not dominant in its field of operations, and with its affiliates does not employ more than a specified number of employees (usually not more than 500, 750, or 1,000, depending on the type of product called for by the contract). For construction and some service industries, the criterion is a specified annual dollar volume of sales or receipts, rather than the number of employees. This definition is drawn from DoD, Washington Headquarters Service, Directorate for Information Operations and Reports, *Prime Contract Awards: Fiscal Year 1990*, DIOR/PO3-90 (Washington, DC: U.S. Government Printing Office, n.d.), p. 60.

[47]Ibid., table 3, p. 11. "Awards to U.S. business firms" are for work in the United States done by U.S.-owned firms. Other awards went to other government agencies, educational and nonprofit institutions, and foreign-owned companies.

[48]Ibid., p. 57.

[49]In the 5 years 1981-85, prime contracts plus reported subcontracts to small business amounted to about 33 percent of the total awards to U.S. business firms, but the data are probably better for the later period. The number of large defense firms reporting to DoD the value of their subcontracts to small business rose continuously from 1,133 in 1981 to 1,664 in 1990.

[50]For construction and some service industries, the SBA criteria are specified dollar volume of receipts rather than number of employees.

Box 7-E—Opportunities for Defense Contractors in Advanced Transport

The state of land transport today is comparable in some ways to that of aviation 30 years ago. A physical infrastructure is in place, carrying a growing volume of passengers and goods, but the field barely incorporates any of the advanced electronic communications technology that supports modern aviation. Defense firms looking to apply resources elsewhere might find some opportunities in advanced transportation technologies. An added attraction is that California, where many defense firms have their home, is in the forefront of promoting new transport technology.

California's Department of Transportation (Caltrans) is developing the State's transport infrastructure in several ways, guided by the goals of economic prosperity, environmental quality, energy conservation, equity, and mobility.[1] Commuter rail transport, financed by a doubled State gasoline tax and a rail bond issue approved by California voters, is getting more emphasis. Although rail cars for the California systems are now made by foreign companies, the State's long-term, reliable financial support for commuter rail systems might attract U.S. companies into the field. Some American firms already make components and subsystems and some do the final assembly for largely foreign-made cars.[2] However, a more promising area for U.S. defense contractors might be in development of new technologies rather than expansion of existing systems.

Electric Vehicles

The California Clean Air Act of 1988 identified a range of strategies for arresting the decline of the State's air quality.[3] These included the use of low-emission vehicles, with annual targets that require an increasing fraction of an automaker's fleet to meet progressively tighter standards. In November 1991 the governors of nine northeastern states and the mayor of Washington, DC signed a memorandum of understanding agreeing to support adoption of the California rules in their States.[4] If all these States, and three others in the region that seem likely to join, adopt the California standards, 36.7 percent of the vehicles in the Nation would be affected, providing a considerable encouragement to manufacturers of alternative fueled vehicles. California alone has an 11.5 percent share of the national market.

Various improved and new technologies based on alternative fuels could satisfy the standards. The strictest category, "zero-emission vehicles" (meaning no measurable quantities of hydrocarbons, carbon monoxide, and nitrogen oxides), are first required in 1998 for 2 percent of an automaker's new models. The fraction grows to 5 percent in 2001 and 10 percent in 2003.[5] The only existing vehicles that meet these standards are electric vehicles (EVs). Hydrogen-burning internal combustion engine vehicles could also satisfy the emission requirements, but very few of these have yet been built, so that most potential manufacturers regard them as a longer term option.

The skills available in southern California, including many in the aerospace and defense communities, are well-suited to EV production. However, the first EVs built in response to California's public policy initiatives will be foreign-made. In 1989, the Los Angeles City Council staged a competition for proposals to develop and build 10,000 EVs over 3 or 4 years.[6] The city offered the winner financial support in the form of long-term loans on favorable terms; by late 1991 they had amounted to $7 million. The city also agreed to buy some of the vehicles for its fleets, although most were intended to be sold to private customers.

---

[1]California Department of Transportation, "California Transportation Directions," Draft, Nov. 15, 1989.

[2]Under Federal "Buy American" requirements, which apply when Federal funds are involved in purchase of the cars, assembly of cars must take place in the United States and 51% of the components must be made in America. Several foreign companies have opened final assembly plants in the United States in order to meet these requirements.

[3]University of California, Los Angeles, Lewis Center for Regional Policy Studies, *Prospects for Alternative Fuel Vehicle Use and Production in Southern California: Environmental Quality and Economic Development*, Working Paper No. 2 (UCLA: May 1991).

[4]The nine States were Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, and Virginia, with Washington, DC also party to the agreement. Connecticut, Rhode Island, and Vermont are also likely to adopt the new standards. Jim Henry and Kristine Stiven Breese, "Calif. Air Rules May Cover Northeast," *Automotive News*, Nov. 4, 1991, p. 1.

[5]*Automotive News*, Feb. 25, 1991.

[6]Material drawn from "Los Angeles Initiative Request for Proposals" and personal communication with Glenn Barr of Councilman Marvin Braude's office, Sept. 9, 1991. Councilman Braude was the author of the initiative.

Although General Motors is developing an EV, it did not put in a bid, nor did any large U.S. company. A Swedish/British company, Clean Air Technology (CAT), won with a proposal for a hybrid vehicle equipped with an electric motor and batteries for stop-and-go city driving and a small, precisely tuned gasoline engine for highway cruising. The four- or five-passenger vehicles will probably sell for about $25,000, a price that reflects the city's low-cost loans. The estimated launch date for the first 3,000 vehicles is the spring of 1992. The first vehicles will be produced in Worthing, UK. Los Angeles representatives are exploring with CAT the possibility of setting up a manufacturing plant in southern California if the vehicle is successful, but nothing has been settled.

Another source of encouragement for production of EVs could be the Federal Government. The Surface Transportation Act of 1991, passed by Congress in November 1991, authorized $12 million for fiscal year 1992 to support at least three EV consortia.[7] The consortia are to design and develop EVs and advanced transit systems, related equipment, and production processes. At least one-half of the funds for the consortia must come from non-Federal sources; the act encourages them to include small businesses and defense and aerospace firms.

A group that aims to use the high technology talents in southern California for making EVs is Amerigon, of Los Angeles.[8] Founded in 1990, the company is coordinating small and medium-sized aerospace and other high technology firms in the area to produce subsystems for an EV, the prototype to be ready in early 1992. According to Lon Bell, Amerigon's founder, the technology of EVs is so different from that of vehicles powered with internal combustion engines that the established automobile manufacturers, with their tremendous resources sunk in one sort of production technology, are not the natural suppliers of EVs. Bell's approach was to match lists of customer or user requirements with available skills, breaking down the EV into 45 subsystems that can be developed independently, and seek the appropriate local engineering firm to work on each of them.

Many of those involved in the enterprise believe that major aerospace companies are no more likely than the big auto companies to become successful EV producers, in part because the aerospace managers and engineers are accustomed to a business in which product cycles are at least 15 years. Aerospace subsystem producers, on the other hand, might be the source of skills that could form a supplier base for a new kind of vehicle industry. Also, marketing to mass consumers is not a strong point of defense and aerospace firms, but marketing will obviously be an important factor in launching widespread EV use. Although California's Clean Air Act requires that a certain fraction of autos be zero-emission vehicles, it is not clear that consumers will want to buy them. Today's EVs are expensive and limited in driving range. By 1998, the price and other qualities may be more appealing, but they will still be unfamiliar. The first purchasers may well be companies or agencies with specialized needs (e.g., utility companies, the Postal Service), but if they ever are to make a big difference in air quality and oil consumption, a mass market of consumers will have to develop.

Smart Cars and Highways

Some quarters of the defense and aerospace business see promising conversion opportunities in the range of technologies termed "smart cars and smart highways." Although the technologies do offer some potential for application of the skills of defense firms, the potential has rather narrow limits.

Smart cars and highways—or, more formally, intelligent vehicle and highway systems (IVHS)—are meant to ease the increasing congestion on American roads by employing many of the technologies widely used in defense and aerospace: communications, sensors, electronic controls, and systems integration. IVHS technology uses computerized signals, driver information systems, and automatic vehicle control for traffic management. The most advanced form of IVHS is an automated highway network, in which cars are controlled by signals from the road. Such a system would require expertise in the integration of many complex subsystems of communication, sensors, information processing, and so forth—similar to what major defense contractors do for other purposes.

---

[7]H.R. 2950, the Intermodal Surface Transportation Infrastructure Act of 1991. No funds have yet been appropriated for the EV program at this writing. Funds may be reprogrammed from elsewhere in the Department of Transportation's budget, or an appropriation may be sought in the second session of the 102d Congress. Other bills relevant to EVs included S. 324, the National Energy Strategy Act of 1991, which included as a short title the Electric Vehicle Technology Development and Demonstration Act of 1991, and authorized a total of $60 million of R&D and demonstration programs. It failed to pass, however. H.R. 1538, the Electric Vehicle Act of 1991, which also provided R&D support, was reported to the House in September 1991, but has gone no further.

[8]Lon Bell, Chairman of Amerigon, personal communication Sept. 23 and 24 and Oct. 17, 1991.

(continued on next page)

Box 7-E—Opportunities for Defense Contractors in Advanced Transport—Continued

The trouble is that the opportunities for defense companies are probably greatest in advanced IVHS systems, and these are the farthest from realization. The technologies need further development, and installing them would not only be expensive but would require sophisticated cooperation among many public and private institutions. For example, establishing an electronic toll and traffic management system in a large metropolitan area, where Federal, State, local and city jurisdictions adjoin and overlap, would involve negotiating daunting institutional barriers. Furthermore, some of these systems might encounter strong consumer resistance; drivers may object to ceding control of their cars to an electronic system.

In the near term, the most promising commercial applications of IVHS technologies are less complex, e.g., computers in cars to give drivers continuously updated information on traffic conditions and routes. The manufacture of such devices demands the kind of experience and knowledge possessed more by producers of consumer electronics than by firms making defense and aerospace equipment. In this market, companies will be left behind if they lack abilities for rapid design, volume production, and effective marketing of cheap, reliable items that are easy to use without special training or continual maintenance.

The more advanced forms of IVHS are unlikely to develop without strong government backing. Federal spending for IVHS has been small, but could increase greatly in the next few years. Federal funding for the technology was about $2.3 million in fiscal year 1990 and $20 million in 1991. The highway bill passed by Congress in November 1991 authorized $660 million for IVHS research over the next 5 years. According to the General Accounting Office, a program to develop IVHS might require total government R&D funding (State and local as well as Federal) of as much as $34.4 billion over the next 20 years.[9] While this is a substantial amount, it does not compare to the sums of about $30 billion per year that the Federal Government has paid defense contractors for research, development, testing, and evaluation in recent years.[10]

IVHS could be one component in the Nation's response to its transportation needs. It may offer some defense companies the chance to apply their skills, but it probably will not amount to much of their business in the near to medium term, and entry to the field will not be easy.

---

[9]U.S. General Accounting Office, *Smart Highways: An Assessment of Their Potential To Improve Travel*, GAO/PEMD-91-18 (Washington, DC: May 1991).

[10]In fiscal year 1990, DoD contracts to private industry for research, development, testing, and evaluation amounted to $19.2 billion (Department of Defense, *Prime Contract Awards, Fiscal Year 1990*, DIOR/PO3-90 (Washington, DC: DoD OSD Directorate for Information, Operations, and Reprints, 1990)). In addition, DoD reimbursed private companies $3.6 billion for defense-related independent R&D and bid and proposal spending (Dr. Joe Golden, staff specialist for special technology programs, Office of Deputy Director of Defense Research and Engineering for Research and Advanced Technology, personal communication, Nov. 25, 1991); the Department of Energy spent $3 billion in defense-related contract R&D, some of which went to private companies (Department of Energy Defense Programs, *Multi-Year Program Plan*, December 1990).

ple, a 1989 survey of 97 small and medium-size prime DoD contractors and subcontractors in Ohio found that in 57 percent of the firms, half or fewer of employees worked on defense contracts; and 65 percent of the firms reported that half or less of their profits came from defense contracts.[51] A 1990 survey of prime defense contractors (mostly small) in New England showed that 40 percent of sales were to DoD.[52] Interestingly, manufacturing firms (286 of the 355 firms responding) were less defense-dependent than service sector firms; 37 percent of their sales were to DoD, compared to 52 percent for all the service firms, and 69 percent for business service companies. In St. Louis, 152 prime defense contractors (again, mostly small) responding to a survey reported that 27 percent of their sales were defense-related companies to 62 percent in the private domestic market.[53] A 1991 survey of prime defense contractors in Pennsylvania found that,

---

[51]Marketel Info-Systems, Inc., Taratec Corp. and Lorz Communications, Inc., *Ohio's Changing Defense Procurement Patterns: A Company Perspective*, report to the Ohio Department of Development, Small and Developing Business Division, Jan. 8, 1990, app. C. The questionnaire did not ask what percentage of sales were due to defense contracts.

[52]Bank of Boston, Economics Department, "Survey of New England Defense Contractors," October 1990.

[53]St. Louis Economic Adjustment and Diversification Task Force, "Survey of Defense Prime Contractors in the St. Louis Metropolitan Area," September 1991, table 5. Although McDonnell Douglas responded to the survey, most of its responses were omitted from the statistical analysis.

overall, sales to DoD averaged 13 percent of all sales.[54] Large firms (over 500 employees) were just about average in defense dependence. The highest rates of defense dependence were found in the very smallest manufacturing firms (under 20 employees), with 45 percent of sales to DoD, and in medium-size manufacturing firms (250-499 employees), with 30 percent DoD sales.

Adjustment Plans of Small and Medium-Size Defense Firms

It seems reasonable to expect that small companies already making commercial as well as military sales are in position to increase their commercial sales. Although these firms must keep separate accounts for their defense work, their managers and work force, very often their production equipment and sometimes the product itself are the same for their military and commercial customers. Unlike major companies that are in both defense and civilian business, small companies rarely have separate defense divisions. Small metalworking companies, in particular, are inherently dual use.

While it may be technically feasible for these companies to substitute commercial work for declining defense contracts, it is not necessarily easy. There may not be enough commercial work to go around. In a Maryland survey of small defense contractors and subcontractors, respondents cited competition as their number one problem in getting new commercial customers.[55] OTA found the same concern in interviews with several small custom machine shops in Massachusetts in May 1991. At one shop, which has four computer numerically controlled (CNC) machine tools, 17 well-trained employees, and an excellent reputation, the owners were spending most of their time chasing new commercial customers, without much success. This interview took place at a low point in the recession, which hit central Massachusetts especially hard; times may improve. However, many of the owners doubted that commercial customers could make up for loss of defense contracts in the custom machine business. Some voiced fears that job shop work would go overseas.[56]

Aside from the critical flaw of too few commercial customers, and despite their success in recent years in getting defense contracts, all of these Massachusetts shops much preferred commercial to defense business. The owner of one explained that there is no loyalty in DoD contracting and little repeat business, which means there is a new learning curve on each order, which in turn lowers profits. DoD business also involves waste of time—in waiting for contracts, waiting for clarification of drawings, extra paperwork, and the incredible detail of military specifications. With commercial customers, the shop can develop long-term relationships and trust; take orders or ask for clarifications over the phone; and get orders for many different parts or long runs of particular parts without going through new bids and new competition.

Managers of several machine shops emphasized that their equipment and people are dual use. In fact, high-tech production and quality inspection equipment bought for defense work has made them more versatile and competitive in commercial markets. For example, one pointed to the precision capabilities in his shop as allowing him to produce bearing housings for fine graphics printing presses, where tolerances are extremely exacting, and to build tools for the manufacture of semiconductor chips. Another shop makes block-and-pin type universal joints for everything from bowling alley cleaners and garbage compactors to machine gun drives, tank turrets, and missiles. The president of this firm thought that loss of defense business, with its low profit margin and administrative hassles, was a real opportunity to go out for more commercial work. The firm recently bought a 4-year-old shop with all CNC machines, highly trained workers, a broad sales base, and a manager who is a Jehovah's Witness and will not do defense work.

Still another Massachusetts firm makes small hand-held borescopes—remote optical viewing equip-

[54]Pennsylvania Industrial Resource Centers and KPMG Peat Marwick, "Survey of Department of Defense Contractors in Pennsylvania," n.d. The survey was sent to 1,705 establishments in Pennsylvania; responses were received from 187 manufacturing and 144 nonmanufacturing firms. Sales data were for 1989.

[55]Preliminary results of a survey by Maryland's Department of Economic and Employment Development, reported to a symposium of the National Governors' Association, Apr. 5, 1991. Complete report is forthcoming.

[56]Both Pratt and Whitney—a major customer for New England machine shops—and GE Aircraft Engines were said to be sending job shop orders abroad. This may reflect the increasing frequency of offset agreements in sales of aircraft engines to foreign customers (i.e., agreements to subcontract some of the work to the country of the purchaser).

ment for looking into areas normally inaccessible to the human eye. The company started up in the early 1970s, making devices for looking into reactor cores for the then-thriving nuclear power industry. In the 1980s, the company turned to DoD as a customer, making equipment for inspecting aircraft engines and gun barrels. But in the later 1980s company managers decided to rely less on DoD sales, with its tight regulation, low profits, and unreliable repeat orders. They moved into medical applications, which is the biggest and fastest growing market for borescopes. It was easy for them to meet Food and Drug Administration quality requirements since they were already meeting tough DoD standards for quality and durability. Ohio firms also reported that equipment and skills they acquired for precision machining of military goods could be applied to health care products, where close tolerances are also demanded.[57]

Although some of these firms have found new commercial customers with considerable success, the main worry of most small to medium-sized defense firms in shifting to more commercial business is in sales and marketing. Surveys of New England, and Ohio firms pointed to marketing as the top concern.[58] The companies mentioned availability of financing as a second major constraint in getting into new or expanded commercial production.

The Pennsylvania and St. Louis surveys found similar results although the questions were framed differently.[59] Asked to rank kinds of business assistance that interested them, the St. Louis firms rated market research and marketing strategies first and second. Access to financial assistance was ranked third. As in Ohio and New England, the St. Louis firms evinced considerable interest in export markets. In Pennsylvania, over half the firms reported that they were developing domestic markets in response to anticipated DoD cutbacks; about one-third said they were developing new products, revising marketing plans, or developing international markets. Over one-third of manufacturing firms were interested in financial assistance for machinery and equipment or for new product development; about 20 percent were interested in technical assistance for new product development.

If small firms that already have a mix of defense and commercial sales find difficulties in the way of expanding their commercial business, the problems would seem to be still greater for companies that concentrate on defense production. Even here, however, there are success stories. One of the best-known examples of conversion to commercial production, dating from the 1970s, was of a relatively small company, Rolm Systems.[60] Rolm's conversion effort began in 1974, in the aftermath of the Vietnam War, but it was not so much a response to loss of military business—military sales were still holding up—as a desire to continue the company's rapid growth.

Rolm Systems was founded in 1969 to produce rugged computer equipment under license from Data General. The market was largely military, both U.S. and foreign, but also included some oil and paper companies that used computers in the field. Rugged computers remained the company's entire business until 1974, when management began to explore getting into production of telecommunications equipment, in particular private branch exchanges (PBXs) for businesses. Managers calculated that the company was reaching the limits of the market for rugged computers (at around $20 million a year), and sought to diversify in order to continue the rapid growth of their first 5 years. The choice of the business telephone market was a natural one; PBXs have much in common with computers, and 80 percent of the technology needed was already available within the company. New people were brought in for sales and marketing, and for aspects of telecom technology that diverged from computers. Rolm's first telecom offering was in 1976; by 1982 PBXs were half of the company's business. At that point, IBM bought the company but later sold the military computer business to Loral, at the behest of the Justice Department on antitrust grounds. Both descendants of the original company were doing well in 1991.

[57]Marketel Info-Systems, Inc., et al., op. cit.

[58]Bank of Boston, op. cit.; Marketel et al, op. cit.

[59]Pennsylvania Industrial Resource Centers and KPMG Peat Marwick, op. cit.; St. Louis Economic Adjustment and Diversification Task Force, op. cit.

[60]Material for this section comes from interviews with company officials of Loral Rolm Mil Spec (Loral now owns the Rolm military computer business) and IBM's Rolm Systems (IBM now owns the Rolm PBX business).

A more recent example of conversion of a small defense company is the Frisby Airborne Hydraulics company of Freeport, NY. This company, long a captive of the military airframe companies on Long Island, has deliberately reduced its defense dependence from 90 to 25 percent. Frisby had the advantage that some of the products for its military and commercial aircraft company customers were very similar; but it also found new commercial applications and customers for a technology (a heat resistant, leak-proof solenoid valve module) it had developed for the military, and it is now starting production of a wholly new product in the commercial field. The transformation was not easy. It took vigorous efforts to sell to new customers, improve productivity and lower costs, and adopt a new management style based on improved worker training and labor-management collaboration.

Government Programs To Help Small Companies' Adjustment

Several government programs that are designed to assist small business generally could be suitable for helping small defense firms expand their commercial business. At the Federal level, many laws give special breaks to small business. For example, the "Buy American" laws that affect U.S. Government purchases of many items give a price advantage of 6 percent to U.S. firms generally (i.e., the government must buy American unless the price offered by a foreign firm is at least 6 percent lower), but small businesses get a 12-percent advantage.

There is special Federal financial help to small business, mostly in the form of government-guaranteed loans; these amount to about $3.5 billion a year ($3.6 billion in fiscal year 1990). In addition, the Small Business Investment Corporations and the Minority Small Business Investment Corporations, private companies licensed by SBA, are subsidized by the Federal Government to the tune of about $84 million in 1990. These corporations make equity investments as well as loans to small firms, amounting to $629 million in fiscal year 1990. Many States have financial assistance programs of various kinds for small business,[61] and though figures on the total available from these programs do not exist, they are probably bigger and almost certainly more varied and accessible than federally guaranteed loans. For a small example, two of five Massachusetts small metalworking firms interviewed in depth by OTA had built their plants and bought machinery using low-interest financing from the Massachusetts Industrial Finance Authority; none had used a federally guaranteed loan from SBA for the purpose.

The SBA also operates a few programs that offer business management and marketing advice to small firms—most often, small retail or service establishments. The Small Business Development Centers (SBDCs) are mostly located on college campuses, provide advice from faculty or students on particular problems firms bring to them, and get half their funding from their home college or university (the other half comes from SBA). Fifty-three SBDCs, located in 46 States, were supported by $55 million in Federal funds in fiscal year 1990. SBA has recently begun efforts to strengthen the SBDCs' ability to serve small manufacturing firms with technical and managerial advice.

Volunteers in the Service Corps of Retired Executives (SCORE) offer brief workshops and counseling on business management to small firms. According to some who have received their services, their greatest benefit is entree to networks in which the SCORE volunteers are well established members.

A Federal program that could prove especially useful to small defense companies is the Small Business Innovative Research (SBIR) program, which set aside $460 million of Federal R&D money for small businesses during fiscal year 1990. Under this program, established by Congress in 1982, Federal agencies with R&D budgets of more than $100 million a year must set aside 1.25 percent of their contract money for small and medium-sized firms. In 1989, 3,183 awards were given to small companies to do R&D work for Federal agencies. The program is in two stages: first, feasibility studies of promising ideas (2,346 awards in 1989, for a total of $118 million); second, development of the ideas with the greatest potential (837 awards, $341 million).

The General Accounting Office has issued several reports on the SBIR program, generally giving it

[61] For a description of a highly varied and innovative program of financial aid to business in the State of Michigan, see Letitia L. Oliveira, "Digging Out From Hard Times: Economic Recovery in Michigan and Pennsylvania," contractor report prepared for the Office of Technology Assessment, August 1990.

high marks for effectively funneling R&D money to small firms and helping young companies develop advanced technologies.[62] A possible major shortcoming of SBIR, from the point of view of companies' converting to commercial production, is that DoD is the biggest funder (since it has far more R&D contract money than any other Federal agency).[63] However, for this very reason the program could offer real opportunities to adapt military technologies to civilian use. Frisby Airborne Hydraulics did just this in forming a partnership with a North Carolina firm that won an SBIR award from the Air Force for a heat exchanger to cool airplane engines. Frisby intends to market the technology to a variety of commercial customers, not only in aircraft but possibly also in electronics (see box 7-F).

Another kind of program that offers promise to small defense companies intending to convert to commercial production is technology extension assistance.[64] Technology extension has real potential to raise the performance of America's 350,000 small manufacturing firms (not just defense firms), but such programs are still quite few and scattered. They exist at both the State and Federal levels, but the States are ahead. In early 1991, 16 States had genuine extension programs (defined as those set up to give one-on-one technical advice to individual firms, with field agents as part of the program), and another 7 had technology demonstration or assistance centers. Most of these centers are fairly new, but a handful have several years' experience and one (Georgia Tech's highly regarded Industrial Extension Service) has existed for nearly 30 years. A rough estimate of what States spend on these programs is $50 million a year. Congress established a Federal program in the 1988 trade act; by 1991 it included five Manufacturing Technology Centers and was funded at about $10 million. Congress has shown considerable interest in strengthening and expanding technology extension. The FY92 funding for Manufacturing Technology Centers was increased to $15 million, but several other bills that received serious consideration in the 102d Congress would broaden the present program and authorize spending of as much as $50 to $75 million a year.[65]

The contribution technology extension can best make to small firms is not so much state-of-the-art products straight out of the R&D lab, but rather acquaintance with best practice in manufacturing. Many small defense firms are at the cutting edge technically, and some may be prepared to enter commercial markets at the high end.[66] However, many can use help in getting their productivity up and costs down by such things as organizing work to get rid of waste, acquiring the right machinery for the job and using it efficiently, training workers in techniques for in-process quality control, and encouraging worker participation in production improvements.

Learning how to sell in the commercial world is a particular challenge for small defense firms. Some States include in their range of services to small firms assistance in finding customers. For example, in the late 1980s Michigan developed its Market Scout program to help auto suppliers move into new markets. On the basis of input-output tables, the program generated a detailed list of industries that buy from particular supplier industries and have the potential to be good customers (e.g., declining industries were pruned from the list). Market Scout also developed data on what alternate products a supplier might be able to make, given certain specific kinds of machinery and workers in certain occupations, and what industries would be likely to buy them. Like many other States, Michigan was in dire financial straits in 1991, and it cut out funding for Market Scout and several other innovative business support programs.[67]

---

[62]Comptroller General of the United States, General Accounting Office, *Implementing the Small Business innovation Development Act—The First Two Years*, GAO/RCED-86-13 (Washington, DC: 1986); *A Profile of Selected Firms Awarded Small Business Innovation Research Funds*, GAO/RCED-83-113D (Washington, DC: 1986); *Effectiveness of Small Business Innovation Research Program Procedures*, GAO/RCED-87-63 (Washington, DC: 1987); *Small Business Innovation Research Participants Give Program High Marks*, GAO/RCED-87-161BR (Washington, DC: 1987); *Federal Research: Assessment of Small Business Innovative Research Programs*, GAO/RCED-89-39 (Washington, DC: 1989).

[63]With declines in defense spending, DoD R&D funds could be cut; however, it was one part of the national defense budget.

[64]For detailed discussion of technology extension programs in the United States, see OTA, *Making Things Better*, op. cit., chs. 2 and 7.

[65]See ch. 2.

[66]Even firms that make highly sophisticated products may not be prepared to sell in commercial markets, however. They may need to redesign their product, get manufacturing costs down and reliability up, and strengthen their marketing.

[67]The nonprofit Industrial Technology Institute (which had developed the program under State grants) took over the program on a pay-for-service basis.

Box 7-F—Frisby Airborne Hydraulics: Conversion in a Small Defense Company

Frisby Airborne Hydraulics, with about 100 employees, was a "captive" Long Island subcontractor to Grumman and Fairchild-Republic for over 30 years.[1] According to its co-owner, Greg Frisby, the 1987 cancellation of the T-46A trainer program after production of only two planes was "devastating." Since DoD had planned for 400 T46As, the company assumed that the trainer was a long-range military commitment. Frisby spent $300,000 developing the required advanced hydraulic control system, with a heat-resistant, leak-proof solenoid valve module that could be placed close to the engine. When DoD canceled the contract, the company received a government check for $40,000 in compensation.

Nevertheless, Frisby managed to survive and prosper while reducing its dependence on military contracts from 90 to 25 percent—and at the same time, keeping to a primary goal of no worker layoffs. It did so through a combination of aggressive marketing, changing its management style, and increasing worker participation in production decisions.

Frisby hired a sales team who agreed to work on commission and were familiar with the needs of the aerospace industry, and it backed up the sales effort with extra responsive customer service. About this time, Boeing (already a Frisby customer) announced "Operation Eagle," in which all its suppliers were to reduce prices 25 percent and freeze them at that level for 5 years. Frisby, with some trepidation, signed the contract. This prompted the company to add a major push for increased productivity to its marketing and service efforts.

Frisby moved to "participative management" in improving product design and production efficiency. It eliminated a layer of management, set up an employee committee on cost-cutting, instituted profit-sharing, offered flexible work shifts, encouraged hourly workers to contribute to production improvements, and held monthly financial statement review meetings with all employees. It cross-trained employees, all of whom now have a second skill, and paid for employees' education, based on grades. It taught English to non-English speaking employees (everyone from porters to operators).

According to Frisby's owners, the results of these efforts include:

- 50-percent reduction of scrap over each of 3 years 1987-90;
- 20-percent reduction of rework costs;
- no employee turnover in 1989-90;
- improved profit margins;
- 30 percent growth in sales volume; and
- no layoffs—in fact, increased employment.

[1]This account of the conversion of Frisby Airborn Hydraulics from a predominantly defense company to a mostly commercial company is drawn mostly from Linda Kravitz, "Wages of Peace: Community and Industry Experience With Military Cutbacks," contractor report prepared for the Office of Technology Assessment, August 1990, and is based on an interview with Greg Frisby, co-owner, May 16, 1990 and on "Economic Adjustment After the Cold War," testimony by Greg Frisby before the Joint Economic Committee, U.S. Congress, Mar. 20, 1990.

(continued on next page)

Some States are making explicit efforts to target their existing business assistance programs to defense contractors. For example, Ohio recently held a conference bringing together small defense contractors to help identify new markets. Connecticut Innovations Inc., a quasi-public State financing agency, has set aside $2 million to invest in defense-dependent firms to help them fund new product and market development.

A few State and local governments are creating new programs for the specific purpose of helping firms convert from defense to commercial production. For example, the California Aerospace Supplier Improvement Program is working with small aerospace subcontractors to help them modernize their production processes, in response to defense spending reductions as well as tougher international competition.[68] Jointly administered by California's

[68]The program's promotional materials state: "Faced with reductions in defense spending as well as international competition, there is mounting pressure for many firms, particularly suppliers to aerospace companies, to explore more efficient manufacturing techniques."

[69]California's Employment Training Program is funded by an employers' payroll tax similar to the unemployment insurance tax; it can be used to retrain displaced workers or active employees who need retraining in order to avoid displacement.

Box 7-F—Frisby Airborne Hydraulics: Conversion in a Small Defense Company—Continued

Frisby is now producing hydraulic actuators, micro pump packages, and valves of varying complexity for Boeing, McDonnell Douglas, Beech, and Cessna. Boeing now represents 40 percent of Frisby's sales. Frisby has evidently become a favored supplier, since Boeing does not "compete" the company, that is, solicit bids from other companies. Frisby still has military sales on the C-17, and while it values these sales, Frisby's co-owner comments that "the paperwork requirements for the C-17 couldn't fit into the airplane."

While improving its sales, service, management, and productivity, Frisby also found another market for its heat-resistant and leak-proof solenoid valve developed for the T46A; i.e., in deep hole oil drilling. A new plant in Clemmons, NC will be home for assembly, repair, and overhaul of Frisby's solenoid manufacturing operations. Moreover, Frisby has entered into a partnership with an R&D firm to commercialize a Small Business Innovative Research (SBIR) Phase II winning system for advanced cooling of avionics and electronics. The R&D firm, from North Carolina, had won 34 SBIRs. Its heat transfer technology, developed with funding from the Air Force, provides a better way to cool avionic systems. The system can cool radar engine systems 40 times better than air or water. Large aerospace braking systems contractors are interested in this technology; it might also be used to cool semiconductor circuit boards. This production too is scheduled for North Carolina

Frisby's owners believe that their successful transition was largely due to the flexibility inherent in smaller companies, and to products readily adaptable to commercial in the aircraft business. They "do not believe that it is impossible for large contractors to make similar transitions." However, in noting the disinclination of some large contractors, Frisby's owners noted that they had received no response from one big company to their proposal for a joint undertaking to produce a major hydraulic system needed for the Boeing 777 airplane. Frisby looked elsewhere, and has found a more commercially oriented prospective partner.

According to Greg Frisby, "What is urgently needed [for company conversion] is unprecedented communication and cooperation between labor and management. Employees must be willing to cross-train, cost-share through concessions and do whatever else is necessary to aid in the transition. Management, though, must work hand in hand with labor and include employees in all re-training, productivity and cost savings decision making."

Department of Commerce, Employment Training Program,[69] and community colleges, the program provides training in total quality management, including statistical process control, just-in-time procurement, and teamwork/communications, through workshops at four Centers for Applied Competitive Technologies and through onsite training. In the program's first 2 years, employees from more than 1,600 companies are expected to attend the seminars, and 200 companies are expected to enroll in the more in-depth, onsite training.

At the Federal level, there is scarcely any assistance specifically targeted to defense firms wishing to convert. However, DoD's Office of Economic Adjustment (OEA), a small agency whose experience lies mostly in helping communities plan for adjustment to military base closings is involved in a demonstration project for that purpose. The OEA is working with the State of New York and local communities to provide technical assistance to nine defense contractors on Long Island, to help them move into commercial markets. A technical consultant is working with the firms to develop strategic plans and help them apply for assistance from local, State, and Federal Government programs to implement the plans. OEA provided $100,000 for the project, the State $70,000, and the nine firms $120,000; local governments and the Chamber of Commerce will provide another $50,000 to $70,000 in-kind support. The nine firms selected are in three size categories and three categories of defense dependency (75 to 100 percent defense, 50 to 75 percent, and up to 50 percent).

[69]California's Employment Training Program is funded by an employers' payroll tax similar to the unemployment insurance tax; it can be used to retrain displaced workers or active employees who need retraining in order to avoid displacement.

Appendix A

Defense Spending and Employment

Table A-1—National Defense Outlays and Budget Authority, 1940-91

Fiscal year	Outlays (billions of current dollars)	Outlays (billions of constant 1991 dollars)	Budget authority (billions of current dollars)	Budget authority (billions of constant 1991 dollars)
1940	1.7	19.4		
1941	6.4	65.9		
1942	25.7	224.9		
1943	66.7	533.9		
1944	79.1	672.0		
1945	83.0	761.1		
1946	42.7	437.1	44.0	425.4
1947	12.8	119.9	9.0	88.1
1948	9.1	82.0	9.5	82.9
1949	13.2	113.7	10.9	97.4
1950	13.7	111.8	16.5	127.1
1951	23.6	172.1	57.8	362.3
1952	46.1	312.2	67.5	438.4
1953	52.8	346.9	56.9	373.1
1954	49.3	330.2	38.7	263.7
1955	42.7	280.4	32.9	221.8
1956	42.5	264.7	35.0	224.0
1957	45.4	268.4	39.4	241.8
1958	46.8	263.5	40.0	234.6
1959	49.0	264.3	45.1	250.1
1960	48.1	258.8	44.3	241.5
1961	49.6	258.9	45.1	244.2
1962	52.3	274.0	50.2	269.1
1963	53.4	278.1	52.1	273.6
1964	54.8	275.1	50.6	259.5
1965	50.6	249.3	64.4	247.0
1966	58.1	268.6	73.1	291.8
1967	71.4	312.6	77.8	318.0
1968	81.9	342.2	78.5	339.9
1969	82.5	332.3	75.3	313.2
1970	81.7	306.6	72.7	281.3
1971	78.9	278.8	76.4	255.2
1972	79.2	258.2	79.1	245.8
1973	76.7	234.7	81.5	234.7
1974	79.3	225.0	86.2	223.0
1975	86.5	219.7	97.3	215.1
1976	89.6	212.5	110.2	226.7
1977	97.2	214.9	117.2	236.7
1978	104.5	215.3	126.5	233.0
1979	116.3	222.7	143.9	231.7
1980	134.0	229.0	180.0	236.1
1981	157.5	240.6	216.5	267.3
1982	185.3	258.2	245.0	299.2
1983	209.9	280.2	265.2	326.6
1984	227.4	292.2	294.7	342.9
1985	252.7	310.8	289.1	365.7
1986	273.4	328.3	287.4	349.5
1987	282.0	329.2	292.0	336.4
1988	290.4	328.3	299.6	329.5
1989	303.6	329.5	301.6	324.9
1990	299.3	314.9	306.9	318.5
1991	298.9	298.9	285.6	285.6

SOURCES: Stephen Alexis Cain, Defense Budget Project, "Analysis of the Presidents' FY 1991 Defense Budget Request," Washington, DC, January 1991; and Office of Management and Budget, *Budget of the United States*, Historical Tables (Washington, DC: 1992).

Table A-2—Defense Employment by State, 1991

	Private defense industry	Active duty military[a]	DoD civilians	Total defense employment[a]	Total employment 1990	Percent of total employment in defense
Alabama	38,893	18,706	25,796	83,395	1,782,706	4.7
Alaska	6,778	21,660	5,688	34,126	260,660	13.1
Arizona	52,110	23,239	10,470	85,819	1,657,239	5.2
Arkansas	17,471	8,968	4,818	31,257	1,063,968	2.9
California	536,472	169,522	123,433	829,427	14,016,522	5.9
Colorado	49,822	33,110	12,921	95,853	1,702,110	5.6
Connecticut	98,207	7,091	5,080	110,378	1,705,091	6.5
Delaware	6,854	4,460	1,822	13,136	347,460	3.8
District of Columbia	13,973	13,883	17,302	45,158	291,883	15.5
Florida	113,419	75,368	32,797	221,584	6,062,368	3.7
Georgia	60,751	44,583	38,437	143,771	3,085,583	4.7
Hawaii	8,291	39,936	19,857	68,084	563,936	12.1
Idaho	4,387	4,743	1,376	10,506	471,743	2.2
Illinois	82,211	35,243	21,269	138,723	5,693,243	2.4
Indiana	63,946	5,523	14,635	84,104	2,687,523	3.1
Iowa	19,976	366	1,702	22,044	1,433,366	1.5
Kansas	25,157	20,902	6,856	52,915	1,263,902	4.2
Kentucky	20,657	30,210	13,079	63,946	1,694,210	3.8
Louisiana	39,867	23,832	9,427	73,126	1,780,832	4.1
Maine	12,886	5,485	10,224	28,595	597,485	4.8
Maryland	75,716	33,186	43,197	152,099	2,450,186	6.2
Massachusetts	136,250	8,722	11,989	156,961	2,985,722	5.3
Michigan	66,896	8,385	10,965	86,246	4,242,385	2.0
Minnesota	46,712	998	2,923	50,633	2,288,998	2.2
Mississippi	31,378	13,470	11,280	56,128	1,109,470	5.1
Missouri	85,747	15,507	19,457	120,711	2,498,507	4.8
Montana	3,611	4,329	1,311	9,251	383,329	2.4
Nebraska	9,293	12,696	4,173	26,162	833,696	3.1
Nevada	6,334	9,280	2,104	17,718	604,280	2.9
New Hampshire	15,646	2,164	1,675	19,485	596,164	3.3
New Jersey	88,432	16,037	26,858	131,327	3,862,037	3.4
New Mexico	15,202	14,757	9,840	39,799	670,757	5.9
New York	183,274	28,627	18,839	230,740	8,250,627	2.8
North Carolina	45,823	69,724	16,141	131,688	3,331,724	4.0
North Dakota	3,441	10,001	1,931	15,373	322,001	4.8
Ohio	122,286	11,551	34,759	168,596	5,137,551	3.3
Oklahoma	23,285	25,640	23,980	72,905	1,479,640	4.9
Oregon	14,975	1,003	2,955	18,933	1,411,003	1.3
Pennsylvania	111,329	6,099	51,672	169,100	5,589,099	3.0
Rhode Island	11,969	3,926	4,355	20,250	484,926	4.1
South Carolina	22,689	37,263	19,965	79,917	1,680,263	4.8
South Dakota	3,148	6,593	1,451	11,192	353,593	3.2
Tennessee	33,259	8,861	7,732	49,852	2,280,861	2.2
Texas	191,896	112,608	59,227	363,731	8,034,608	4.5
Utah	18,322	5,809	21,294	45,425	763,809	5.9
Vermont	6,022	149	641	6,812	294,149	2.3
Virginia	129,963	89,489	108,184	327,636	3,148,489	10.4
Washington	72,408	35,785	28,886	137,079	2,416,785	5.7
West Virginia	10,702	529	1,778	13,009	708,529	1.8
Wisconsin	38,421	1,088	3,270	42,779	2,475,088	1.7
Wyoming	3,441	3,628	1,090	8,159	236,628	3.4
Nation	2,900,000	1,184,734	930,911	5,015,645	119,086,734	4.2

[a]Includes active duty military personnel stationed in the States and the District of Columbia, but not those stationed overseas.

SOURCES: Military and civilian DoD employment from the Department of Defense, *Selected Manpower Statistics FY 1990* (Washington, DC: 1991). Industry employment are OTA estimates using methodology described in chapter 3.

Index

Index

A-12 aircraft, 16, 70, 81, 97, 103, 104, 195, 216
Advance notice, 11, 50, 89-90, 159-160. *See also* Worker Adjustment and Retraining Notification Act
Advanced Tactical Fighter, 14, 195, 216
Advanced Technology Program, 36, 53
Aerospace Employment Project, 117
African Americans, 25, 48, 130, 137-139, 140
Air Force
  displaced worker assistance programs, 92-93
  numbers and composition, 129-131
  personnel cuts, 136
  veterans' adjustment programs, 145
Airbus Industrie, 169, 202
Aircraft industry, 14-17, 30, 63-64, 195-196, 201-203, 206-210, 213, 216
Alabama, 185
Alaska, 12, 13, 158
All Volunteer Force, 25, 129, 131, 139. *See also* Military personnel
Allied Signal Corp., 202, 209-210
AM General, 203
American Institute of Aeronautics and Astronautics, 117
Antelope Valley, CA, 160-161
Arizona, 93
Arkansas, 166
Arms sales. *See* Exporting arms and technology
Army
  displaced worker assistance programs, 92
  numbers and composition, 129-131
  personnel cuts, 136-137
  veterans' adjustment programs, 143-146
Army Career and Alumni Program, 92, 94, 145
Aroostook County, ME, 166
Atlanta, GA, 156

B-1B bomber, 64, 121, 160
B-2 Stealth bomber, 11, 64, 196, 213
Baltimore, MD, 163
Base closings
  advance notice, 11, 159-160
  displaced workers, 66
  effectiveness of development efforts, 185-187
  environmental problems, 26, 50, 166-169, 187
  impacts, 26, 164-166, 169
  local economic conditions, 165-166
  property transfer, 26, 50, 166-169
Base Closure Account, 168
Bath, ME, 25, 158
Bath Iron Works, 14, 156
Beech Aircraft, 205, 206
Benicia Arsenal, CA, 185
Berkeley Planning Associates, 79
Blue-collar workers, 18, 19, 22-23, 64, 65, 71, 73, 95, 97, 163
Blytheville, AR, 166
Boeing, 8, 11, 24, 29, 30, 63, 96, 108, 117, 121, 122, 197, 198, 201, 202, 206-209, 213
Boeing Vertol, 206, 207
Boston, MA, 26, 156, 158, 162, 164, 182
Bradley M-2 fighting vehicle, 196
Brookly Air Force Base, AL, 185
Buffalo, NY, 163
Business and Industrial Development Loans and Grants, 176
"Buy American" laws, 223

C-17 cargo plane, 195
C-130 cargo plane, 202
California, 12-13, 144, 156, 158, 160-166. *See also* Los Angeles, CA
  assistance for displaced workers, 81-82, 84, 88, 98, 123, 124
  support for transportation initiatives, 30, 53, 217, 218-219
  unemployment insurance benefits, 75
California Aerospace Supplier Improvement Program, 225-226
Cameron Station, Alexandria, VA, 165
Canada's Industrial Adjustment Service, 87
Career Awareness Program, 144
Center for Applied Technology, 123
"The Center for Practical Solutions," 118
Champaign County, IL, 166
CHAMPUS, 143
Chanute Air Force Base, IL, 92-93, 166, 168, 174, 178, 179
Cheney, Richard, 16, 81, 138, 195
Chicago, IL, 166
Chippewa County, MI, 186-187
Cincinnati, OH, 163
Civilian employees of DoD
  advance notice, 89-90
  displacement, 47, 59-61, 65-66
  OPM Placement program, 91
  policy issues and options, 46-47
  Priority Placement Program, 22, 90-91
  prospects, 97-99
  severance pay and unemployment insurance, 91-92
  transition assistance programs, 22, 89-97
Civilian Health and Medical Program of the Uniformed Services, 143
Civilian service, 48, 139, 140
Colorado, 70, 72-73, 90, 92, 93, 99, 166
Commissary access, 143
Commonwealth Career Center, 123
Communications industry, 14-16, 40, 203-204, 222
Community Development Block Grants, 176
Community impacts
  base closings and realignments, 11, 164-169, 185-187
  defense-dependent communities, 12-14, 25-28, 34-35, 158-159
  economic development efforts, 170-190
  factors affecting, 159-164
  Federal assistance programs, 172-176
  locations of defense spending, 12-14, 154-159
  mitigating impacts, 169-184
  policy issues and options, 48-51
  reasons for concern, 153-154
  State and local assistance programs, 176-184
  urban vs. rural defense dependency, 159
Connecticut, 12, 14, 25, 156, 158, 196
Connecticut Innovations Inc., 225

Critical Technology Application Centers, 36

Danish Technological Institute, 183-184
Data rights, 54-55, 214-215
Defense companies
  barriers to conversion, 213-217
  conversion, 29-30, 206-213
  culture of, 29, 39, 213-214
  development costs and data rights, 54-55, 214-215
  displaced worker assistance, 94-97
  diversification, 29, 199, 204-206
  downsizing, 60, 199-200
  exporting arms and technology, 29, 200-201
  government assistance programs, 31, 35-36, 51-55
  impacts, 14-18, 28-31, 193-195
  major company adjustment plans, 198-213
  outlook, 28-30, 195-198, 215-217
  policy issues and options, 31-32, 51-55
  sales to civilian government agencies, 203-204, 215
  shifting to commercial products, 62-64, 201-203
  small business, 30-31, 217-226
  spinoff companies, 204
  technology extension, 31, 35-36, 224
Defense Environmental Restoration Account, 168
Defense Environmental Restoration Program, 168
Defense Outplacement Referral System, 144
Defense spending
  cutbacks, 3-6, 193, 229
  historical perspective, 6-11, 229
  locations of, 11-14, 154-159
Denver, CO, 166
Department of Commerce, 49-50, 174-176
Department of Defense. *See also specific branches of the military;* Civilian employees of DoD; Defense companies; Military personnel; Office of Economic Adjustment; Veterans
  DoD-wide transition assistance, 143-144
  transition assistance for civilian employees, 22, 89-97
Department of Energy, 53, 196
Department of Labor, 20, 21-22, 25, 33, 34, 42-43, 46, 77, 78, 81, 87, 106, 116, 123, 125, 145, 147
Department of Veterans' Affairs, 25
Derson Group, 97
Deutsche Airbus, 169, 179
Development cost recoupment, 54-55, 214-215
Disadvantaged workers, 82-83
Displaced defense workers. *See also* Civilian employees of DoD; Engineers
  adjustment assistance programs, 19-23, 41-46, 71-89
  advance notice, 70, 89-90
  costs of displacement, 66-67
  dimensions of displacement, 18, 59-66
  DoD assistance programs for civilian employees, 89-94
  elements of effective assistance programs, 67-74
  industry assistance programs, 94-97
  labor-management cooperation, 70-71
  policy issues and options, 41-48
  prospects, 18-19, 97-99
  rapid response, 42-43, 70
  retraining, 43, 45, 72-74
  U.S. vs. foreign practice, 67
Displaced Employee Program, 91
DoD. *See* Department of Defense
DOL. *See* Department of Labor
Drake, Beam, Morin, 95

Eaker Air Force Base, AR, 166
Eaton AIL, 16
Economic Adjustment Committee, 172-173
Economic development
  assisting existing and new businesses, 181-184
  attracting new industry, 51, 179-181
  effectiveness, 184-190
  organizing and planning for, 178
  policy issues and options, 39-41, 50-51
  programs for, 26-28, 174-176
Economic Development Administration, 27, 32, 34, 49-50, 51, 174-176
Economic Dislocation and Worker Adjustment Assistance
  allocation of EDWAA funds, 43-44, 87-88
  changes in, 41-42, 78-79
  discretionary funds, 80-82
  DOL supervision and assistance, 42
  engineers, 33, 47-48, 121-124
  Federal responsibilities, 86-87
  funding, 34, 45-46, 77
  history, 77-78
  links with DoD outplacement programs, 94
  quality of services, 19, 33-34, 82-84
  rapid response, 33, 42-43, 79-80
  spending rules, 88-89
  state and substate funds and responsibilities, 34, 84
  training, 33-34, 43, 47-48, 84-86
  veterans, 146-147
EDA. *See* Economic Development Administration
Edgemont Army Depot, SD, 162
Education
  of enlisted personnel, 25, 131-133
  GI Bill, 25, 147-149
  as national goal, 40, 72-73
EDWAA. *See* Economic Dislocation and Worker Adjustment Assistance
Eglin Air Force Base, FL, 184
Electric Boat, 14, 96, 99, 158, 196
Electric vehicles. *See* Transportation industry
Electronics industry, 64
Employer attitudes
  layoffs, 67
  perceptions of veterans, 129, 133
Employment Service, 75, 86, 143-144, 146
Engineers
  age factors, 24, 110
  company assistance programs, 23-24, 118-121
  continuing education, 24, 112-115
  current layoff and reemployment experience, 109-112
  degrees, 24, 111
  dissipation of technical know-how, 17-18, 47
  entrepreneurial assistance, 125-126
  government assistance programs, 23, 47-48, 121-124
  impacts of defense cutbacks, 23, 103
  moving to civilian employment, 107-109
  policy issues and options, 47-48
  post-Vietnam War build-down, 106-107, 116-117
  professional associations, 117-118

prospects, 23, 103-105
retraining, 24, 33-34, 47-48, 115-126
salary levels, 24, 107, 108-109
specialization, 24, 107, 111
teacher training, 47-48, 124-125
Enlisted personnel. *See also* Military personnel
education and aptitude, 25, 131-133
employer perceptions, 129, 133
Entrepreneurial assistance, 36, 125-126
Environment One, 204, 205
Environmental issues
base transfers, 26, 50, 166-169, 187
U.S. environmental industry, 40
Equal opportunity employment. *See* Social impacts
Exchange access, 143
Experience Unlimited job clubs, 123
Export Promotion Services, 176
Exporting arms and technology, 29, 200-201

F-14 aircraft, 104
F-15 aircraft, 104, 195
F-16 aircraft, 104, 195, 201
F-22 aircraft, 14, 195, 216
F/A-18 aircraft, 16, 195, 201
Fairchild, 172
Fairchild-Republic, 195
Fairfax County, VA, 179
Family service centers, 145
Farmers Home Administration, 176
Federal Aviation Administration, 29, 196, 203
Florida, 84, 158, 184, 185
Florida Technology Coast Manufacturing and Engineering Network, 184
Fort Carson, CO, 70, 72, 92, 99
Fort Dix, NJ, 145, 146
Fort Douglas, UT, 178
Fort Meade, MD, 165
Fort Ord, CA, 166
Fort Polk, LA, 162, 166
Fort Sheridan, Chicago, IL, 165
Fort Worth, TX, 16, 158, 203
Frisby Airborne Hydraulics, 222-223, 224, 225-226

General Dynamics, 14, 16, 29, 81, 97, 103, 104, 110, 195, 197, 199-200
General Dynamics' Electric Boat, 14, 96, 99, 158, 196
General Electric, 29, 197, 198, 204
General Electric Aerospace, 54, 65, 71, 83, 95, 96, 98, 110, 111, 120, 122, 124, 158, 198, 208
General Electric Aircraft Engines, 96, 98, 201, 202
General Motors, 29, 197
George Air Force Base, CA, 178
Georgia, 156, 163
GI Bill, 25, 147-149
Glasgow Air Force Base, MT, 162
Groton, CT, 25, 158, 196
Grumman, 16, 29, 104, 108, 111, 161, 197, 198, 208-209, 216
GTE, 29, 197

Hagerstown, MD, 172
Hawaii, 12, 13, 87, 158
Hazeltine, 16
Health care, 25, 143
Historical perspective on defense spending, 6-11
Housing, 143
HUD Community Development Block Grants, 176
Hughes, 163-164
Humvee, 203

IBM, 29, 197
Illinois, 92-93, 165, 166, 168, 174, 178, 179, 187
Immigrants, 64-65, 163
Indiana, 178, 179
Indianapolis, IN, 179
Industrial recruitment, 51, 179-181
Ingalls Shipbuilding, Pascagoula, MS, 12, 210
Institute of Electrical and Electronics Engineers, Inc., 105, 117
Intellectual property rights, 54-55, 214-215
Intermagnetics General, 204
Iosco, County, MI, 166
ITT, 29, 197

Jackson County, MI, 85, 185, 187-189
Japan
continuing education for engineers, 113
subsidies for foreign firms, 180
and worker displacement, 67, 68-69
Jefferson Proving Ground, Madison, IN, 178
Job fairs, 80, 93, 96, 115, 120
Job Training Partnership Act Title IIA, 79, 82-84, 89
Job Training Partnership Act Title III. *See* Economic Dislocation and Worker Adjustment Assistance

Kansas, 158, 172
Kincheloe Air Force Base, MI, 186-187

Labor-management cooperation, 67, 70-71
Leesville, LA, 162, 166
Lewiston Air Force Base, MT, 162
Lima, OH, 12, 158
Limestone, ME, 162
Litton Industries, 210
Local impacts. *See* Community impacts
Lockheed, 29, 76, 95, 97, 104, 107, 110, 111, 120, 160-161, 163 197, 201, 202, 216
Long Beach, CA, 16, 19
Long Island, NY, 16, 26, 156, 160, 162, 163, 164, 182, 203
Loring Air Force Base, ME, 162, 166
Los Angeles, CA, 12, 19, 26, 64-65, 84, 98, 158, 160-161, 163, 164, 169, 182, 203
Louisiana, 162, 166
Lowry Air Force Base, Denver, CO, 93

M-1 tank, 196
M-1A2 tank, 104
M-2 fighting vehicle, 196
Madison, IN, 178
Maine, 14, 25, 156, 158, 162, 166
Managers, 24, 65, 71, 73, 95
Manufacturing, 5, 10, 14-18, 64-65, 170. *See also* Defense companies
Manufacturing Technology Centers, 35, 50, 52, 224
Mare Island Naval Shipyard, CA, 71, 91, 93-94
Marietta, GA, 163
Marine Corps
numbers and composition, 129-131
personnel cuts, 136

Market Scout program, 224
Martin Marietta, 197, 198, 203-204
Maryland, 12, 70-71, 158, 163, 165, 172
Mass transit. *See* Transportation industry
Massachusetts, 12, 19, 22, 29, 65, 71, 75, 83-84, 97, 98, 122, 123, 125-126, 158, 221
  Boston, 26, 156, 158, 162, 164, 182
  Pittsfield, 65, 71, 98, 158, 198
  Taunton, 190
Mather Air Force Base, CA, 93
McDonnell Douglas, 14, 16, 17, 63, 70, 71, 76, 82, 96, 98, 103, 104, 107, 110, 120, 121, 124, 125, 178, 195, 197, 200, 201, 202, 216
Michigan, 85, 162, 166, 185-189, 224
Michigan Automotive Compressors, 188
Military base closings. *See* Base closings
Military personnel. *See also specific branches of the military*; Veterans
  characteristics of enlistees, 131-133
  cuts by service, 136-137
  education and aptitude, 25, 131-133
  employer perceptions, 129, 133
  how forces are cut, 134-136
  minorities, 5, 25, 48, 130, 137-139, 140, 149
  numbers and composition, 129-131
  numbers and composition of cuts, 24-25, 133-139
  skills and training, 133
  women, 139
The Miltran Guide to Career Opportunities, 147
Minorities, 5, 25, 48, 130, 137-139, 140, 149
Mississippi, 12, 210
Missouri, 16, 125, 126, 158, 163, 178, 203, 220, 222
Montana, 162
Monterey, CA, 166
Montgomery County, MD, 163
Montgomery GI Bill, 25, 147-149

National Aeronautics and Space Administration, 29, 53, 196, 203
National Association of Counties, 79
National Association of State Budget Officers, 177
National Centers of Manufacturing and Process Technology, 53
National Defense Education Act, 33, 48
National Executive Service Corps, 124
National Governor's Association, 49, 79, 81, 87
National Institute of Standards and Technology, 35, 36, 51-52, 53
National League of Cities, 49, 117
National Research Council, 113
National Science Foundation, 33, 47, 103, 108, 109, 113
National service program, 48, 139, 140
National Society of Professional Engineers, 116
National Technological University, 114
Naval Air Station at Moffett Field, CA, 165-166
Naval Underwater Systems Command, 158
Navy
  displaced worker programs, 90, 93-94
  numbers and composition, 129-131
  personnel cuts, 136
  veterans' adjustment programs, 145
New Careers in Teaching, 149
New England, 156-157, 161, 220, 222
New Hampshire, 165, 169
New Jersey, 145, 146
New Jersey Provisional Teacher Program, 124-125
New London County, CT, 156
New York, NY, 166
New York State
  Buffalo, 163
  Long Island, 16, 26, 156, 160, 162-164, 182, 203
  New York City, 166
Newport News, VA, 12, 25, 158, 196
Norden Systems, 203
North Carolina, 84
Northrop, 64, 196, 216
Norton Air Force Base, CA, 160-161, 179, 202

OEA. *See* Office of Economic Adjustment
Office of Economic Adjustment, 8, 27, 34, 49, 50, 51, 166, 172-174, 178, 185, 226
Office of Personnel Management Placement Program, 91
Office of Work Based Learning, 87
Officers, 130
Ohio, 12, 158, 163, 222, 224-225
Okaloosa County, FL, 158, 184
Oregon, 184
Oscoda, MI, 162, 166

Palmdale, CA, 11
Pease Air Force Base, NH, 165, 169
Pennsylvania, 182, 220-221, 222
Persian Gulf War
  effect on arms sales, 29, 201, 203
  effect on employer perceptions of veterans, 48, 129
  effect on transition programs, 145
Philadelphia, PA, 182
Philadelphia Naval Shipyard, 66
Pittsfield, MA, 65, 71, 98, 158, 198
Policy issues and options, 31-36, 39-55
Portsmouth Naval Shipyard, 80, 81, 90, 99
Pratt and Whitney, 14, 110, 201, 202
The Presidio, San Francisco, CA, 165
Priority Placement Program, 22, 90-91, 99
Project Choice, 92-93
Pueblo Army Depot, CO, 72-73, 90, 92

Rantoul, IL, 166, 168, 174, 178, 179, 187
Rapid response, 20, 33, 42-43, 67, 70, 78, 79-80
Raytheon, 29, 190, 197, 204-206
Regional impacts, 11-18. *See also* Community impacts; State impacts
  defense-dependent regions, 156-157
  economic development efforts, 170-190
  locations of defense spending, 154-159, 230
Relocation and reemployment, 24, 71-72, 98-99, 110, 111, 143, 179
Remedial training, 74
Research and development. *See* Technology development
Retraining, 43, 45, 72-74, 84-86
Rockwell, 29, 64, 96, 121, 124, 160, 198
Rockwell Collins, 202
Rohr Industries, 206, 207-208
Rolm Systems, 222

Sacramento, CA, 166
Sagadahoc County, ME, 156

Salt Lake City, UT, 178
San Bernardino County, CA, 178
San Jose, CA, 158, 162, 182
SEATECH, 182
Seattle, WA, 11, 158, 161, 166
Seawolf attack submarine, 14, 196
Service Corps of Retired Executives, 223
Severance pay
  civilian employees of DoD, 91-92
  displaced workers, 94, 95
  military personnel, 25, 142
Shipbuilding industry, 12, 14, 63, 196, 208
Shultz, George P., 67
Skill certification, 144
Small Business Administration, 176, 182-183, 223
Small Business Development Centers, 176, 182, 223
Small Business Innovative Research program, 223-224
Small businesses
  adjustment plans, 221-223
  defense dependence, 30-31, 217-220
  entrepreneurial assistance, 36, 125-126
  government adjustment assistance, 31, 223-226
  technology extension, 31, 35-36, 224
Social impacts
  on immigrants, 64-65, 163
  loss of family-wage jobs, 64-65
  loss of opportunity for minorities, 5, 25, 48, 130, 137-139, 140, 149
South Dakota, 162
SRI International, 76, 79, 83, 88
St. Louis, MO, 16, 125, 126, 158, 163, 178, 203, 220, 222
State impacts. *See also* Community impacts
  defense-dependent States, 12-14, 157-158
  defense employment by State, 13-14, 230
  economic development efforts, 170-190
  factors affecting, 159-164
  Federal assistance programs, 172-176
  locations of defense spending, 154-156, 230
  policy issues and options, 48-51
  reasons for concern, 153-154
  State and local assistance programs, 176-179
State technology extension programs, 35, 51
Sudden and Severe Economic Dislocation program, 27, 34, 174-176
Sundstrand, 216

T-46 Navy jet trainer, 16, 195
TAP. *See* Transition Assistance Program
Taunton, MA, 190
Tax incentives
  for defense company conversion, 36, 54-55
  engineer training, 47
  entrepreneurial companies, 36, 54
  State and local economic development, 181
Teacher training
  engineers, 47-48, 124-125
  soldiers, 149
Technological Institute, Denmark, 183-184
Technology development
  development costs and data rights, 54-55, 214-215
  government-industry partnership, 40, 53
Technology extension assistance, 29-31, 35-36, 51-52, 224, 225
Technology Mobilization and Reemployment Program, 116
Technology resources and expertise, 5, 17-18, 28, 194
Technology Utilization Project, 116
Tenneco, 12, 196, 198
Texas, 16, 158, 203
Texas Instruments, 95, 98, 99, 107, 112, 115, 120-121
Tokia Rika, 188
Trade Adjustment Assistance, 45, 85
Transition Assistance Program, 22, 25, 92, 143-146
Transition Bulletin Board, 91
Transportation industry, 30, 40, 53-54, 206-210, 218-220
Trident missile-launching submarine, 196
Truman Annex, Key West, FL, 185
TRW, 203, 216

UCX, 142
Unemployment insurance, 44-45, 74-75, 85, 91, 142
United Airlines, 179, 180
United Nuclear Corp. (UNC), 14, 73-74, 82, 96, 97, 99, 110, 111, 158, 159
United Technologies, 29, 110, 198, 203
U.S. Conference of Mayors, 79, 117
Utah, 178

Veterans. *See also* Military personnel
  in the civilian economy, 139-142
  dimensions of personnel cuts, 133-139
  educational benefits, 25, 147-149
  effects of involuntary separations, 24-25, 129
  employer perceptions, 129, 133
  separation benefits, 25, 48, 142-143
  skill transfer, 141
  teacher training, 149
  transition assistance programs, 25, 143-147
  veterans' organizations, 147
Veterans' Educational Assistance Program, 147-148
Veterans' organizations, 147
Virginia, 12, 13, 25, 158, 165, 179, 196

WARN. *See* Worker Adjustment and Retraining Notification Act
Washington, DC, 13, 26, 158, 162, 163, 164, 166, 182
Washington State, 11, 125-126, 158, 161, 166
Weber, Arnold, 67
West Virginia, 87
Westinghouse, 29, 70-71, 197, 198, 216
White-collar workers, 65, 71, 73, 95. *See also* Engineers
Wichita, KS, 158, 172
Wichita Engineering Association, 117, 122
Williams Air Force Base, AZ, 93
Women, 139
Wood Products Competitiveness Corp., 184
Worker Adjustment and Retraining Notification Act, 18, 23, 42, 75-76, 81, 89, 97, 121, 143
Wurtsmith Air Force Base, MI, 162, 166

Superintendent of Documents **Publications** Order Form

P3

Order Processing Code:
* **6186**

Charge your order. It's Easy! MasterCard VISA

To fax your orders (202) 512–2250

☐ **YES**, please send me the following:

_____ copies of ***After the Cold War: Living With Lower Defense Spending***, S/N 052-003-01274-0 at $12.00 each.

The total cost of my order is $_____. International customers please add 25%. Prices include regular domestic postage and handling and are subject to change.

_____
(Company or Personal Name) (Please type or print)

_____
(Additional address/attention line)

_____
(Street address)

_____
(City, State, ZIP Code)

_____
(Daytime phone including area code)

_____
(Purchase Order No.)

May we make your name/address available to other mailers? YES ☐ NO ☐

Please Choose Method of Payment:

☐ Check Payable to the Superintendent of Documents

☐ GPO Deposit Account ☐☐☐☐☐☐☐ – ☐

☐ VISA or MasterCard Account

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

☐☐☐☐ (Credit card expiration date)

Thank you for your order!

_____
(Authorizing Signature) 2/92

Mail To: New Orders, Superintendent of Documents
P.O. Box 371954, Pittsburgh, PA 15250–7954