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brief 9

US Conversion after the Cold War, 1990-1997

*Lessons for Forging a New
Conversion Policy*

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Zusammenfassung

German summary

Seit 1990 ist die weltweit größte Verteidigungswirtschaft um ein Drittel geschrumpft. Dieser BICC Brief beschreibt die daraus folgenden Veränderungen für die US-amerikanische Rüstungsindustrie, rüstungsabhängige Kommunen, Angehörige der Streitkräfte und die Infrastruktur militärischer Anlagen und Forschungseinrichtungen, sowie die gesamte Wirtschaft. Die Analyse der US-amerikanischen Reaktionen auf die Verminderung der Verteidigungsausgaben liefert eine Reihe von Erkenntnissen für zukünftige Reduzierungen und einen Vergleichsmaßstab für die Erfahrungen in anderen Ländern.

Die Konversion militärischer Ressourcen war erfolgreicher als häufig angenommen wird. Sie war allerdings weitaus begrenzter als die weitreichenden geopolitischen Veränderungen nach dem Ende des Kalten Krieges gestattet hätten. Mehr als 85 Prozent der „Friedensdividende“ - 116 Milliarden US-Dollar in kumulierten Einsparungen seit 1990 - wurden zur Verminderung des Haushaltsdefizits eingesetzt und nicht für zivile staatliche Zwecke ausgegeben. Die einseitige Konzentration auf den Ausgleich des Haushalts hat bereits zu einer Begrenzung des Umfangs ziviler staatlicher Aufträge beigetragen, die Rüstungsfirmen dazu verhelfen könnten, zivile Märkte zu finden.

In diesem BICC Brief wird gezeigt, daß Rüstungsfirmen gewillt und häufig in der Lage waren, in neuen Technologiefeldern wie Transportsysteme, Umweltschutz, Telekommunikation und Luftraumkontrolle erfolgreich zu sein, wenn sie staatliche Unterstützung erhielten. Einige große Firmen und viele kleinere

haben vollständig auf zivile Produktion umgestellt. Die öffentliche Förderung des Zusammenschlusses von Rüstungsfirmen und ein erneutes Hoffen auf wieder ansteigende Beschaffungen haben allerdings zu einer Konzentration der Rüstungskapazitäten in wenigen Händen geführt.

Die staatliche Förderung der Konversion wurde vornehmlich nicht auf Investitionen in zivilen Bereichen ausgerichtet, sondern auf die Unterstützung von sowohl zivil als auch militärisch verwendbaren Technologien und Hilfen für Beschäftigte und Kommunen nach dem Verlust von Arbeitsplätzen. Allerdings sind die „dual-use“-Programme zunehmend darauf ausgerichtet worden, zivile Technologien für militärische Zwecke nutzbar zu machen. Die Programme für Beschäftigte und Kommunen sind finanziell zu gering ausgestattet und nicht ausreichend mit regionalen Beschäftigungs- und Industrieansiedlungsprogrammen verzahnt. Der BICC Brief erwähnt eine Reihe weiterer kleinerer staatlicher Programme, die kleineren und mittleren Unternehmen Unterstützung bei der Umstellung gegeben haben, insbesondere das staatliche Netzwerk von Industriekompetenzzentren, die eine Reihe von Dienstleistungen anbieten, wie Umschulungen, Unterstützung im Marketing, Gründerhilfen und Modernisierungs-Netzwerke. Auch den Anstrengungen, einen Teil des

in staatlichen Forschungseinrichtungen gewonnenen technologischen Wissens zivil nutzbar zu machen, waren einige Erfolge beschieden. Sie wurden aber durch unklare und schwankende Zielbestimmungen für diese Einrichtungen, die nun wieder verstärkt militärische Forschung, vor allem im Bereich der Atomwaffen, betreiben sollen, behindert.

Nicht zuletzt weil die staatlichen Kompetenzen im Falle der Schließung von militärischen Liegenschaften eindeutiger geregelt sind, ist hier der Konversionserfolg relativ hoch gewesen. Der BICC Brief zeigt einige Faktoren für diesen Erfolg auf, wie einen geordneten und alle Akteure einschließenden Entscheidungsprozeß, der die meisten Entscheidungen über die Umnutzung auf die lokale Ebene verlagerte und ausreichende Planungsvorläufe ermöglichte, sowie relativ großzügige und flexible staatliche Unterstützung für den Ausbau von Infrastruktur und andere regionale Entwicklungsmaßnahmen. Teile von Liegenschaften konnten bereits entwickelt werden während andere noch saniert wurden. Allerdings könnten zu geringe Haushaltsansätze für Sanierungsmaßnahmen, die nur dazu reichen die Umweltprobleme einzudämmen, nicht aber sie zu beseitigen, zu Problemen führen.

Der BICC Brief schließt mit einer politischen Einschätzung der Erfahrungen mit Demilitarisierung und Konversion in den 90er Jahren. Dabei wird die Ansicht vertreten, daß weiterer Fortschritt davon abhängt inwieweit es gelingt, die kritische Debatte über die Sicherheitspolitik der Vereinigten Staaten nach dem Ende des Kalten Krieges voranzutreiben - immerhin liegen die Militärausgaben immer noch bei einem Niveau von 85 Prozent der Ausgaben während des Kalten Krieges.

Introduction

Since 1990, the significantly diminished threat of a catastrophic war of global proportions has led to a major restructuring and downsizing of the United States' Cold War military forces and accelerated redundancies in its military base structure. Six years after the formal end of the Cold War, there is still contentious debate about what constitutes the most effective and least expensive security policy for the United States and its allies, with this debate reflecting the fact that such downsizing carries with it far-reaching military and economic effects for the armed services and the military-serving industries and communities.

Military spending for 1997 has declined in real terms from its Cold War peak in 1989 by one-third and weapons procurement by two-thirds, while all defense-related employment has fallen by 2.6 million workers since its 1987-high point. In January 1997, the forecast for future budgets, even after taking into account congressional increases in the Clinton Administration's future years defense plan, implies further reductions in real terms, with budget outlays falling from 1997-levels by perhaps 10 percent by the year 2002.¹ And while the downsizing of the active-duty military force has been largely completed, planned base closures and further defense company mergers imply additional layoffs of between a half-million and three-quarters of a million more defense industry workers. In addition, the closure and restructuring of redundant military installations and the nuclear weapons complex has forced the nation to address the environmental legacy of the Cold War, requiring perhaps several hundred billion dollars over the next few decades to contain and clean up the damage.

Despite these changes, the United States still plans to spend, in real terms, over 80 percent of the Cold War annual average on the military through the end of this decade.² In an era of severe budgetary austerity, the issues of the military paying its share for the liabilities and costs of downsizing, and the challenge of charting a path to the most effective and least expensive security policy, come into sharp relief.

Military spending declines have begun to slow as Congress and the Administration begin to consider procurement funding measures for post-Cold War modernization programs.

These trends presage a new phase of the post-Cold War period characterized by real growth in defense procurement and dramatic cuts in funding for conversion-related programs. Nevertheless, these steps do not preclude further downsizing among defense-serving firms and their workforces, nor in other facets of military spending, but they do signal a clear turning point in defense conversion efforts.

This report examines the size, composition and effectiveness of conversion and transition assistance programs in the United States from 1990 to 1997. The programs are evaluated within the context of the unfolding and shifting debate about the appropriateness of public sector initiatives to reinvest defense savings in other public objectives, to promote, where possible, the conversion of defense resources and facilities to relevant civilian applications, and to minimize the social and economic dislocation of defense downsizing. In addition, this study will examine how the debate over post-Cold War national security requirements has raised questions about the extent to which production lines should be kept

running either through domestic procurement or arms exports to maintain the defense industrial base, especially so-called 'defense unique' capabilities such as those dedicated to submarine, aircraft or tank production.

The extent of defense budget reductions and the manner in which defense savings are used for other public purposes are key determinants of the scope and impact of the broad-based conversion of the United States defense economy. Thus, we turn to examine the size of defense cuts since the end of the Cold War and then analyze how these savings—often termed the 'peace dividend'—have been used.

¹ Computations based on *The Budget of the United States Government for FY 1997 and FY 1998*, Office of Management and Budget, *Historical Tables*, Washington, DC, Table 3.2. Deflators for 1997 dollars are taken from Department of Defense, 1996, Table 5-8 and *the Resolution on the Budget for Fiscal Year Concurrent 1996*, 26 June 1995, Conference Report, Report 104-159, p. 47.

² This computation of the Cold War average marks the beginning of the Cold War in 1950 and its close in 1990, but excludes all 'hot war' years: Korean War 1950-1954; Vietnam War 1964-1974. All data on total military spending are from *The Budget of the United States Government for FY 1996*, Office of Management and Budget, *Historical Tables*, Washington, DC, Table 3.2. Deflators for 1996 dollars are taken from Department of Defense, 1996, Table 5-8. Other analysts have not excluded war years and have marked the beginning of the Cold War in 1946, which yields an average of about US \$300 billion in 1996 dollars (see O'Hanlen, 1995).

What Happened to the Peace Dividend?

What has happened to the peace dividend which was widely anticipated to accrue from reduced defense spending after the end of the Cold War? After the collapse of the Soviet Union, many in the United States began debating whether substantial defense cuts should go to reduce the federal deficit, cut taxes, or address pressing domestic concerns. Reinvesting defense savings in the civilian economy was seen as one way to offset the economic impact of defense cuts by stimulating new conversion opportunities for defense firms and new business for non-defense firms. That argument was settled in favor of deficit reduction, which since 1990 has commanded about 85 percent of the US \$116 billion in cumulative annual defense savings (as measured in 1996-dollars), while the balance was reinvested in broadly construed conversion initiatives.³ But, of the US \$17.1 billion going to 'conversion' programs during the period 1990–1997, US \$7.3 billion went to defense technology initiatives with few real conversion benefits, US \$3.6 billion went for separation benefits for departing members of the military, while nearly US \$1.4 billion went to assist defense workers and communities, and about US \$4.9 to stimulate new high-tech industries (as measured in 1996-dollars).⁴

President Clinton, in unveiling his economic conversion plan in March 1993, said of his administration: *[We will] continue to reduce defense, as we must, but we're trying to plan for the future of those people and those incredible resources [being released*

from the defense sectors] (White House, 1993; Marcus and Mintz, 1993). The Administration's conversion program was based largely on the 1993 congressional initiative which established defense adjustment funding for defense-dependent workers and communities and initiatives for promoting dual-use technologies with both defense and commercial applications. As a new initiative, the President promised to enhance competitiveness and economic growth by reinvesting the defense savings in infrastructure, civilian research and development (R&D), and job training. The President's plan aimed to partially replace the role which defense investments had played in stimulating the nation's science and technology efforts, pledging to increase to fifty percent the overall civilian-oriented share of federally-funded R&D by 1998 (Clinton and Gore, 1993).

The Clinton conversion program was put in place in 1993, mid-way through the 1987–1997 defense drawdown. In sheer scale, the Clinton program was an immense improvement over the Bush Administration's approach which had done little to help businesses, workers and communities adjust to defense cuts begun by Defense Secretary Cheney. Actual spending by the Clinton Administration for these programs, however, has fallen considerably short of the original plan of nearly US \$20 billion, with US \$16.5 billion allocated over the 1993–1997 period (as measured in current dollars). While this conversion funding has assisted businesses and workers to move into

civilian work, the timing, focus and funding levels have been inadequate to offset the huge impact of defense budget reductions. In addition, beginning in 1995, the congressional push for deficit reduction and increased defense spending, as well as harsh partisan criticism of the conversion objectives in general, have led to significant reductions in conversion funding.

Assistance for defense industries

Industrial conversion has been tackled primarily through dual-use programs, ostensibly geared to developing technologies which serve both defense and commercial objectives.

The three major objectives of the dual-use technology programs were to 'spin-off' defense technologies into commercial fields, 'spin-on' commercial technologies to lower costs for new defense technologies, and invest in new technologies which served both military and commercial objectives. The Defense Department's (DOD) *Technology Reinvestment Project (TRP)* was the centerpiece of the dual-use effort, and during its first two years, 1993 and 1994, the program was heavily subscribed to by prime defense contractors and numerous small- to medium-sized firms. In spite this interest, the program was criticized by congressional defense advocates as not being defense-oriented

³ Computations based on *The Budget of the United States Government for FY 1997 and FY 1998* Office of Management and Budget, *Historical Tables*, Washington, DC, Table 3.2. Deflators for 1996 dollars are taken from Department of Defense, 1996, Table 5-8.

⁴ Compilation of conversion-related programs by the National Commission for Economic Conversion and Disarmament based on various appropriation bills and administration budget documents over the 1990–1997 period. The framework for identifying conversion-related programs comes from White House, 1993

Figure 1: Defense reinvestment and conversion-related programs (Less rescissions)

Millions of current dollars

Fiscal Year	1993	1994	1995	1996	1997	Total
<i>DEPARTMENT/Office/Program</i>						
DEFENSE DEPARTMENT (DOD)						
<i>Technology Reinvestment Project</i>	472	397	220	195	85	1,369
<i>Other Dual-Use Initiatives</i>	381	1,227	1,536	1,237	1,030	5,410
<i>Maritech</i>	0	80	40	50	50	220
<i>Military Personnel Assistance</i>	756	596	985	1,093	0	3,430
<i>Office of Economic Adjustment</i>	80	39	39	61	53	272
DEPARTMENT OF ENERGY (DOE)						
<i>Office of Worker & Community Assistance</i>	85	100	115	83	62	445
DEPARTMENT OF COMMERCE (DOC)						
<i>Economic Development Administration (EDA)</i>	80	80	95	90	90	435
<i>National Institute for Standards & Technology (NIST)^a</i>	140	228	319	301	320	1,380
DEPARTMENT OF LABOR (DOL)						
<i>Displaced Defense Worker Training^b</i>	75	24	20	20	20	159
MULTI-AGENCY PROGRAMS						
<i>Conversion-related High Technology Initiatives^c</i>	-	1,072	827	744	730	3,373
Grand total:	2,069	3,843	4,260	3,874	2,440	16,493

^a Numbers for National Institute for Standards & Technology include *Advanced Technology Program, Manufacturing Extension Partnerships*, and in-house R&D.

^b The White House, National Economic Council originally estimated that about US \$178 million annually would go to defense workers from general dislocated workers assistance funds (Title III, JTPA (Job Training and Partnership Act))but subsequent experience failed to validate these levels; instead, about US \$20 million per year seems more reasonable, based on actual grants made from the Title III National Reserve Account for 1994–1996.

^c Includes all of the new money over 1993-levels allocated for DOE CRADAs (Cooperative Research and Development Agreements), NASA Aeronautics Initiative, DOT (Department of Transportation) Intelligent Vehicle Highway System, Multi-Agency High Performance Computing, DOC (Department of Commerce) Information Highways, and EPA (Environmental Protection Agency) Environmental Technology.

enough, despite the results of impartial research which showed a strong defense orientation for over 80 percent of the projects (Oden, Bischak and Evans-Klock, 1995). These congressional critics also attacked the conversion objectives of the dual-use programs as originally advanced by the Administration.

As a result, funding for *TRP* was slashed in 1995 and 1996, and the *TRP* was eliminated altogether in 1997 in favor of a much smaller replacement program, which is being called the *Dual-Use Applications Program*. This program is now single-mindedly focused on leveraging commercial technologies for defense purposes. Thus, what was billed at its original unveiling as the flagship of the Administration's conversion program has now been stripped of all semblance of a conversion intent. Based on a careful analysis of *TRP Project* awards during the first three years of the program, the National Commission for Economic Conversion and Disarmament (NCECD) estimates that of the US \$1.4 billion spent on the *TRP* and its successor over the 1993–1997 period, only 20 percent have really served conversion objectives (Oden, Bischak and Evans-Klock, 1995).

In addition to the *TRP*, the Defense Department has funded a collection of other dual-use programs which are managed as traditional defense research grant programs, without the *TRP's* cost-matching requirement for participants. Funding for these defense programs has been declining since 1995, although it remains at about US \$1 billion for Fiscal Year 1997. Despite the best efforts of military interests to rid these dual-use programs of all taint of conversion, they do fund research and development, which has some potential commercial utility in such fields as electric car technology, and more general research for advanced electronics, computing systems,

communications and new composite materials. At best, however, the spin-off commercial potential of these programs is estimated by NCECD at about 10 percent of the total US \$5.4 billion which has been spent on these dual-use programs (GAO, 1996a).

Since 1994, the Defense Department has also provided US \$220 million for the *Maritech* program, which is focused on assisting naval shipbuilding contractors to enter commercial growth markets for commercial cargo ships, tankers, luxury cruiseliners and other ships. Although the program has yet to produce real results, its funding has been maintained, principally because of the influence of members of the Senate Armed Services Committee from shipbuilding states.

The Commerce Department's National Institute of Standards and Technology (NIST) also has programs which serve conversion, with total funding through 1997 amounting to nearly US \$1.4 billion. The *Advanced Technology Program (ATP)* is a commercially-oriented applied research program, while the *Manufacturing Extension Partnership (MEP)* program offers technical assistance to manufacturers coping with conversion. Although Congress cut *ATP* funding, the Administration successfully blocked moves to eliminate it entirely. However, the *ATP* has not been well focused on conversion issues, despite assurances by the Administration that it would serve the same commercial purposes as the *TRP*. In contrast, although the *Manufacturing Extension Program* is not explicitly focused on conversion, businesses participating in it have given *MEP* generally good marks for assisting companies in improving productivity and adopting the best manufacturing commercial practices (GAO, 1996a).

Defense-related workers assistance

The Departments of Defense, Labor and Energy have all run workforce training and assistance programs for military and non-military personnel and defense industry workers.

The Department of Defense (DOD) has provided over US \$3.4 billion through 1996 for early retirement, separation pay and retraining and education of uniformed military personnel. In 1996, Congress increased funding for these programs, but also called on the DOD to report on phasing them out, since the majority of planned force reductions would be completed in that year. No new money was appropriated for additional separation benefits for former uniformed military personnel in the 1997-budget.

From 1991 through 1994, laid-off defense industry workers received support and retraining largely through a transfer of US \$225 million from the DOD to the Department of Labor (DOL), but once DOD funds were exhausted, the Labor Department was only able to devote US \$20 million annually for 1995 and 1996 of its own program monies for dislocated workers assistance. While the planned downsizing of the active duty military force has been largely completed, with a reduction from 2.2 million to 1.5 million active-duty troops, base closures and defense industry mergers will lay off an additional half-million to three-quarters of a million more defense industry workers. However, these workers will now have to compete with all displaced workers for fewer federal dollars to be spent on employment and training.

In 1993, Congress authorized the Department of Energy (DOE) to establish workforce and community adjustment programs for addressing the problems of downsizing the

nuclear weapons production complex. It is noteworthy that total DOE prime contractor employment within the nuclear complex had grown from 1989 to 1992, but funding cuts in 1993 led to sharp reductions in the total workforce, with employment falling from its peak of 149,000 in 1992 to a projected 110,000 by the end of Fiscal Year 1997.⁵ To mitigate these local impacts, DOE programs have provided separation benefits to those workers who elected to be voluntarily laid off and less generous benefits for those who were involuntarily laid off. In addition, DOE's Office of Worker and Community Transition has also provided grants to communities affected by these layoffs to set up training programs and community diversification programs. Over the 1997-1999 period, the DOE will probably face the prospect of further workforce cutbacks, thereby extending the need for continued workforce assistance.

Community transition assistance

Government programs have been quite effective in planning and implementing conversion strategies for defense industry dependent communities as well as closed military bases. The Pentagon's Office of Economic Adjustment (OEA) provides technical assistance and planning grants to communities affected by base closures and restructuring, as well as defense industry cutbacks. OEA's funding has averaged US \$54 million between 1993 and 1997. The Commerce Department's Economic Development Administration

(EDA) has complemented the OEA's efforts by providing economic development grants, revolving loan funds, and grants for infrastructure improvement. Despite Congressional efforts to kill EDA, its funding level has held steady at US \$90 million in 1996 and 1997. The majority of funds from these two community assistance programs, OEA and EDA, has been devoted to base closures. In the four rounds of base closures since 1988, over 146 major bases and numerous minor installations in the United States have been selected for closure.

The Department of Energy, which manages the country's nuclear weapons facilities, is a relative newcomer to the community economic assistance field. With the downsizing and closure of several nuclear weapons facilities, the DOE has provided a comprehensive program including both planning and implementation grants to mitigate the impact of these changes. After a few years of growth, funding from the DOE's Office of Worker and Community Transition was reduced from a high of US \$115 million in 1995 to US \$62 million in 1997. Twelve of the sixteen communities located near nuclear weapons installations have established such programs.

Reinvestment and high-technology conversion

New federal investments in civilian research and development, high-technology and manufacturing extension programs were originally part of the Clinton conversion program, with nearly US \$10 billion being targeted over five years to create conversion opportunities for defense firms and communities. As part of its conversion effort, the Clinton Administration redirected science and technology spending to key areas such as environmental applications, renewable energy, energy conservation, alternative transportation, computing and information technologies, civilian aerospace and the Energy Department Cooperative Research and Development Agreements (CRADAs).

While the Clinton Administration has increased funding in these civilian high-tech fields, it has not succeeded in significantly increasing overall federal investments in civilian science and technology.

Indeed, the Administration will fall short of its promise to invest fifty percent of federal R&D in civilian applications.⁶ In part, this reflects the influence of both deficit reduction measures and the priorities of the Republican-controlled Congress which cut back on these civilian R&D priorities in the 1996-budget.

⁵ Department of Energy, Office of Industrial Relations, "Contractor Employment Summary Report by Contractor Classification" US DOE 1986, 1988, 1992, 1994, and 1997 data from the Office of Workers and Community Transition, US DOE, Debbie Swickow.

⁶ See *Budget of the United States Government for Fiscal Year 1998, Historical Tables, Table 9.7.*

The Results: Implementation of the Clinton Program

One of the hallmarks of economic conversion is the reorientation of defense industry firms, military facilities and workers toward relevant non-defense work. Yet, the biblical vision of pounding swords into ploughshares has proven to be one of the most challenging aspects of post-Cold War conversion. While federal policies and funding have stimulated many innovative conversion and diversification projects throughout the country, they have had widely varying effects on the direction and extent of the economic adjustment strategies of defense dependent businesses, workers, communities, military bases and national laboratories. In what follows we will examine the outcomes from implementing these conversion and adjustment strategies for defense businesses, workers, communities, military installations and labs.

Major defense contractors: a mixed record on conversion

Deep reductions in defense procurement spending in the 1990s brought about dramatic changes in the private defense sector of the United States. Major military contractors responded to these cutbacks through a variety of strategies, including downsizing, layoffs, consolidation, and acquisitions and mergers. Some

contractors opted to sell off their defense divisions and exit the industry, while others expanded their defense business through mergers and acquisitions. Still other firms diversified their product mix by commercializing defense technologies or expanding into new lines of business through product development or commercial acquisitions.

The net effect of defense industry restructuring has been a rapid consolidation in the top rungs of the industry, with the market share of the top five firms rising from 21 percent in 1987 to 24 percent in 1995 and to a projected 30 percent in 1997.⁷ These mergers and acquisitions have reduced the competition within each segment of the industry, often only leaving two major competitors.

Much can be learned about the industry's dynamics by focusing on the top three defense firms' strategies and organizational structure, especially since these top firms represent different adjustment strategies in the post-Cold War era.

Lockheed and Martin Marietta joined forces in 1994 to become the industry's largest firm both domestically and worldwide, with nearly nine percent of all Defense Department prime contract awards in Fiscal Year 1995 and US \$14.4 billion in worldwide sales. This newly merged entity incorporated pieces of General Electric, General Dynamics and Loral, among others, leading to a dominant position for

the new behemoth in space launch and systems and a leadership position in military and commercial satellites and military aircraft, as well as electronics and information and systems integration. All of these could result in annual defense revenues of nearly US \$20 billion annually (Lockheed Martin's 1995 Annual Report; Oden, 1996).

Winning the lion's share of the defense market did not entail greater defense dependency, in part because of Lockheed Martin's efforts to diversify into commercial product markets. These include information and technology services, energy and environmental markets and commercial aeronautics and electronics. In addition, the company has developed new lines of business in non-defense government contracting through contracts for modernizing the Federal Aviation Administration air-traffic control systems, developing computerized electronic benefits transfers for federal and state welfare programs, electronic toll systems for municipalities and a variety of information systems for federal, state and local agencies. The company has also entered into a joint venture with Molten Metals Inc. to form M-4, a new company dedicated to developing new processes for cleaning up industrial and defense wastes (M4, 1996). Together, Lockheed and Martin Marietta have also participated in over 22 TRP projects, pursuing a wide variety of dual-use applications with commercialization potential (United States Department of Defense, 1995).

These commercialization efforts have not diverted Lockheed Martin from its core commitment to defense. Indeed its dominance in this

⁷ See *100 Companies Receiving the Largest Dollar Volume of Prime Contract Awards*, Fiscal Year 1990 and Fiscal Year 1995 edition, Exhibit A, p. 2, Directorate for Information Operations and Reports, Department of Defense, Washington, DC.

market is likely to increase as work on new weapons systems, like the F-22, enter the procurement phase. Arms exports, especially the F-16 fighter, have been another strategic focus for the company, as has the maintenance and operations of the DOE's nuclear weapons-related facilities, including large contracts for environmental restoration work. Moreover, Lockheed Martin seeks to win contracts privatizing defense maintenance work at government depots.

Yet, rising corporate revenues and stock prices have hardly been matched by employment gains. Announced layoffs at both companies have totaled over 47,000 since 1990 (NCECD, 1990–1995). While the company has provided some help to those it has laid off, in the form of early retirements incentives, voluntary separation benefits and job search assistance, what it has not done is to promote a proactive policy of integrating new product development efforts with job redevelopment for laid-off or 'at risk' workers.

Boeing, traditionally among the most commercially-oriented of the defense-serving companies, has become more defense-dependent in the post-Cold War period through its acquisitions of McDonnell Douglas and Rockwell International's major defense aerospace division. With these two acquisitions, Boeing's defense share of revenues will grow from 21 percent in 1990 to a projected 50 percent or more in 1997. Boeing is heavily invested in the Pentagon's modernization program, with contracts for the F-22 fighter, the V-22 Osprey, the Comanche helicopter, as well as Rockwell's contracts for airborne lasers, tactical missiles, and aircraft and helicopter modifications. The addition of

McDonnell Douglas' defense contracts and production capabilities may also enhance Boeing's chances of winning the lucrative contract for producing the multi-service Joint Strike fighter. The combined firm becomes the dominant firm in supplying military helicopters and one of two major suppliers of tactical combat aircraft.

Raytheon's acquisition of Hughes' and Texas Instruments' defense divisions has lofted it into the number three position for defense sales and made it the dominant defense electronics firm in the industry. Prior to these acquisitions, however, Raytheon had significantly reduced its military dependency by strategically commercializing defense technologies and acquiring commercially-oriented firms. Key areas for technology diversification have been domestic and international air traffic control modernization programs, computer chips for communication satellites and business jets. Yet, prior to the acquisitions of Hughes and Texas Instruments, the company had expanded its military business by acquiring E-Systems, a leader in intelligence, reconnaissance and surveillance work. While Raytheon's diversification strategy has led to revenue growth for the company, it was also accompanied by a substantial downsizing of the workforce, with layoffs of nearly 17,000 in the 1990s (NCECD, 1990–1995).

Deepening defense business

The merger of **Northrup and Grumman** joined two of the most vulnerable defense contractors in an effort to strengthen their economic and political base for winning new defense work. With the drying up of most of Grumman's major aerospace work, and the heavy dependence of Northrup on the B-2 bomber, each was a weak competitor which had taken the low road toward downsizing, with layoffs in the 1990s cumulatively totaling nearly 36,000. Together, these companies have deepened their reliance on defense with the acquisition of Westinghouse Electric's defense division. These mergers have also dampened the company leadership's interest in its diversification and commercialization work (Oden et al., 1996).

Likewise **General Dynamics**, once one of the giants of the defense industry, took the low-road by downsizing its workforce by 35,000 and selling off many of its commercial and defense divisions. What remained was the most specialized defense production capacity for tanks and nuclear submarines and a company management which was deeply resistant to any conversion or diversification initiatives. By acquiring Bath Iron Works (BIW), in a move to strengthen its hand in naval contracting, the company both increased its defense dependency to over 96 percent in 1996, and dampened the conversion initiatives which had been started at the BIW (NCECD, 1990–1995).

Diversifying companies

Other large defense companies have chosen a strategy combining a fairly ambitious effort to diversify with a strong commitment to selected defense contracts. **TRW**, like Hughes and Rockwell, is an aerospace company with a strong business base in automobiles and ground transportation which has provided growth markets for diversification and technology transfer. The company has dramatically reduced its defense dependency and has enjoyed overall revenue growth through its commercialization efforts. TRW has also sought to coordinate and stimulate technology transfer and commercialization efforts by organizing a new company-wide transportation systems unit. Similar efforts are found in other companies with a strong focus on communications and electronics such as **Texas Instruments**, **Textron** and **Allied Signal**. Despite the impressive growth of commercial sales and the development of new products, most of these companies remain highly committed to their defense business for the foreseeable future.

Exiting defense

Some major prime defense contractors have chosen to shed their defense divisions and exit the industry, either partially or completely. **Hughes Electronics Corporation**, itself a division of General Motors Corporation since 1985, has been so successful in commercializing its defense technologies, developing new products, and increasing sales for its non-defense divisions, that it has opted to sell off its defense division. Hughes' principal diversification successes have been in automotive electronics, satellites and telecommunications. Its collision warning technology, heads-up display for instrumentation, car navigation and voice recognition systems are all examples of defense-

spawned technologies which have been applied to automotive electronics. Its Direct TV satellite dish for the residential market is a huge success in penetrating a whole new market. The development of this technology was a result of Hughes strong position in the commercial satellite market and its defense electronics capabilities, particularly in data compression and digital communications. The company has also applied its defense technologies to work for the Federal Aviation Administration for modernizing the nation's air traffic control system.

Despite these commercialization efforts, Hughes made at least 14,000 defense-related layoffs during the 1990s. As a result of intense public pressure in the Los Angeles region, Hughes pursued and won two Labor Department grants for defense worker retraining to provide 4,000 affected workers with basic adjustment services such as job counseling, outplacement assistance and some retraining. Overall, however, Hughes did little to redeploy workers within the company and instead opted to relocate most of its California-based operations to non-union Tucson, Arizona.

Westinghouse Electric, with the sale of its defense division to Northrup Grumman, will virtually exit the industry, after having been among the top twenty-five contractors for decades. **Tenneco** will also exit defense by spinning off its huge defense division, Newport News, which is the largest naval shipbuilder in the United States. **General Electric**, long among the biggest defense contractors, sold off its largest defense divisions to

Martin Marietta in 1992 and has seen its defense share fall from over 16 percent of sales in 1990 to slightly over 3 percent in 1995. And after years of acquiring other defense companies and divisions to strengthen its market position, **Loral** finally became the object of an acquisition by Lockheed Martin, allowing Loral to exit the industry to focus on its commercial space business (*Defense News*, 22 July 1991, 24 July 1994 and 6 August 1994).

A few findings come into relief from a brief review of the strategy and structure of major defense corporations in the post-Cold War era. First, as regards conversion and diversification strategies, those corporations which chose to become more commercially oriented did so by establishing a clear corporate strategy for increasing commercial sales, developing commercial products, commercializing, where possible, defense technologies, and rapidly shedding excess defense capacity.

Many firms achieved rapid commercial sales growth and quickly fielded new commercial products in new and emerging markets. Virtually no major defense contractor, however, sought to build bridges for their workforces between their commercialization efforts and their defense downsizing plans. And while commercializing firms generally laid off a smaller percentage of their workforces than did more defense-dedicated firms (Oden, 1996, p.13), they did not exhibit any greater tendency for creative strategies in dealing with layoffs.

Second, most companies' commercialization strategies were clearly influenced by civilian federal investments in new technologies such as alternative transportation, environmental remediation, telecommunications, and modernization of the air traffic control system. Early

pronouncements by the Clinton Administration about a reinvestment agenda focused on modernizing the nation's economic infrastructure attracted considerable attention in the corporate world, with many defense companies targeting these fields as strategic successors to their defense work. Indeed, even the largest defense companies continue to pursue this work, but the cutbacks in federal funding initiatives in 1995 and 1996 have led to a refocusing of defense companies' energies onto their traditional military work.

Third, the consolidation trends in the industry have produced a more oligopolized industry structure within each major segment of the defense industry, with just two or three firms remaining in each type of weapons production. Curiously, federal policy to subsidize defense industry consolidation may have produced one of the least efficient market structures for the defense industry since oligopoly suppliers tend to hold more excess capacity than a monopoly market or a more competitive market (Bischak, 1996, pp. 28–31). Doubly curious, despite the avowed commitment of the Clinton Administration to promote commercial–military integration through its dual-use policy, there is little evidence that the dedicated defense giants emerging from this consolidation process are any more capable of performing such integration. Indeed, the Clinton Administration's stated military-strategic objective of maintaining the qualitative, technological superiority of the US military will probably preempt the possibility for such commercial–military integration as the pursuit of superiority brings with it technological uncertainty and substantial risk of cost escalation (Bischak, 1997, pp. 49–55). Thus, the United States is left with a less competitive and more dedicated defense industry.

Fourth, those firms which have remained in the defense industry have become much larger, more specialized weapon systems integrators pitted against their remaining rivals to deliver the most sophisticated next generation of weaponry. Indeed, recent changes in Pentagon contracting now permit wider use of cost-plus-a-fixed-fee development contracts to cover the uncertainty associated with developing new, technologically complex weapons, thereby encouraging technological rivalry for winning new contracts for producing systems such as the Joint Strike Fighter and the New Attack Submarine. Thus, the Pentagon has found a replacement for the technological competition of the arms race with an oligopoly rivalry among the science-based defense firms dedicated to supplying the most advanced weaponry possible.

In short, the Clinton conversion and defense procurement reforms have produced a more highly concentrated, more defense dedicated industry structure among the top-tier firms, with the top five firms now accounting for nearly a third of all defense contracts. These same policies seem to have had a different result for the small- to medium-sized defense firms.

Small- and medium-sized defense contractors and subcontractors

As a group, small- to medium-sized defense contractors have been forced by the procurement squeeze to put greater emphasis on commercialization of defense technologies than the prime contractors. Moreover, there is some evidence that they have put more effort into retaining key employees simply because the workforce is a prime asset of smaller businesses. Overall, the defense subcontracting base has grown

smaller as the larger corporations have narrowed their use of subcontractors and forced many smaller companies to exit the industry and diversify. Paradoxically, while trade journals report that a greater proportion of defense work has been subcontracted out by large corporations in recent years, it is going to fewer subcontractors, as the prime contractors have tried to consolidate their subcontracting chain and negotiate tougher deals with those who remain (*Defense News*, 29 July–4 August 1996, p.10, *Defense News*, 31 July –6 August 1995, p.18). As a result, the conversion strategies of smaller firms have been more aggressive.

Typically, these commercialization strategies have included:

- Expanding existing commercial sales
- Developing commercial applications for defense technologies
- Pursuing joint ventures with other companies to enhance commercial potential
- New business start-ups by former defense industry managers and engineers and spin-offs of divisions of existing companies as stand-alone small businesses.

In all of these cases, companies have had to implement new commercial cost and quality control measures to ensure the competitiveness of the new products. A few cases will illustrate these trends.

Lau Technologies, a small, employee-owned electronics firm based in Acton, Massachusetts, which once primarily did defense subcontracting work for the Army's Bradley vehicle program, has diversified into producing digital imaging systems which make drivers licenses for states' motor vehicle departments. Lau identified this emerging market through careful market research and then cobbled together the finance to develop this product internally by using its cash flow from defense work and commercial loans. Its difficulties in raising investment capital for new product development is a problem frequently cited by small firms trying to diversify. Nonetheless, in developing its completely new commercial line, Lau invested in employee training, created 100 new jobs, and expects to reduce its defense dependency from 90 percent in 1990 to 50 percent in 1998 (Evans-Klock, 1995, pp. 4-5).

Chandler Evans, a division of Coltec Industries, used TRP-funding to develop commercial applications for fuel pump technology and won a major contract to supply Rolls-Royce with this technology for two of its prototype jet engines. This diversification project developed through labor-management cooperation began explicitly to stem the loss of business and jobs due to defense cutbacks. The company forecasts as many as 1,200 jobs retained or created (Oden, Bischak and Evans-Klock, 1995, pp. 27-28).

H.R. Textron, a division of Textron Inc. and a first-tier aerospace components subcontractor, has reduced its defense dependency by commercializing three of its defense products, including servo-mechanism technologies for commercial aerospace. Its proposal

for an innovative commercialization network of 30 small- to medium-sized defense subcontractors and suppliers was rejected by TRP managers as being "too commercially oriented."

Undeterred, the company worked with its machinists union, which had managed to secure a Labor Department conversion adjustment training grant, to develop and implement an innovative high-performance work organization project to increase the flexibility and productivity of its production processes with the aim of winning new business. The net result of these joint labor-management efforts was improved productivity which permitted the company to win six new contracts for commercial applications of servo-valves in the highly competitive automobile industry and for commercial aircraft. Through this expanded work, the employment levels grew by 15 percent, thereby reversing the downward trend in employment which had begun in 1990 (Yudken, 1996, pp. 91-110).

A study of the diversification and conversion strategies of 25 small- to medium-sized defense firms in the Los Angeles region by the *Project on Regional and Industrial Economics* at Rutgers reveals that success requires an early and sustained research and development effort, an adoption of commercial best practices in quality and cost controls, a reduction in defense-related overhead costs for accounting and quality control, and production process improvements. In addition, some companies have developed partnerships with commercial distribution and service firms in order to gain access to commercial markets. Others have looked to government programs, university and non-profit organizations to solve technical problems and to leverage resources. The start-up and spin-off companies have been able to move outside of the defense contracting environment altogether. Examples include **Leica**, a spin-off from Magnavox Electronics,

and **Magellan Systems**, a venture capital start-up, both of which have developed commercial hand-held navigational devices using data from Global Positioning Satellites (Oden et al., 1996, pp. 57-83).

Smaller defense supplier firms, like machine shops and parts producers, have had somewhat greater difficulty in adapting to the defense drawdown, particularly because reduced cash flow from defense payments makes it hard to maintain working capital, let alone raise investment funds. In these cases government-supported programs have been very useful, particularly the Small Business Administration's *Defense Loan and Technical Assistance* program which has allowed some firms to buy new equipment and refinance their debt (Bridgman, 1995, pp. 6-7). The federal *Manufacturing Extension Program* has also been useful in assisting companies to modernize their production processes and acquire business services necessary to assess new markets, develop new products and improve quality (GAO, 1996a).

Despite these positive examples of diversification among small- to medium-sized firms, the evidence indicates that many smaller companies experienced great difficulty financing transition (Pemberton, 1994, p. 8). Moreover, many accounts suggest that substantial employment losses were still the rule within most small- to medium-sized defense firms. In this context, let us examine the track record of defense worker assistance programs.

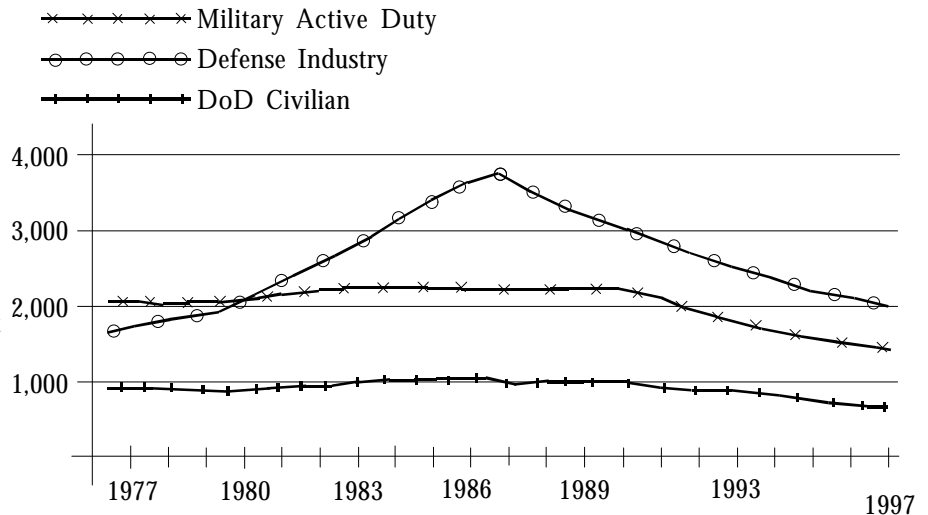
Defense worker assistance and retraining programs

Congress acted in Fiscal Years 1991 and 1993 to create special programs which assisted defense-dependent workers through employment and retraining programs. These programs assisted both uniformed and non-uniformed Defense Department workers and private defense industry workers affected by reductions in military procurement contracts.

Private sector defense-related employment has been most sharply affected by the defense drawdown. As Figure 2 indicates, total private sector defense industry employment experienced a steady decline from its peak level of 3.6 million workers in 1987 to 2 million workers in 1997. Military active duty forces were cut by 722,000 personnel between 1987 and 1997, while the number of civilian Defense Department workers was cut by 290,000 over the same period.

The *Transition Assistance Program* for separating uniformed military personnel, established by Congress in 1991, has spent over US \$3.4 billion to assist former troops make the transition to civilian life. Most of this money was spent on providing a package of attractive separation benefits to encourage military personnel to voluntarily leave the armed services. Early retirement benefits were available for those with between fifteen and nineteen years of service. Those with fewer years of service were offered a lump sum payment which ranged from a few thousand to several thousand dollars. If the service members had not previously enrolled in a post-service education program, they could subscribe, but would have the cost deducted from the lump-sum payment. In addition, the program provided special job counseling for service members which was supposed to take place

Figure 2: Defense-related employment, 1977-1997



Source: *National Defense Budget Estimates for Fiscal Year 1997*, Office of the Comptroller of the Department of Defense, Washington DC, April 1996, Table 7-6, pp. 160-1

prior to actual separation from the armed services (GAO, 1994). However, according to the General Accounting Office, during the first four years of the program, only about half of the eligible troops were receiving their counseling on separation benefits and services prior to their leaving the armed services (GAO, 1994). Meanwhile, a retraining program dedicated to assisting veterans served only 8,000 people and only succeeded in placing one in ten participants in a job. Finally, the *Troops-to-Teachers* program placed a few thousand former servicemen in teachers certification programs for science and math teachers (GAO 1994; Pemberton, 1994).

Private sector defense industry workers were served by two programs established by amendments to the Defense Authorization Acts of 1991 and 1993. These amendments authorized the transfer of US \$225 million from the Defense Department to the

Department of Labor. Both general employment services and retraining were provided to displaced workers, as well as funding for special projects to explore innovative demonstration retraining projects.

Implementation of the first of these employment and retraining programs in 1991 was delayed for over a year because of bureaucratic resistance from the Defense Department. Eventually, grassroots and congressional pressures led to the transfer of the funds and launching of these programs in 1992. The rationale for establishing these dedicated defense industry retraining programs was that these public policy changes could be anticipated in advance and programs could be put in place to mitigate the economic disruption due to changes in defense spending. In addition, because defense spending is geographically concentrated, the impacts could hit defense-dependent regions especially hard. Finally, the specialization and age of defense workers would most likely make adjustment more difficult than for other dislocated workers.

By the end of 1994, nearly US \$257 million had been spent assisting defense-related workers through these programs, including the demonstration programs and additional funding from the Labor Department's national reserve accounts for dislocated workers assistance programs. In 1995, with dedicated funding for defense workers assistance exhausted, nearly US \$20 million was awarded for these projects drawing on funds from the Labor Secretary's National Reserve Account of Title III of the Job Training and Partnership Act.

Excluding the demonstration projects, the programs served over 86,000 civilian workers formerly employed by private defense contractors, military bases scheduled for closure, and four downsizing Department of Energy nuclear weapons facilities.⁸ These programs provided general services such as career counseling, job search assistance and other support services, as well as more comprehensive occupational training. Although no comprehensive study has been completed evaluating these defense assistance and retraining programs, a study of 13,000 defense industry workers conducted by the Congressional Budget Office showed that 85 percent of displaced defense industry workers have availed themselves of some adjustment assistance, but that only one in five enrolled in job training programs (CBO, 1993, pp. 19–22). This study also indicates that about sixty percent of displaced defense workers took pay cuts in their new jobs, although this result did not compare the outcomes for comparable workers with and without enrollment in training programs. A 1996-survey of displaced workers by the International Association of Machinists confirms that nearly sixty percent of

laid-off aerospace workers had taken pay cuts and that the majority found deficiencies in the quality of both company and government employment assistance (IAM, 1996). The effectiveness of these defense retraining programs has not been evaluated in terms of placements rates, the ratio of new job earnings to original earnings, and the fit between skills acquired in training programs compared with those required for the job.

Nonetheless, individual audits of these projects by the Inspector General of the Department of Labor leave one to conclude that company- and federal-initiated efforts for helping laid-off workers were slow in being set up and very uneven in the quality of service delivered.⁹

One bright note in this otherwise dismal picture was the establishment of a demonstration program to promote innovative efforts for coping with defense retraining issues. Under the demonstration program three types of projects were permitted which differed from traditional job training approaches:

- Dislocation aversion projects involved early intervention to assist firms and workers at risk of losing jobs from impending defense cuts in order to prevent job loss
- Worker mobility projects assisted a targeted group of workers to obtain reemployment
- Community planning projects developed plans to assist firms and workers on a community-wide basis by identifying options, mobilizing resources and implementing the plans.

The dislocation aversion projects served sixty firms with 10,000 'at-risk' defense industry workers and they demonstrated some positive job retention results (Berkeley Planning Associates, 1995). These projects sought to retain jobs by identifying new markets, developing non-defense products, learning new marketing techniques, and providing high performance work organization (HPWO) training to enhance the productivity of the management and the workforce. The success of these firms in averting layoffs, however, may reflect a self-selection process where the most committed and proactive managements and workers sought to access resources to achieve this end. The lack of success by community planning demonstrations illustrate the problems of linking longer range development plans with the immediate needs of laid-off workers, with few projects succeeding in accomplishing their stated goals. Finally, the worker mobility projects really did not substantially differ from normal reemployment job services, although no quantitative evaluation has been done to see whether the strategic focus and intensive efforts in targeting impacted workers enhanced the outcomes for workers' placement rates in higher quality jobs. Overall, the dislocation aversion projects may have merit as larger-scale efforts to cope with further types of defense downsizing.

⁸ All data on participation in the *Defense Conversion Amendment* projects and the *Defense Diversification* projects comes from the Department of Labor's, Employment and Training Administration.

⁹ In July 1996, the Inspector General of the Department of Labor audited the Hughes Aircraft Company for its compliance with the financial, cost and performance terms of the grant. The Inspector General contested US \$1.9 million in reimbursement claims, finding that Hughes had not spent the stipulated amount on retraining, had claimed excessive pension plan contributions for laid-off workers, had inappropriately subcontracted for outplacement services, and had exceeded allowable administrative expenses.

Community transition assistance

Community-based conversion and diversification efforts focused on two major types of problems: diversifying the economies of highly defense-dependent industrial regions, and converting major military bases and installations to civilian work.

While the employment and economic impacts of defense industry downsizing were substantially greater than the job losses from base closures, the majority of federal funding for community assistance from the Office of Economic Adjustment (OEA) and the Economic Development Administration (EDA) went to address the impacts of base closures.

One of the principal reasons why base conversion projects were favored over defense industrial diversification projects is that the military bases are in the public domain, thereby placing the job issues squarely in the public policy arena and usually within a well-defined locality capable of being readily mobilized. By contrast, the adjustment strategies of private defense industry contractors have been viewed by policy-makers largely as market-based calculations which are best left to management and the stockmarket to decide.

Despite private sector resistance, defense industry conversion did become a focus of regional and community planning efforts to diversify defense-dependent economies. The most notable examples, however, are not necessarily the most successful cases. Perhaps the earliest and best documented is the St. Louis region which, in 1990, launched an early and well-developed regional planning and diversification effort embracing the ten counties in the

greater St. Louis region. The St. Louis Economic Adjustment and Diversification Committee brought together a broad range of community interests to establish a variety of programs for assisting small- to medium-sized firms diversify and retraining programs for laid-off defense workers. It took a few years, however, to get these programs up and running, and the major defense contractor in the region, McDonnell Douglas, resisted wider conversion efforts, but did participate in various retraining efforts. The diversification efforts relied on several economic development methods to stimulate conversion in the region, including setting up: a revolving loan fund to provide gap financing for smaller, diversifying defense companies; a *Management Training and Technical Assistance project* to help companies identify core competencies and plan strategically for commercial markets; a teaching factory for machining companies; a business incubator; and several other initiatives (Oden et al., 1993).

While these programs did succeed in fostering the diversification of several smaller companies, they did not move McDonnell Douglas to seriously address the conversion issue. It is noteworthy to mention that behind all of this initiative was a local community-based organization, the *St. Louis Economic Conversion Project* (perhaps the oldest such group in the United States), which had consistently advanced a proactive agenda to plan for conversion after the Cold War. It is doubtful that the issue would have developed as far or as fast without such a public interest organization playing this vital role.

Throughout the nation in military-dependent states such as Maine, Massachusetts, Connecticut, Texas, New Mexico, New York,

California, Arizona and Washington similar efforts were launched as community-based organizations, locally elected officials, unions, peace groups and economic development organizations came together to form regional planning bodies at the local or state levels. Usually, the large prime defense contractors were either indifferent or hostile to such efforts, although in California, the larger industrial interests did participate in the Aerospace Taskforce which Governor Pete Wilson established, but little was accomplished. Nonetheless, the real work of economic diversification usually took place at the city or county levels through new or existing economic planning bodies.

In some instances, local groups like the *Maine Economic Conversion project* managed to work at both the state-wide and local levels to bring together state leaders and, in the case of the Bath Iron Works, defense industry officials. While the Maine groups did set a process in motion and managed to get both large and small companies to begin a diversification process, practically all of the companies still remained highly defense dependent. In Arizona, the Arizona Council for Economic Conversion (ACEC) was highly successful in using federal program money from the Office of Economic Adjustment, the Economic Development Administration and the Department of Labor to set up a variety of programs to assist defense companies and workers transition to civilian work. The Arizona approach to conversion was to use former business leaders to help fourteen companies plan commercial work. While the ACEC did manage to get support from Hughes and McDonnell Douglas to advance their work, the other prime contractors pursued their own course (Pemberton, 1995b, p. 9).

In California and Los Angeles, in particular, defense conversion planning was slow in addressing the scale of the problem, even while major contractors, like **Hughes and Lockheed**, were shutting down plants, laying off thousands of workers, and leaving the state in the early 1990s (Oden et al., 1996). Nonetheless, one of the major accomplishments was the establishment of CALSTART, a consortium of aerospace firms, public utilities, unions and state and local governments, to develop new technologies and markets for the alternative transportation industry, including the electric car (Pemberton, 1995a, p. 1, 14).

In the New England region, a number of planning and diversification efforts were undertaken at the regional, state and local levels. Several state governors established a regional taskforce to identify opportunities for conversion and industrial revitalization principally focused on multimodal transportation and environmental technologies. Despite these efforts most of the major contractors shunned any real conversion efforts. One innovative labor-led organization in the New England region, Call to Action, brought together the six state AFL-CIO organizations (American Federation of Labor and Congress of Industrial Organizations) to address the problems of defense downsizing and conversion. This organization was launched in 1993 through the leadership of the UAW's (United Automobile Workers) Region 9A and sought to work at regional, state and plant levels, including forming several alternative-use committees at several defense plants. While Call to Action can claim credit for stimulating several plant-level conversion projects, the organization has not been able to significantly move any of the major contractors.

In general, communities have accessed federal funds to plan and deploy diversification strategies which use all of the conventional and unconventional economic development tools available. Typical regional diversification strategies began with developing baseline economic analyses to identify the region's comparative economic strengths upon which to build new businesses, jobs, and develop new high-growth industry clusters. In this regard, the Office of Economic Adjustment and the Economic Development Administration were very useful in encouraging and guiding local planners in developing these assessments. From there, communities often established revolving loan funds to provide gap financing for smaller companies, business incubators to start new businesses, and manufacturing modernization networks to enhance the competitiveness of smaller defense contractors. In addition, some communities developed entrepreneurial training programs in hopes of spawning new businesses, while others tried to stimulate regional exports.

Spin-off companies from larger prime defense contractors were not often the objective of regional diversification planning. However, the International Association of Machinists in Los Angeles and the St. Louis Economic Conversion Project have independently advanced a very interesting proposal to set up a stand-alone, non-profit corporation to create and spin off new firms by drawing on the defense companies' unutilized technology patents which had commercial potential. The defense companies could become equity investors in the corporation by turning over patents which they did not wish to commercialize. Former

engineers, managers and workers could become the new staff in starting up these new businesses. Unfortunately, despite the innovative nature of this idea, the advocates never succeeded in interesting corporate or state officials in establishing such a corporation.

Overall, the efforts to diversify defense dependent industrial economies has had only modest success, usually confined to assisting small- to medium-sized companies diversify. No region succeeded in qualitatively changing its economic base and generating a significant number of jobs to offset the impact of defense reductions. By contrast, however, the legacy of base conversion tells a different story.

Military base conversion

Base conversion is one of the success stories of post-Cold War demobilization. This success has depended on local activism, buttressed by substantial federal funding, linking the redevelopment strategy to the regions' comparative advantages. Bases have successfully been converted to such uses as commercial airfields, industrial parks, hospitals, schools, childcare facilities, stores, recreational facilities and housing.

Throughout the base closure process, federal funding has been available for affected communities for technical assistance and planning, implementation of economic development plans and projects, worker retraining, facility conversion and environmental clean-up. For instance, in 1997, the Defense Department was appropriated US \$2.5 billion for base closure implementation, principally to bring existing installations and infrastructure into compliance with municipal and state codes, and US \$2 billion for environmental restoration of Defense

Department facilities. The latter may be the most important investment, because toxic contamination remains the greatest obstacle to base redevelopment. Indeed, the up-front environmental investments are required to enable rapid and environmentally responsible economic development.

The Office of Economic Adjustment has been a key resource in providing technical assistance and grants to communities seeking to do military base conversion planning. OEA grants typically range from US \$500,000 to US \$2 million each, although one US \$52 million grant was specially awarded by congressional appropriators to the Philadelphia Naval Shipyard. Implementation grants by the Economic Development Administration are of vital importance because they leverage private sector and local public sector dollars for targeted investments to alleviate the sudden economic dislocation caused by base closures. These grants provide substantial funds for a range of services including: infrastructure development, technology initiatives, revolving loan funds and other economic development strategies. The Federal Aviation Administration (FAA) is another source of federal funding for converting military airfields to civilian, commercial uses. In the first three round of base closures, the FAA has provided over US \$182 million in grants for such airport conversions. Funds from the Labor Department's *Dislocated Worker Program* and the Defense Department's *Military Personnel Transition Assistance Program* round off the palette of available assistance for communities and workers facing base closures.

Public-purpose conveyance of part or all of the base's land and remaining facilities and equipment is another source of federal assistance which may be available to impacted communities. Educational, public safety, public health, housing for the homeless, civilian airport needs, and economic development purposes are all grounds for applying for such public-purpose conveyance to the community.

Experience shows that, with careful planning, base reuse can lead to new business and job creation for a community. But the process usually takes several years from planning to implementation (East Bay Conversion and Reinvestment Commission, 1996).

Communities also need to be realistic about the job creation potential of base reuse and treat with caution estimates of the OEA touting the job creation at former military bases. Indeed, OEA data on past base closures and job development probably overstate the new jobs created at former military bases because they do not account for existing jobs which have simply been relocated onto the site from elsewhere in the immediate locale (Hill and Raffel, 1993). Job creation at former military bases usually depends on federal spending for planning, infrastructure improvement, economic development assistance and retraining. Data compiled by the General Accounting Office indicates that significant job recovery usually requires federal investment of between US \$7,000 to US \$20,000 per job, with this federal money leveraging comparable funding from state and local government and the private sector (GAO, 1996b, pp. 37-40; GAO, 1995, pp. 114-117).

Urban base reuse is generally easier than rural base reuse, given a city's economic diversification and the demand for real estate and services which a redeveloped base might provide. As an example, in 1974 the

transformation of McCoy Air Force Base in Orlando into an air cargo transport hub brought about the employment of 6,000 people, easily compensating for the loss of 395 civilian jobs and nearly 3,000 military personnel (United States Department of Defense, 1991). More recently, Chanute Air Force Base in Illinois, which closed in 1993 after being tagged for closure in 1998, has been redeveloped as a civilian airport and has already generated enough jobs to compensate for the civilian job losses.

Rural base reuse can also be successful, given the proper planning. Presque Isle, closed in 1961, was located in an isolated rural location. However, the local leadership was able to transform the base into an economically diverse center by planning strategically, inviting outside companies to the site and prorating rent to the number of new jobs created. Over 1,300 jobs were created, with new industrial tenants including **Indian Head Plywood, Aroostook Shoe Company, International Paper, Converse Rubber Company, Northeast Publishing** and a vocational training school (United States Department of Defense, 1991).

Industrial parks are a popular option for base reuse and have been used by communities to attract new businesses. Often, bases are large enough to accommodate public services and private developments under a 'mixed-use' strategy. Air Force bases and naval air stations have often been successfully converted to new municipal or

regional airports and air cargo hubs. Redevelopment of former bases as schools has been a successful model with 47 bases closed in the 1960s and 1970s now having schools on them. And while using bases for low-income and homeless housing does not raise money through sale, it does achieve other important national objectives, while allowing local governments to acquire the property at little or no cost. Other government uses are also possible, including administrative facilities, hospitals, postal distributions centers and offices, rehabilitation centers and prisons.

Converting the federal laboratories

During the Cold War, a vast array of scientific research laboratories was developed to serve the military's objectives and maintain US technological superiority. These laboratories include: the principal nuclear weapons design facilities, as well as those other multi-mission labs managed by the Department of Energy which serve both defense and non-defense objectives; the DOD's laboratories managed by the individual armed services; and the Federally Funded Research and Development Facilities (FFRDCs) which are run by private contractors, non-profit organizations or universities. Taken together, these labs and related test facilities command about one-third of the total federal research and development annual budgets. While the total number of federal research-related facilities and labs has been estimated at over 700, the core of the defense-serving federal lab system is dominated by about 100 labs controlled by the DOE, the DOD and the FFRDCs (OTA, 1993, p. 8).

Perhaps the best known of these labs are the nuclear weapons design laboratories run by the DOE, especially Lawrence Livermore, Los Alamos, and Sandia, but the DOE runs nearly one hundred other lab-

related facilities including six multi-purpose labs: Brookhaven, Argonne, Oak Ridge, Idaho National Lab, Pacific Northwest Lab, Lawrence-Berkeley, and the National Renewable Energy Laboratory. The Defense Department labs are relatively less known, but include 81 dedicated research, development and test facilities which serve the technological needs of each of the armed services. All Federally Funded Research and Development Facilities conduct or manage research for the federal government or one of its agencies and receive 70 percent or more of their funding from the federal government. The defense work of the 10 defense-serving FFRDCs is perhaps best known by the research of the Lincoln Laboratory at the Massachusetts Institute of Technology (MIT).

With the end of the Cold War, a major reassessment of the missions and functions of these labs was undertaken by the Clinton Administration to evaluate the labs' conversion potential and the need for consolidation, reorientation or closure. In May of 1994, President Clinton issued a Presidential Review Directive which established the Interagency Review of Federal Laboratories mandating the executive agencies to evaluate the labs' potential to serve other national science and technology needs and options to cut costs and improve productivity. Broadly speaking the options considered were:

- Shrinking the labs to free up money for other public objectives
- Improving the process of technology transfer from the labs to serve industrial purposes and to enhance national competitiveness
- Reorienting the labs to new national missions in other fields such as environmental technologies, alternative energy research, transportation or other areas closely related to the labs core scientific competency
- Downsizing and focusing on new national security objectives like non-proliferation, verification and dismantlement
- Retaining the full range of nuclear weapons design and remanufacture capabilities for maintaining a nuclear deterrent.

Given the diversity of the defense-related labs, no one of the foregoing options would necessarily apply to all these facilities. In response to the Presidential Review Directive, agency studies were completed in 1995 by the Departments of Defense and Energy and the National Aeronautics and Space Administration (NASA). The Department of Energy's study fell short of its mandated goal of identifying the costs and benefits of alternative future scenarios for the labs. NASA's study recommended large-scale closures and consolidation of many of its facilities. Meanwhile, the Department of Defense made modest recommendations for consolidation and closures which were actually scaled back by the Base Closure and Realignment Commission before being turned over for congressional and presidential ratification.

In September, 1995 President Clinton issued his initial set of directives for lab consolidation based on these agencies' studies. Virtually no hard decisions were made for eliminating or consolidating any of these three defense-related lab systems. In essence the Administration argued that it would *"invest in ... federal laboratories, while pursuing aggressive management reforms that ensure the maximum productive output for the taxpayers' investments"* (White House, 1996). So vague were the actual guidelines that they offered little practical guidance in addressing the complexities of reshaping the Cold War orientation of these labs. Indeed, in order to remedy these shortcomings, the Pentagon in December 1996 requested new legislative powers to cut the excess capacity of the defense labs and, where possible, to privatize them (*Defense News*, 2-8 December 1996, p. 3).

The DOD labs

Most of the DoD's 81 labs and research and test facilities are completely dedicated to enhancing the military's warfighting capabilities. According to the DOD, the defense labs act as interpreters and integrators of science and technology into the military's warfighting needs. They also act to connect these warfighting priorities with the acquisition managers and to work with the private sector contractors to ensure that the latest commercial technological advances are incorporated into new weapon systems and defense technologies.

The Defense Department began to downsize the armed services lab system by putting nineteen facilities on the 1995-list of the Base Closure and Realignment Commission for

possible closure or realignment. However, the Base Closure and Realignment Commission (BRAC) chose only to recommend closure of fourteen of these facilities. Moreover, despite the need for further closures, BRAC did not add a single lab to the list before passing it on to Congress and the executive branches for further action. This lacuna is particularly curious because of the obvious redundancies within the military's overwrought lab system. For instance, does the Army really need an aero-medical research facility, especially given that the Air Force and NASA possess far more scientifically complex aero-medical facilities? These shortcomings highlight the drag of Cold War thinking, especially as each of the armed services seeks to maintain its respective control over the existing assets.

Federally Funded Research and Development Centers

The other dedicated defense labs are the Federally Funded Research and Development Centers (FFRDCs) like MITRE Corporation, the Aerospace Corporation and Lincoln labs which are operated by private non-profit organizations and university-affiliated organizations. To date, no major plan has been developed about how to downsize the ten defense dedicated FFRDCs. Indeed, the 1996 House National Security Committee Defense Authorization Bill Report indicates that the principal FFRDCs have not suffered any serious budget cuts or attrition up to the present and recommends a serious consideration of budget cuts (House of Representatives, 1995, p.81). Nevertheless, private defense contractors are beginning to call for the privatization of these labs so that the contractors can bid for this work. The armed services have countered that the non-profit organizations can do the work more cheaply.

At least one military analyst, Lt. General William Odom, has argued that the current situation is untenable for the DOD and that it ought to completely eliminate all of the DOD labs and privatize their functions (Odom, 1993, p. 159). A contest is clearly shaping up between the armed services which wish to maintain their own science and technology capabilities and the private sector contractors which are seeking new sources of government contracts to make up for the deep cuts that have occurred in defense R&D and procurement funding. In either case, both sets of interests envision a continuance of a militarized trajectory for the public's science and technology investments.

The DOE labs

Since the end of the Cold War, the US Department of Energy's budget for Atomic Energy Defense Activities has remained relatively stable as compared to other defense-related budgets. However, the reduction in strategic weapons procurement stemming from both actual arms treaties and reduced tensions has had a substantial impact on the US nuclear weapons complex.

Spending for the research and production of nuclear materials and warheads carried out by the US Department of Energy has been dramatically scaled back. In contrast, the massive environmental damage from the forty-five-year nuclear arms race has required significant new spending to begin the daunting task of cleaning up the nuclear weapons design and production facilities.

Until very recently, estimates suggested that the clean-up costs of the entire weapons production complex could range from US \$300 billion to US \$1 trillion (Environmental Protection Agency, 1993, Introduction). As DOE officials

have noted, these environmental clean-up activities have given them a 'new mission' which will last into the middle of the 21st century. However the DOE scaled back its commitment to total clean-up costs by setting a ceiling at US \$230 billion to stabilize, rather than clean-up, the environmental problems at the DOE complex.¹⁰

In 1995, the shift in congressional power changed budget priorities for the DOE by halting the growth in DOE-funding for environmental restoration work, cutting back funding for conversion and technology transfer to relevant commercial work, and increasing nuclear weapons-related research.

In 1995, the Administration's nuclear posture review of post-Cold War requirements for nuclear weaponry essentially left unaltered the strategic nuclear forces agreed to under the START II Treaty, thereby delaying further decisions about future disarmament. Meanwhile, the Administration began implementing its 'nuclear weapons stewardship' program which places a premium on the labs' research work in advancing nuclear weapons physics, as well as maintaining and monitoring the existing nuclear arsenal. Despite possible consolidation of nuclear weapon design, and a halt to nuclear testing at the Nevada Nuclear Test Site, the Administration's currently proposed nuclear stewardship program is likely to require an expansion of the DOE's nuclear weapons research, development and testing budget (CBO, 1994; Zerriffiti and Makhijani, 1996, pp. 23-28).

Thus far, the laboratory conversion process has been dominated by funding Cooperative Research and Development Agreements (CRADAs), principally focused on serving industry needs. These agreements permit partnerships between private industry and public labs to access technology developed at taxpayer expense ostensibly to facilitate the diffusion of publicly-funded research results into the private economy.

Several laws in the 1980s extended the CRADA approach and permitted lab directors more authority in licensing or waiving intellectual property rights to private companies. Controversies over the privatization of publicly-funded intellectual property slowed the development of the CRADA process. Moreover, some small business interests have claimed that the large DOE contractors and other big corporations have garnered the lion's share of these CRADAs. Domestic preferences clauses in CRADAs originally required that any products developed under these agreements would be produced in the United States, but such preferential clauses were subsequently watered down. Meanwhile, the Department of Defense has ensured that the majority of CRADAs have served defense purposes (OTA, 1993, p.105; Markusen et al., 1995, Part IV).

In February 1995, the Department of Energy released its study on the "Alternative Futures for the Department of Energy National Laboratories" which was supposed to propose specific alternatives for directing the scientific and engineering resources of the federal laboratories toward the economic, environmental, defense, scientific, and energy needs of the nation. The Commission, however, failed to identify the costs and benefits of alternative future scenarios for the

labs, including possible closure and consolidation of the labs and the redirection and restructuring of the remainder of the labs. The majority of the reports recommendations offered little in the way of dramatic change in the size, structure or mission of the labs which would serve public needs in civilian fields. Instead, the recommendations support new investments in nuclear testing-related infrastructure, continued dominance of the basic energy research agenda by nuclear science, and a proposal to 'corporatize' the national labs.

Some independent analysts have argued that the United States can ill afford to continue spending billions on nuclear weapons research and instead that it would improve its security by expanding funding for environmental restoration, non-proliferation, alternative energy, transportation and other relevant research. Furthermore, they argue that the nuclear weapons budget functions of the DOE labs could readily be cut by two-thirds with the balance of the efforts devoted to an alternative 'non-proliferation-based stockpile stewardship' program. This reconfigured stewardship program could focus on expanded non-proliferation efforts, surveillance, verification, export and nuclear materials controls (Markusen et al., 1995; Mello et al., 1992). Another alternative security mission is to use the labs as a platform to increase international cooperation on cutting-edge global environmental and energy research. This could help to increase the transparency of the labs' operation, build confidence and trust, identify new opportunities for collaborative work, assist in compliance with the Nuclear Nonproliferation Treaty (NPT), strengthen resolve around the Comprehensive Test Ban (CTB) and ultimately assist in speeding compliance with the arms control regime.

¹⁰ See press release from the Office of the Assistant Secretary of Energy, Tom Grumbly, 3 April 1995.

Clearly, a combination of these alternative strategies offers the best hope of converting the vast array of scientific and technical resources held by the DOE's lab system. Yet, the movement towards a truly post-Cold War footing for these facilities is being reversed by the attempts to refocus the labs' on their traditional defense-serving missions.

Reinvestment and conversion

Research and development (R&D)

Reinvestment of defense research and development savings in non-defense research and development objectives has been one of the tangible peace dividends of the post-Cold War era. With military R&D down in real terms by over 28 percent since its Cold War peak in 1989, civilian R&D spending has realized a modest boost. But while cuts in military R&D have yielded cumulative annual savings of US \$12.7 billion over the 1990–1998 period (measured in 1996-dollars), only about 44 percent have been reinvested in civilian R&D priorities, with most of this reinvestment having taken place during the Bush Administration.¹¹ Indeed, despite the bold rhetoric of the Clinton Administration, its achievements in this area have fallen dramatically short. While the Republican-controlled Congress has played a key role in reversing these civilian R&D priorities, there is

some support among Republicans, notably Senator Phil Gramm (Republican, Texas), to increase federal non-defense R&D, particularly for basic research.¹² Thus, there is some hope of recapturing the promise that President Clinton once made to spend the majority of R&D funds on non-defense applications.

Physical and human capital investments

Meanwhile, federal non-defense investments in physical and human capital investments have ceased to increase. Indeed, it was under the Bush Administration that such investment expanded, as 19 percent of defense procurement savings were reinvested in domestic needs. These non-defense investments included infrastructure, construction, and grants for transportation, community and regional development, natural resources and the environment, education and training and community health services. But under the Clinton Administration, with its commitment to balancing the federal budget, such reinvestment has all but disappeared.¹³ These categories of federal investment, however, are also being targeted for drastic cuts by the Republican Congress over the next few years.

¹¹ See *Historical Tables of the Budget of the United States Government FY 1998*, Office of Management and Budget, Washington, DC, February, 1997, Tables 9.6, 9.7, 9.8.

¹² See *National Research Investment Act of 1997* sponsored by Senator Phil Gramm, *Congressional Record-Senate*, 23 January 1997.

¹³ See *Historical Tables of the Budget of the United States Government FY 1998*, Office of Management and Budget, Washington, DC, February 1997, Tables 9.6, 9.7, 9.8.

The Future of Defense Conversion

The nation's conversion strategy has been narrowly focused on dual-use assistance to defense firms and adjustment assistance for workers and communities rather than on reorienting national budget priorities.

Yet, real conversion and new job generation depends on a much more profound demilitarization and redirection of defense savings into non-defense public investments which serve definable public needs. However key political economic factors have prevented the nation from pursuing these objectives, particularly the obsession with deficit reduction and the continued adherence to military-strategic conceptions of national power.

In large measure, past and present military policy decisions have blocked the way to a broad-based demilitarization and conversion program. The deficit-financed military build-up of the 1980s ballooned the federal budget deficit and created a huge political obstacle to channeling post-Cold War defense savings into a domestic investment agenda. In the 1990s, the political consensus in Washington and on Wall Street was that the nation needed to reduce its deficit rather than reinvest savings in the domestic economy. By the mid-1990s, the conventional wisdom in Washington and Wall Street was that defense had made its contribution to deficit reduction and that further cuts might be

damaging to national security. In part, this thinking reflected the continuing influence of the artificially high military spending during the Reagan build-up. These military budget levels have become a benchmark by which military interests have argued that the post-Cold War cuts in spending have been too severe.

But the defining issue is that post-Cold War defense planners have succeeded in imposing their view that the nation's security is best protected by maintaining the United States military's qualitative superiority over all potential foes. These military interests seek to develop more flexible and discriminant means of projecting military power throughout the world (Bischak, 1997, pp. 49-55). Little consideration has been given as to how alternative security approaches might meet the security requirements of the post-Cold War environment without requiring continuous modernization of weapons and forces. Nor has there been much discussion of how strengthening and building international institutions could enhance national security and address the new threats to international security through non-military, non-technological means. Such considerations could yield substantially different approaches to national security planning for scientific, technological and industrial investments, and lessen the drive to develop a faster, more flexible and mobile military force equipped with the most advanced weapon systems.

Another key factor was the failure to forge a successful political coalition around a post-Cold War

national investment agenda. The lack of successful political outreach to labor unions meant that the national budget priorities issue was always of marginal interest to labor, let alone to non-defense business interests. While there had been major efforts in the early 1990s to bring together labor, environmentalists, mayors, educators, healthcare workers, academics, community redevelopment interests, religious groups, scientists and technologists with peace and conversion activists, the disparate nature of the coalition made it difficult to find a common denominator of political interest. In particular, the efforts to bring in organized labor usually foundered on the rocky shoals of jobs and the military budget.

In the 1990s, the push for new budget priorities scored an ideological success by engaging the rhetoric of the Clinton presidential campaign, but the subsequent abandonment of a real shift in national priorities by the Administration represented a victory of Wall Street and the Pentagon over the conversion agenda. Yet, these dominant interests are still vulnerable on the jobs issue, as the failure to convert and to reinvest defense savings means that many social and economic needs remain unaddressed. Indeed, the negative economics of public sector downsizing, raising of interest rates, corporate layoffs and the real legacy of four decades of trade liberalization (namely a rising and persistent trade deficit and job loss), means that the priorities strategy should be sharpened to focus more on these jobs-related issues.

For the moment, the United States has lost an opportunity to begin a wider process of demilitarization and conversion, but some positive and genuine lessons have been learned in the 1990s which can be used to further the campaign.

Federal policies have had contradictory effects on corporate adjustment and conversion strategies. On the positive side, increased government investment in non-defense fields has lured defense contractors into such work as modernization of air traffic controls, environmental remediation, information systems and services, and alternative and mass transportation technologies. Defense businesses have also accessed federal and state programs which were established or expanded to promote diversification, technology transfer and retraining. Smaller firms have used federal and state manufacturing extension services and technology centers which assist in commercialization, as well as small business conversion loans. But, with budgets for civilian public investments shrinking, conversion on a national scale remains stalled.

On the negative side, federal subsidies for defense merger and acquisition consolidation costs have retarded conversion efforts by increasing the defense dependence of some contractors. Perhaps more importantly, the military-strategic imperative of post-Cold War security policy of continuing to pursue military superiority in all fields has effectively undermined any chance of lessening the grip of military-industrial interests on security policy. Indeed, the pursuit of military superiority means that commercial-military integration cannot really be initiated because the armed services will not relax performance requirements for advanced weaponry and defense contractors will continue to develop exotic and costly new technologies. Thus, any hope for further demilitarization and conversion really rests on developing a concerted critique of post-Cold War security policies.

Macro-political lessons

Clearly, from a macro-political standpoint, the job which remains to be done is to make the case for further defense-spending reduction to match the reduced post-Cold War threats and then argue for the investment of these savings, dollar-for-dollar, in critical public sectors.

These include education, training, environmental protection and restoration, community redevelopment, and public infrastructure such as transportation, safe drinking water, and waste water treatment.

In addition, the case must be made for realigning national research and development priorities toward non-defense research and development objectives. There is little to suggest that the private sector could make up more than a fraction of the science and technology effort which public sector military spending had provided. Major economic pressures are acting to restrain private sector R&D efforts, including corporate takeovers and consolidations, downsizing and increased global competition. Indeed, heroic assumptions are necessary to support the claim that market-driven R&D investments will make up for the decline in federal R&D investments. For instance, the United States has historically invested about 1.9 percent of its Gross Domestic Product in non-defense R&D, while Germany and Japan have invested 2.5 and 3 percent of their economies in such efforts. For the United States to just maintain its own rate of non-defense R&D investment, private sector

R&D would have to grow at a 4.5 percent annual rate to compensate for the cutback in federal R&D over the next seven years. More daunting is the challenge to try to meet the investment rates of Japan or Germany, which would require the private sector to annually increase investment at a 9.25 percent rate.¹⁴

Currently, Congress has slated to cut such domestic public investment in order to balance the federal budget plan. But deficit reduction does not require sacrificing US investment in economic security. Congress could better accomplish fiscal responsibility by cutting unnecessary defense programs, paring back other corporate subsidies and basing the tax system on the ability to pay (Galbraith, 1996, pp. 60-67). Such a realignment of national priorities would permit the nation to enjoy a real peace dividend.

Micro-political lessons

Any future conversion program should abandon the pretense that dual-use programs serve civilian production. Instead, the focus should be on providing businesses with real incentives to commercialize and develop new products which build on their core organizational and technological strengths.

Specifically, federal policy should build on the lessons learned from successful company diversification and conversion by encouraging the following:

- Corporate commitment to reorienting firms toward commercial market opportunities
- Cost reduction and quality control programs to enhance competitiveness in commercial markets

¹⁴ Computations are based on National Science Foundation data in *National Patterns of R&D Resources: 1995*, Tables B-12 and B-20.

- Organizational innovations to promote technology transfer between defense and commercial fields and to encourage the mobility of staff between divisions and companies in order to learn better procedures
- Labor and management cooperation focused on job creation and retention through new product and process innovations
- Partnerships to enhance marketing capabilities and gain technical capacity in commercial technologies
- Stimulation of business spin-offs and start-ups through technology transfer with companies acting as venture capital partners.

Federal domestic programs for supporting conversion by small- to medium-sized firms should be maintained, particularly small business loans for conversion and manufacturing extension and technology centers to assist them in diversifying their product mix. At the same time, the Administration should put an end to all federal subsidies for the consolidation costs of defense mergers and acquisitions which have already cost the taxpayer US \$1.8 billion and have only deepened the defense commitment of the remaining firms in the upper tier of the defense markets.

Adjustment assistance for workers and communities has worked well, given the limitations of current capacity constraints. Nonetheless, the actual sums which have been spent on worker and community assistance have been modest, comprising only eight percent of the US \$16.5 billion multi-year conversion program. There is little

doubt that the lessons from the demonstration job loss aversion projects are promising and that this model ought to be explored for its potential to prevent layoffs through innovative labor-management collaboration. Meanwhile, proposals to consolidate the government's employment and training system cannot succeed in providing effective reform without expanded capacity and performance accountability, including report cards on what training providers have actually done for their enrollees, so that workers can determine which programs are effective. Realistically, such reforms will require more money.

In the realm of community diversification, several positive lessons have been learned. First, advance planning is crucial to mitigate the economic effects and to evaluate the comparative advantages of alternative civilian purposes. Communities which took full advantage of this lead time often developed successful strategies for rapid job creation, such as Chanute Air Force Base in Illinois. By contrast, those communities which fought a rear-guard effort to challenge the closures—like the City of Philadelphia which tried legal challenges to keep the Philadelphia Naval Shipyard open—often delayed planning efforts and failed to implement any significant economic development plan prior to actual closure. The Philadelphia case is especially telling since the city had received an unusually large infusion of federal funding through congressional earmarking to develop alternatives, but the money was not used in a timely and effective manner.

Another facet of successful base conversion is the development of an inclusive planning process which brings in as many stakeholders as possible into community reuse organization. Indeed, guidelines developed by Congress and the Defense Department have encouraged the development of an inclusive planning process, recognizing that local, state and federal government officials, private developers, labor unions and representatives, local citizens, and citizens groups all have a valuable role to play. Experience shows that no single party should be excluded or allowed to dominate the process. Inclusiveness also enhances local coordination of planned activities so that communities can deliver comprehensive services efficiently. An active government role is also essential to ensure that, in instances where reuse is feasible, conversion plans carefully weigh both the community's social and economic needs and the interests of private developers.

Contentious local and national debate over how environmental clean-up at bases have affected the pace of economic development efforts has led to innovative solutions. Environmental and economic development interest groups have agreed to develop a strategy of parcelizing the bases' land area into uncontaminated and contaminated lands so that clean-up and development can proceed simultaneously. This approach has not only speeded up development but has also permitted a comprehensive approach to environmental clean up. In addition, clean-up operations have provided some employment relief for former base workers as they have been retrained to perform the clean-up operations.

Another mechanism which has been developed is the negotiation of federal/state clean-up agreements which set schedules for the Defense Department to complete the clean-up and give the states rights under those agreements to seek fines, penalties and judicial orders compelling the DOD to conduct the required environmental work.

At the national level, successful local efforts have been greatly aided by expanded funding in the 1990s for advance planning, economic development and retraining programs to support the base closure process. Indeed, the wide impact of the base closure process has ensured that some programs, such as the Economic Development Administration, have survived partisan political efforts to eliminate the programs. Elsewhere, the Office of Economic Adjustment has enjoyed a major increase in its funding over the last few years. Nonetheless, the austere federal budget situation may reduce other resources, such as retraining monies, as well as infrastructure repair and environmental clean-up funding. Cutbacks in such programs could jeopardize the future of the base conversion process.

Conclusions

The reversal of even the modest efforts by the Clinton Administration to reinvest military savings in civilian priorities will have wider effects than currently forecast. More importantly, the nation is losing a historic opportunity to fundamentally recast its public investment and science and technology priorities.

In essence, the investment in alternative futures is being gutted in favor of a continuation of the past. Lost in the fray is the chance to invest in those things which the market cannot: public needs, environmental quality, education, training, and the quality of life.

For forty-five years the United States has pursued an industrial policy designed to make its military second to none. This policy has succeeded, but at a high cost. Behind the display of military might lies the wreckage of US cities, persistent trade deficits, the decay of US infrastructure, the despoiling of the environment and the decline of educational achievement. Economic conversion is the linchpin of domestic security necessary to reverse this decline and begin the process of social, environmental and economic reconstruction.

List of Selected Acronyms

ACEC	Arizona Council for Economic Conversion	GAO	United States General Accounting Office
AFL-CIO	American Federation of Labor and Congress of Industrial Organizations	HPWO	High performance work organization
ATP	Advance Technology Program	IAM	International Association of Machinists
BIW	Bath Iron Works	JTPA	Job Training and Partnership Act
BRAC	Base Closure and Realignment Commission	MEP	Manufacturing Extension Partnership
CALSTART	California-based conversion consortium of high-tech firms	MIT	Massachusetts Institute of Technology
CBO	Congressional Budget Office	NASA	National Aeronautics and Space Administration
CRADA	Cooperative Research and Development Agreement	NCECD	National Commission for Economic Conversion and Disarmament
CTB	Comprehensive Test Ban	NIST	National Institute for Standards & Technology
DOC	Department of Commerce	NPT	Nuclear Nonproliferation Treaty
DOD	Department of Defense	OEA	Office of Economic Adjustment
DOE	Department of Energy	OTA	Office of Technology Assessment
DOL	Department of Labor	R&D	Research and development
DOT	Department of Transportation	TRP	Technology Reinvestment Project
EDA	Economic Development Administration	UAW	United Automobile Workers
EPA	Environmental Protection Agency		
FAA	Federal Aviation Administration		
FFRDC	Federally Funded Research and Development Facilities		

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The National Commission for Economic Conversion and Disarmament (ECD)

The National Commission for Economic Conversion and Disarmament (ECD) is a non-profit, non-partisan research and public education organization dedicated to educating the public on the need and the means for an orderly transfer of military resources to civilian use. The end of the Cold War gives us an unprecedented opportunity to reverse the arms race, build a new foundation for international security, and reorient billions in the defense budget to our neglected domestic needs. What holds us back are the millions of jobs and the economic health of whole communities and whole sectors of our economy that are currently dependent on military spending. The key to breaking this impasse is a comprehensive program of economic conversion, emphasizing planning for alternative production before the cuts, and the layoffs, occur. Replacing the stimulus of military spending will also require investments that will open up alternative civilian markets for defense contractors and promote sustainable economic growth.

ECD's current projects include:

- Serving as an information clearinghouse for members of Congress, executive branch agencies, academic and independent researchers, business, trade unions, activists and the general public on conversion issues and policy.
- Research comparing the size of world markets for arms and for environmental technologies, and the federal programs supporting our exports of each.
- Research documenting successful conversion examples and linking them to federal public investment.
- Critiques of the principal policy documents produced by the 1997-98 government review of U.S. military strategy, including the Quadrennial Defense Review and the final report of the National Defense Panel.

Selected research reports

"Demobilization from the Cold War 1990-1997: Lessons for Forging a New Conversion Policy," by Greg Bischak. (released jointly with the Bonn International Center for Conversion, Summer, 1997.)

"A Tale of Two Industrial Policies: Trade in Arms and Environmental Technologies," by Miriam Pemberton and Michael Renner. (forthcoming, 1997.)

"Remaking US Peacekeeping: U.S. Policy and Real Reform," by Michael Renner. Now available.

"The Technology Reinvestment Project: The Limits of Dual-Use Technology," by Michael Oden, Greg Bischak and Chris Evans-Klock. Now available.

"From Private to State Capitalism: How the Permanent War Economy Transformed the Institutions of American Capitalism," by Seymour Melman. Now available.

"What Else is There To Do? Neglected Prospects for Major Job Creation in U.S. Manufacturing," by Seymour Melman. Now available.

"Military Base Closures in the 1990s: Lessons for Redevelopment," by Catherine Hill with Jim Raffel. Now available.

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