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FORGING A PEACE ECONOMY IN MINNESOTA

A Report for the
Minnesota Task Force
on Economic Conversion

February 1991



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February 1991

Wilbur Maki, University of Minnesota
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This study is dedicated
to the life and work of
Michael Senese
(1960-1989),
whose research and energy
made an invaluable contribution
to our May 1989 report.

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Preface

The Minnesota Economic Conversion Task Force has authorized the release of this report, which is designed to build on its May 1989 document. The report is intended to improve understanding of the economic issues surrounding military goods production in Minnesota. Based on extensive research and analysis, the report proposes recommendations that would help the state and its citizens meet the challenges posed by recent declines in military procurement spending, changes which threaten employment and prosperity in Minnesota.

This study was conducted by noted regional economist and University of Minnesota faculty member Wilbur Maki. Dr. Maki was assisted by Hossein Akhavi-Pour of Hamline University, and by Christine Evans of Boston University.

Dr. Richard Bolan of the University of Minnesota's Humphrey Institute provided case study reviews as well as analysis of current conditions.

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Summary

The period 1987-89 brought deep military cuts to Minnesota, and saw the U.S. arms industry in disarray, as companies tried to sell off or spin off their unprofitable weapons divisions. The long-term prospect is for continuing serious cuts in the Pentagon budget, with continuing dislocations in Minnesota.

Findings:

- 1. In 1989, Minnesota lost \$3.255 billion (\$748 per person or \$1,981 per household) in taxes to the Pentagon.** Minnesotans paid \$5.4 billion in taxes to the military in 1989 and received \$2.145 billion in military expenditures.
- 2. Between 1987 and 1989, military procurement spending in Minnesota (prime contracts over \$25,000) dropped \$693 million, a 29 percent decline which decisively reversed the Reagan-era trend of growth in military spending.** These cuts cost Minnesota 29,500 jobs and \$2.08 billion in Gross State Output. Procurement cuts in Minnesota were far deeper than the national average.
- 3. Many sectors of Minnesota's durable goods industry were heavily impacted by the 29 percent cut.** Pentagon purchases of Minnesota Professional & Scientific Instruments fell from \$260 million to \$18 million; Communications Equipment, Miscellaneous Instruments, and Electric Industrial Appliances each lost over \$125 million.

4. Ten-year economic projections for the nation and the state show that in the long run military cuts will actually *help* the economy recover from the deficits of the 1980s, but they also show severe social pain and economic dislocation in the short run. The early and mid-1990s will be painful for workers and companies in military-related industries, and government action is needed to mitigate that pain. By the year 2000, the projections show Minnesota with a very strong economy, booming due to improved export conditions.

5. Spending on health care, housing, education, and infrastructure improvement creates more jobs for the dollars spent than military spending. It also improves productivity and profits by increasing the amount of "public capital" workers and businesses have access to. These infrastructure improvements are also crucial in attracting manufacturing jobs to Greater Minnesota.

6. With the world downturn in military spending, economic conversion is now a global phenomenon. China and the Soviet Union are well into ambitious national conversion programs, and numerous European site conversion projects are underway. Minnesotans can learn a great deal from these efforts, and this report contains a series of case studies on economic conversion.

Recommendations

To state government:

1. The state should conduct an annual study on the impact of military spending, documenting type and duration of prime contracts, net contractual losses and gains, industrial sectors and occupations specifically impacted, and military tax outflow analysis.
2. In light of the extreme vulnerability of weapons industries over the coming decade, the state should require all major military contractors to establish alternative-use committees, including members of the work force and the community, to plan for an orderly transition away from military dependence.
3. The state Department of Jobs and Training should conduct analysis and formulate policy recommendations to be sure that the costs of military cuts (unemployment insurance, retraining, etc.) are paid for by the activities that directly contribute to those costs and not by workers, the public, or businesses in general.
4. The state should begin immediately to identify opportunities for future growth both in new technologies and in basic manufacturing based upon social needs. This process should start from the recent report by the State Department of Trade and Economic Development on Minnesota's economy, the Unisys Alternative Product report, and the technology studies done for the Greater Minnesota Corporation. The growth opportunities identified should guide state economic development and job training programs.
5. The state should give priority for existing economic development, financial assistance, and training programs to military businesses in the process of conversion, provided they meet the Task Force's written criteria for social usefulness, environmental soundness, etc.
6. The state should give preference in purchasing to products that have been created through an alternative-use process that meets the written Task Force criteria.
7. The state should establish an emergency fund to assist communities and workers hard hit by military cut backs in planning for and providing housing, medical care, social services, job training, and economic development while engaged in the alternative-use process. Whenever possible, this fund should be used to leverage federal assistance such as that available from the Department of Defense, Office of Economic Adjustment.

8. The state should establish a position of coordinator for economic conversion, to monitor and carry out the activities listed in 1-7 above, and to provide research and technical assistance to business, labor, and community groups involved in economic conversion.

9. The state should hold a conference or a series of educational sessions to help management, labor, and community organizations familiarize themselves with conversion, so they can begin making the attitudinal changes, including changes in corporate culture, that are essential to a successful conversion process.

10. The state should establish university grants in economic conversion. The express aim of these grants should be to initiate changes away from the Pentagon mindset in the culture of research, development, and education.

To the Minnesota Congressional delegation:

1. Congress should cut the military budget by at least 8 percent annually, with the resulting peace dividend devoted to a mix of deficit reduction with social and environmental needs, and support for economic conversion.
2. Congress should establish a national economic conversion program that requires local alternative-use planning, involving business, labor, and the community. Such a program should provide income support and training to laid-off workers, and should expand the grant monies available to communities to plan their transition away from military dependency. The program should have specific, written criteria for the social usefulness, environmental soundness, and other desirable characteristics of new products and processes to be encouraged.
3. Congress should mandate that data concerning product, location, and amount be gathered and made public on all military sub-contracts in excess of \$10,000.
4. Congress should create an advanced civilian research and development agency, analogous to the Japanese Ministry of International Trade and Industry, to stimulate the development of socially useful products. Given the economic and budgetary record of the U.S. military, the current trend toward using the Pentagon's Defense

Advanced Research Projects Agency (DARPA) as such a development agency is not acceptable.

5. Congress should increase funding for education, mass transit, conservation technology, energy-

efficient, affordable housing, and new clean energy sources to make our air cleaner and our nation less energy-dependent. Such spending would stimulate use of the excess industrial capacity being created by military cuts.

The Current Context

Peace broke out between the superpowers in 1989, and the period since the completion of the Task Force's May 1989 report has been very eventful. The dismantling of the Berlin Wall symbolized the end of the Cold War, and was followed by the disintegration of the Warsaw Pact, the reunification of Germany, and the disappearance of the perceived Soviet military threat to the United States. Soviet President Gorbachev pledged to convert hundreds of weapons factories to civilian production, and the Soviets formed a National Commission to Promote Conversion. Pressure to reduce the U.S. budget deficit had already ended the Carter-Reagan arms buildup. A decline in military spending, which the Task Force had anticipated since 1985, began in 1988 and was noted in the earlier report.

The changed international situation, combined with continued federal budget shortfalls, increased the pressure for large military cuts, with dramatic results in Minnesota. The earlier task force report had used a computer model of the Minnesota economy to project the effects of a 25 percent cut in military procurement spending. Many observers at that time thought this an improbably large cut, and very unlikely to occur, though perhaps interesting to project for study purposes. Actual figures now in hand show that **between 1987 and 1989, Minnesota lost more than the projected 25**

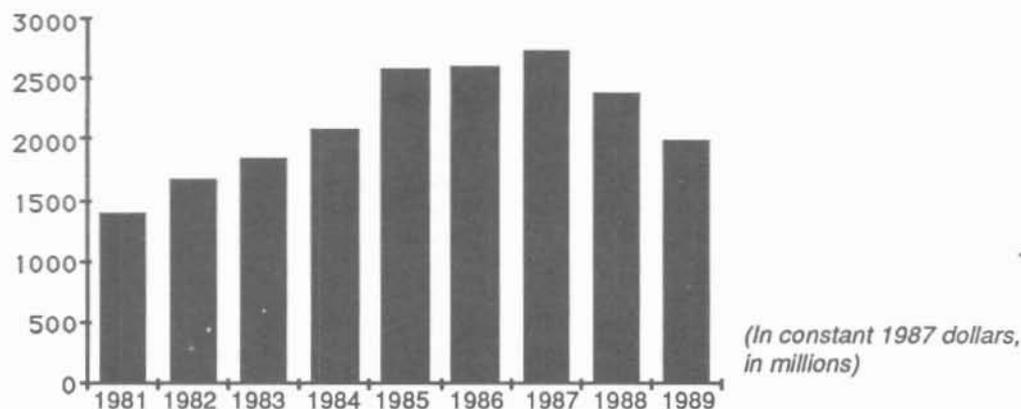
percent, suffering a 29 percent loss in military procurement contracts, down from \$2.42 billion to \$1.73 billion (in constant 1987 dollars). This \$690 million cut caused a loss of about 29,500 jobs in the state. Without government or industry conversion planning, there was little to mitigate this loss. It accounts for much of the recent weakness in the metropolitan economy of the Twin Cities.

Nationally, the overall military budget remained bloated, and procurement spending cuts (about 15 percent over the two-year period) were not as deep as in Minnesota, but they definitely signalled a turning point for U.S. military industries.

Business Week predicted "a toe-curling recession for the whole defense industry" in its July 2, 1990, issue, reporting that the collective market value of the seven purest major military contractors had fallen 23 percent over the past year. The article pointed to recent layoffs of 25,000 workers at major military contractors, and predicted that 830,000 defense-related jobs in the private sector could vanish by the year 2000, including 55,000 engineering positions. Under these dire circumstances, *Business Week* reported, economic conversion "once regarded as a utopian fantasy . . . is getting another look."

In the spring of 1989, over 50 U.S. corporations were trying to sell their military contracting divisions. Minnesota's Honeywell Corporation,

Total Military Spending in Minnesota, Fiscal Years 1981-1989



after trying unsuccessfully for over a year to sell its weapons groups, finally spun many of them off in 1990, creating a new armaments producer called Alliant Techsystems Incorporated. The layoffs noted in the earlier report continued to mount, with combined layoffs at Honeywell, FMC, and Control Data totaling in the thousands between 1987 and late 1990. By the middle of 1990, FMC was looking for a way to close its brand-new weapons research facility in Minneapolis' high-tech corridor.

Hardest hit was Unisys Corporation, with approximately 5,000 Minnesota workers laid off since the 1986 merger that united Sperry and Burroughs to form Unisys. Unisys' troubles were not by any means attributable solely to reductions in military spending, but those hurt the company badly, especially in the late 1980s. By October 1990, with Unisys stock down to \$2.25 from a 1987 high of \$45, W. Michael Blumenthal, who engineered the merger strategy, had resigned from his posts as CEO and chairman of the board.

Workers at Unisys' Shepard Road weapons plant, faced with unending layoffs and no sign of a management plan to save their jobs, approached the Economic Conversion Task Force for assistance. In January 1989, the International Brotherhood of Electrical Workers #2047 (IBEW) began to formulate an alternative-use plan for the plant. Starting from worker suggestions generated by questionnaires and shop-floor meetings, the union produced a list of alternative products that could be made by the existing work force at the Unisys facility. With state and local government help, the IBEW hired a consulting firm to study the list and select the most feasible new products. The consultant's report suggests some very promising new products, including water-saving "smart" irrigation systems and energy-saving low-power lighting ballasts. Unfortunately, Unisys' management has not agreed to cooperate with the alternative-use committee, but various options for continuing the conversion process are being explored. (See below, p. 15)

The Persian Gulf Crisis

Just as it seemed there would be a worldwide wave of disarmament and conversion, Iraq invaded Kuwait on Aug. 2, 1990, and U.S. President George Bush responded with a huge display of military force in the Persian Gulf, temporarily shifting public attention from peace to the possibility of war. The Gulf crisis is very serious and as we produce this report in December 1990, it is impossible to predict the outcome of the crisis. Our considered opinion, however, is that the need for economic conversion and a large "peace dividend" will continue undiminished no

matter what happens in the Gulf. The crisis has already produced a temporary rise in U.S. military spending; contractors for such items as military rations and uniforms report strong demand, and orders for some high-tech items like AWACS radar will probably go up. If there is a war, demand for tanks, ordnance, and other items will increase.

However, all military spending is cyclical, and this crisis-induced spending is likely to boom and bust very quickly. Observers do not believe it will change the underlying economics of the weapons industry. Despite the frequent comparisons in the mass media, Saddam Hussein does not have the industrial base Hitler had. Hussein has spent the last eight years failing to conquer his next-door neighbor, Iran. As Americans have been finding out lately, the most powerful weapons Saddam Hussein has were sold to him by European and American armaments manufacturers, including Minnesota's Honeywell Corporation (*Minneapolis Star Tribune*, Dec. 16, 1990). As sales plummet, more and more weapons makers are desperately seeking to stay in business by exploiting Third World conflicts like that between India and Pakistan (See "Selling Arms Abroad," *St. Paul Pioneer Press*, Dec. 17, 1990). Such behavior is another argument for economic conversion as a way for companies and workers to prosper without increasing global danger by irresponsible arms sales.

More to the point, Iraq is not the Soviet Union. Even the most hawkish predictions about the Gulf crisis and future so-called "resource wars" cannot justify continued production of such big-ticket items as Star Wars, Trident, and MX. Even with a superpower adversary, the need for such weapons systems strained credibility. With the Cold War over and the defense of Europe (estimated to cost the U.S. \$130 billion a year) no longer necessary, large cuts in procurement spending seem inevitable.

Moreover, pressure to bring down the federal deficit is stronger than ever, and some of the reduction will almost certainly have to come out of military spending. The accumulated deficits of the 1980s amount to about \$2 trillion dollars; Savings & Loan losses of a half trillion dollars, money spent in the 1980s that will have to be paid back in the 1990s, should properly be counted with this deficit. These Reagan-era borrowings against the nation's future will greatly constrain policymakers during the '90s, particularly in the first half of the decade. The Gulf crisis makes troop reductions and base closings more difficult to accomplish, and the \$35 billion a year cost of the Gulf expeditionary force may actually increase pressure to cut big military hardware systems.

Continuing Decline in Military Spending

In its Oct. 1, 1990, prospectus for Alliant Techsystems, Honeywell advised stockholders of a "Defense Industry Slowdown":

Total defense spending by the U.S. government both on existing programs and on new weapons programs is expected to decrease in the next few years for economic and political reasons. This expected decrease is a result of several factors, including increased demands and constraints on the federal budget, the recent developments in Europe and the Soviet Union, and the resultant continuing improvement in East-West relations The overall impact of these developments is likely to be a sizeable decrease in defense spending, which . . . may cause a contraction of the defense industry as a whole with possible layoffs and plant closings.

The Persian Gulf crisis does not fundamentally change this sober estimate by a major weapons maker, and a Dec. 17, 1990, *St. Paul Pioneer Press* article headed "Defense firms don't expect long-term help from crisis" bears this out. The article details the short-term rise in demand for some Pentagon producers in Minnesota, but takes its theme from Chip Emery, vice-president for Honeywell military avionics, who says: "All our planning is that [the Middle East] is a short-term factor."

In spite of the current turmoil and threat of war, therefore, the Task Force believes that preparation for a large peace dividend and economic conversion are essential to Minnesota's economic health. The layoffs and hardships the task force has been predicting are no longer in the future. They have already begun, and will continue. State action is needed *now*. Unfortunately, the country appears to be heading into a recession, which will make conversion more difficult, but the stresses of a recession only increase the need for a comprehensive conversion program, with support and retraining for dislocated workers, and government assistance in the search for new marketable products.

Two other aspects of the current context are worth mentioning. First, the continuing difficulties of the Greater Minnesota Corporation should prompt state legislators and policymakers to take a serious look at conversion as a more solidly based, realistic approach to economic development. Many suppliers for prime military contractors in the metropolitan area are in Greater Minnesota, and manufacturing is now as important as agriculture in providing Greater Minnesota with a basic export-producing industry.

Second, it became absolutely clear in the late 1980s that global environmental problems such as the greenhouse effect and acid rain will be central to policy debates in the 1990s and the next century, and that there is solid popular support for environmental action. It seems likely in this context that successful conversion programs will involve improving the environment.

Overview of the Task Force Report

The May 1989 study used computer modelling techniques to analyze the effects of a one-time 25 percent cut in military procurement on the Minnesota economy, and to show that diverting those Pentagon savings into social services and infrastructure improvements would result in a **net gain of 9,400 jobs** in the state. That conclusion and its implications are still important to Minnesota and national policymakers; this report, however, does not repeat the previous study. Instead, it provides:

1. A description of current military taxation and spending in Minnesota, with an analysis of sectoral and occupational effects of the significant drop in military spending from 1987 to 1989.
2. A 10-year computer simulation showing the effects of gradual cuts in the military budget from

1990-2000. In the long term, the results are beneficial, with a federal budget surplus, rising exports, and rising GNP growth in the late 1990s. In the short run, the cuts cause enormous social and economic pain, with large job losses and significant drops in personal consumption expenditures. This 10-year picture suggests that energetic conversion activity is needed to mitigate the pain in the early 1990s and to speed the transition to a peace economy.

3. Case reports on the lessons from successful and unsuccessful conversions, illustrating both the problems and the opportunities implied by the conversion process.
4. Task force recommendations for state and local action to ease Minnesota's transition to a less military-dependent economy.

Method of Analysis

This report utilizes the same computer model as the May 1989 report for analyzing the effects of military spending in the Minnesota economy. Known as IPASS (Interactive Policy Analysis Simulation System), the model is a dynamic inter-industry and inter-sectoral model that traces raw material and intermediate product (industry) origins coupled with product (sectoral) sales destinations. The model has been used to provide detailed measures of the effects of the cuts in

military spending between Fiscal Year (FY) 1987 (Oct. 1986-Sept. 30, 1987) and FY 1989, as well as to project the future scenario listed above.

Project staff also have done considerable research exploring case studies of economic conversion efforts of various military contractor firms. In addition to library research, these efforts used a variety of media and interview sources, and included site visits to conversion locations in Europe and the U.S.

Military Spending in Minnesota: 1987-89

In 1989, Minnesotans paid an estimated \$5.4 billion in taxes appropriated to the Department of Defense. This amounted to \$3,290 per household, or \$1,242 per person. Please note, however, that these figures seriously underestimate the military tax burden, because they do not include significant military outlays by the National Aeronautics and Space Administration (NASA) and the Department of Energy (DOE). Nor do they include interest on war borrowing.

Of the total tax outflow, \$2.145 billion returned to the state in the form of military contracts and payroll, resulting in a net outflow from Minnesota to the Pentagon of \$3.255 billion. This amounted to a net loss of \$748 for each person in Minnesota, or a net loss of \$1,981 for every Minnesota household.

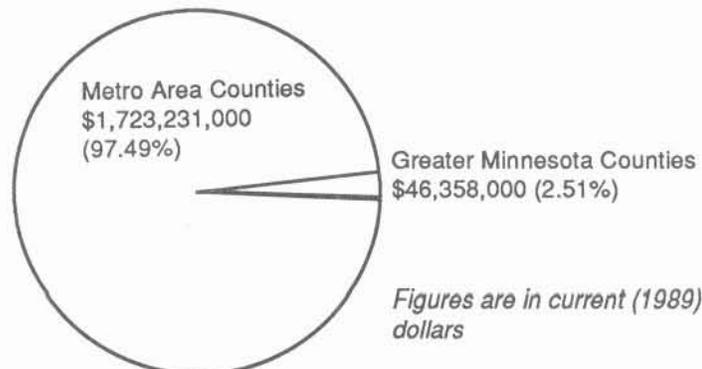
Military spending continued to be largely metropolitan, with over 95 percent of direct prime contracts above \$25,000 awarded in the metropolitan area. Most Minnesota counties continued to be net losers to the Pentagon, with only the metro area registering net gains. Detailed information on subcontracting and supplier linkages is not collected. If it were available, so

that the input-supplying subcontractors in Greater Minnesota could be identified, the metro area economic benefits of military spending might be reduced, and the Greater Minnesota losses to the Pentagon correspondingly smaller.

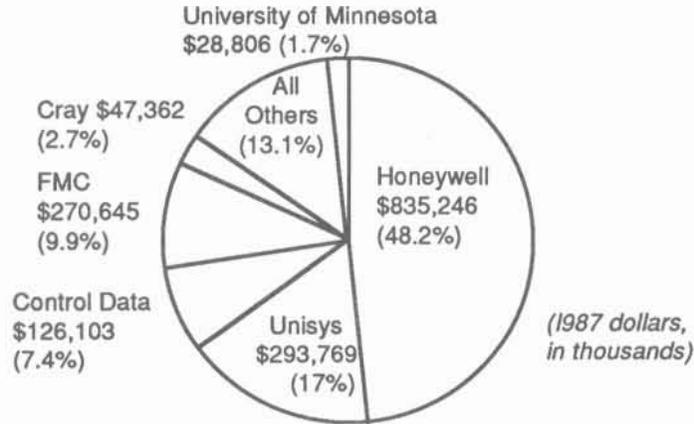
The economic effects of uneven urban/rural Pentagon spending, however, seem to have reversed since the time of the previous report: severe military cuts slowed metro growth, while some Greater Minnesota counties, which were less dependent on Pentagon spending, showed better economic growth.

Weapons spending also continued to be concentrated in a few firms, with Honeywell, Unisys, FMC, and Control Data receiving 82 percent of the dollar value of prime contracts in the state, down by less than a percentage point from their 1987 share. Note, however, that 1989 will be the last year for this "Big Four" configuration. Honeywell's new spinoff, Alliant Techsystems, will appear on any future list of important contractors, and the extreme pressures now changing the weapons industry may cause other changes to the list as well.

Distribution of Minnesota Department of Defense Contract Awards by County: 1989



Leading Minnesota Military Contractors in 1989



Overall Decline in Military Spending 1987-89

The Task Force's May 1989 report analyzed the consequences of a one-time 25 percent cut in military procurement, a cut many observers at the time believed was quite large, and not likely to occur. As it turned out, more than half the projected cut occurred in one year, from 1987 to 1988, with procurement spending in Minnesota falling from \$2.42 billion to \$2.02 billion, a cut of 16%. The following year, spending fell \$290 million or another 14 percent. **Over the two-year period, prime military contracts of \$25,000 or more dropped a total of \$693 million, a 29 percent decline,** decisively reversing the overall trend of growth in military spending during the Reagan period.

Direct and indirect losses in the 1987-1989 period due to reductions in military procurement in Minnesota totaled **29,500 jobs, \$656 million in total earnings, \$771 million in total value-added, and \$2.08 billion in Gross State Output.** The employment losses were in the range predicted in the earlier report, but were slightly smaller because cuts came in capital-intensive sectors where fewer jobs were lost per dollar of retrenchment. These actual employment losses have been concentrated in the Twin Cities metropolitan region, and appear to account for much of the metropolitan region's slower employment growth relative to greater Minnesota since 1988.

Military Spending Declines in Minnesota 1987-89 (Prime contracts over \$25,000)

All amounts in constant 1987 dollars

1987	1988	1987-88 Change		1989	1988-89 Change		1987-89 Change	
		Dollars	%		Dollars	%	Dollars	%
2.42 billion	2.02 billion	-400.5 million	-16.6%	1.73 billion	-289.9 million	-14.3	-692.5 million	-29%

Sources: Military Spending Research Service with IPASS extrapolations

Sectoral and Occupational Impacts

The drop described above is, however, only the net decline, with sectors that gained contracts partially offsetting large losses in other sectors. A close look at detailed data by industrial sectors shows an even more unsettling picture (See table below). Total losses in sectors that declined between '87 and '88 were slightly more than a billion dollars, with 83 percent of these losses in high-tech or durable goods manufacturing. Industries such as scientific instruments and computers suffered large losses, which were partially offset by a rise in military construction (likely to be one-time contracts) and in business services and non-durables. Between '88 and '89, computers gained back part of what they had lost, but communication equipment and other transportation (which includes missiles and space vehicles) were the biggest losers. Minnesota's scientific instrument sector was almost eliminated from the military market, dropping from over \$200 million in 1987 to only \$18 million in 1989.

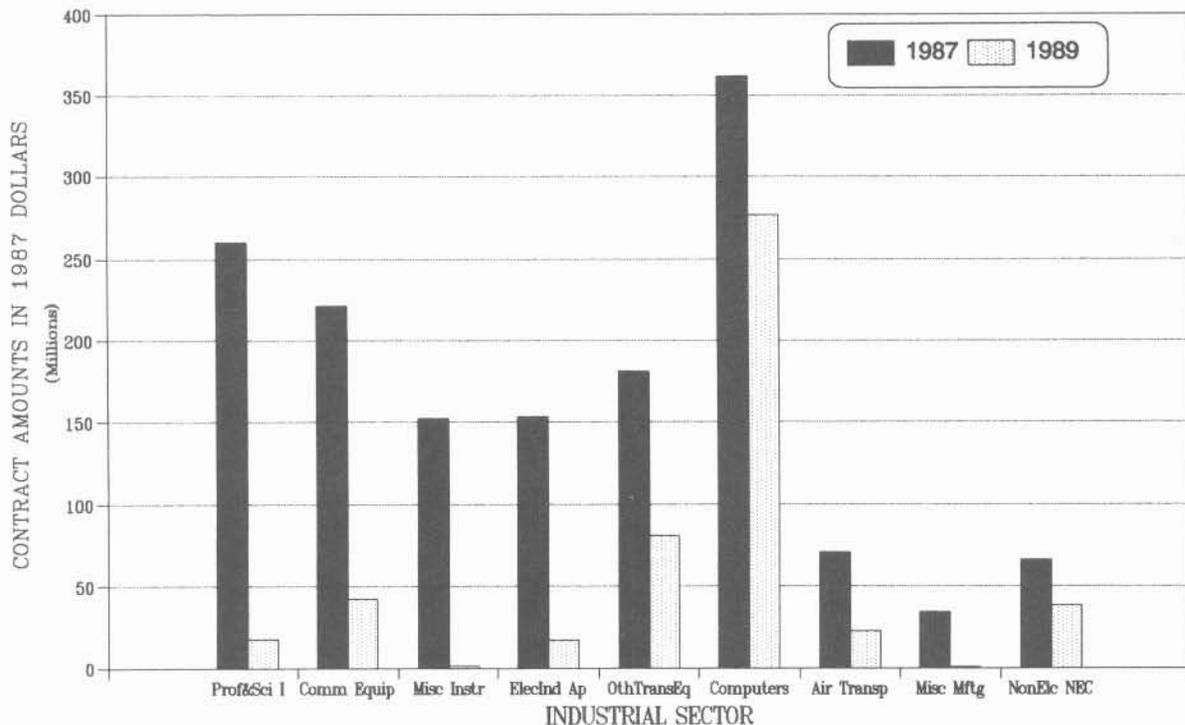
High-tech and durable goods sectors, then, were impacted even more adversely than the net statewide figures show. These sectors are

disproportionately important to the state's economy because they generally have strong backward linkages to in-state suppliers and produce goods with high value-added, for export from the state. For example, every \$100 worth of computers contains only about \$44 worth of raw material; the rest is value added by Minnesotans who reap the difference as income and profits. By comparison, \$100 worth of Spam contains \$86 worth of pork, spices, and overhead costs, leaving only \$14 for wages, profits, and taxes. The high-tech and durable goods sectors bring money into Minnesota, and it tends to circulate in the state economy for a relatively long time before being spent elsewhere.

Loss of Skilled Workers

More importantly, these sectors employ a significant share of the state's scientific and engineering personnel and of its skilled workers, whose talents are needed for innovation and future economic growth. These innovators could be creating the new products that in turn produce future jobs. People in these occupations, along with a high proportion of metal workers and skilled precision workers, have been significantly engaged in the work of the Pentagon, and with the

Sectors experiencing greatest losses in military contracts: Minnesota 1987-89



current declines are vulnerable to layoffs. Since metalworkers and skilled precision workers tend to be unionized and well-paid, the loss of these jobs could have a deflating impact on wages throughout the area.

Scientific and technical personnel and skilled workers are relatively mobile in terms of future job opportunities. Keeping them in Minnesota and productively employed here is a problem of growing importance. According to information collected by the Hennepin County Department of Training and Employment Assistance, at least 400 former Control Data employees have relocated since April 1989. Various newspaper articles (see *St. Paul Pioneer Press* Oct. 4, 1989, and Nov. 5, 1989) also provide anecdotal evidence that Minnesota is losing highly qualified workers because of weapons industry layoffs.

Moreover, specific survey data gathered by Hennepin County confirm in detail the social and economic pain implied by a 29 percent cut in military spending. Hennepin County's data includes 5,757 metro-area layoffs in computers, telecommunications, and electronics during 1989 and 1990, including 1,500 at Honeywell, 800 at Unisys, and 1,734 at Control Data. At least 1,000 of these were directly related to declines in military production; many others were indirectly related.

Technicians and engineers together made up 42 percent of those laid off. Skilled, experienced production workers suffered badly as well, with many assembly workers laid off. As Unisys worker Mona Ott told an interviewer: "At our age, I can say that most generally the people have held four or five different classifications. Together they can build a computer from the moment it's born to the time it's graduated into somebody's hands." (In *Positive Alternatives*, Fall 1990, pp. 4-5) Such mature productive skills are wasted by layoffs, and nearly 70 percent of laid-off employees responding to the survey had been out of work more than six months.

Unemployment in the Twin Cities' electronic manufacturing industry as of early 1990 was calculated at 29 percent, according to the Hennepin County survey, and unemployment was rising "steeply," due to the recent loss of 4,300 jobs in durable goods manufacturing. Information gathered by the county confirms the likelihood of continuing layoffs at major electronics and computer employers. Nearly 75 percent of laid-off respondents said they needed help in finding another job; 36 percent asked for technical retraining in new computer languages and techniques.

In general, the survey data collected by Hennepin County confirm and complement the statewide macroeconomic figures. Both kinds of information show that the 29 percent cut in military procurement spending has caused severe dislocations in high-tech and durable goods industries, that important sectors of the Minnesota economy are still experiencing the turmoil of those dislocations, that skilled workers necessary to the state's economic health are being laid off and are in danger of leaving, and that government action to provide income support and retraining is urgently needed now.

Significant Obstacles to Re-employment

One more point emerges strongly from the survey data: the most frequently cited "obstacles to re-employment" noted by laid-off workers were "Lack of Openings in the Industry" and "Lack of Openings Paying the Same Wage." Of the workers surveyed, 496 cited the first reason and 492 the second. The survey adds that:

...over the last 2 years, the EDWAAA (Economic Dislocation and Worker Adjustment Assistance Act) counselors have referred persons hit by the first wave of layoffs at Unisys or Control Data to other computer companies, such as CPT or Cray Research. Now these companies are also laying off, as the whole industry has declined. . . . The local economy has less ability to absorb and re-employ the thousands of layoffs at anything close to their former wage. It is possible that these thousands of layoffs are beginning to chip away at the resilience of the local economy." (Hennepin County, 1990)

In this situation, retraining will not by itself be sufficient. Training workers for nonexistent jobs is both cruel and futile. A vigorous economic conversion effort of the kind initiated by IBEW Local #2047 at Unisys is needed to find alternative products that can save old jobs and create new ones.

Post Cold War Budget Projections: The First Ten Years

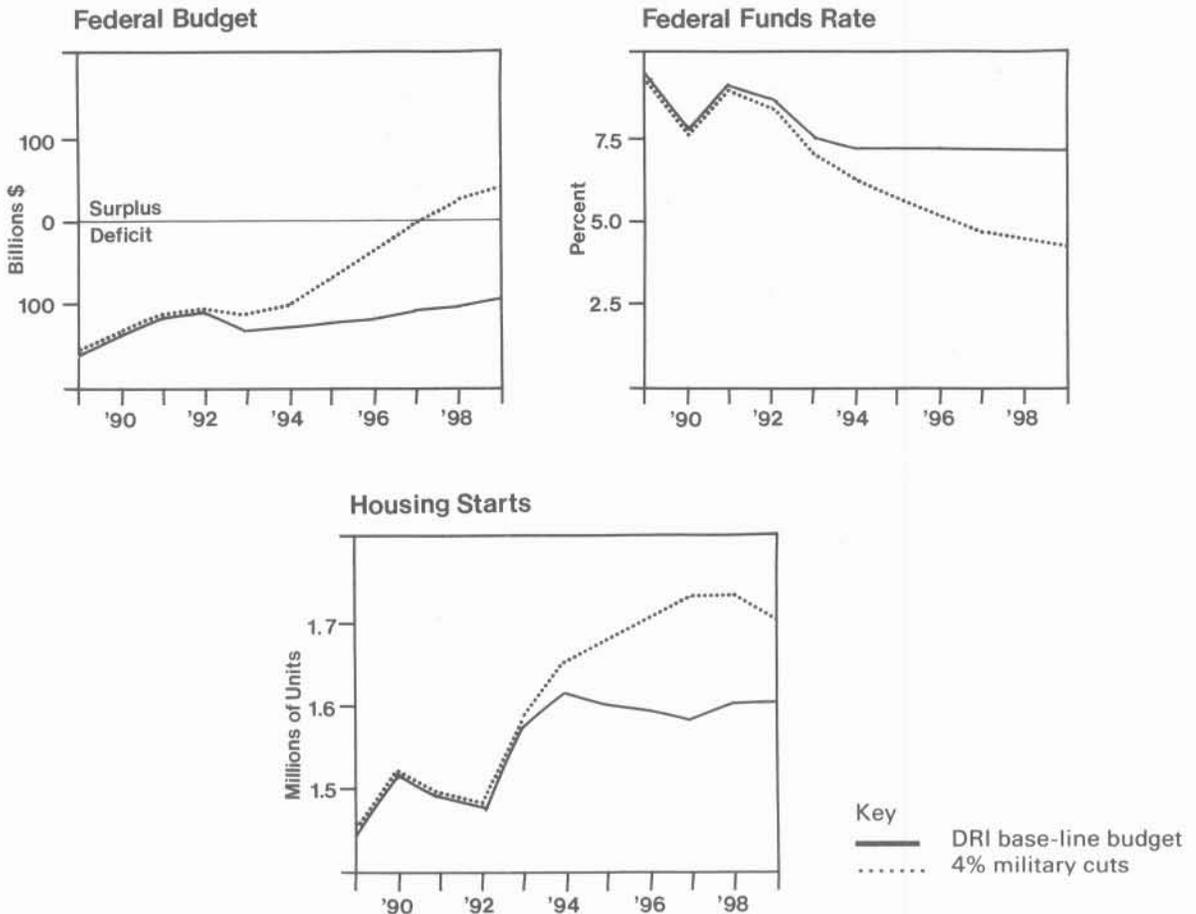
National Study

The June 12, 1989, issue of *Business Week* reported on a national study done by the economic consulting and forecasting firm of Data Resources Incorporated/McGraw Hill (DRI). DRI used its computer model of the U.S. economy to project the effects of a cumulative 4 percent reduction in military spending each year throughout the 1990s. This projection was compared with DRI's base-line projection about the most likely course of the economy, which included a slight rise in military spending (average real growth of 1.8 percent above the last Reagan Pentagon budget over the decade). Savings would be small at first; 4 percent of a \$300 billion military budget would yield a saving of \$12 billion. But the savings would also be cumulative, so that second-year savings would

be nearly \$24 billion, third-year savings nearly \$36 billion, and so on.

The results of this small cumulative reduction were eye-opening: the bad news is that even modest cuts would produce serious economic hardship in the early 1990s. The good news is that in the long run, reductions in military spending would **help** the economy overcome the debts accumulated during the 1980s. By the end of the decade, there would be a federal budget **surplus**; short-term interest rates could drop below 5 percent. Easier availability of investment capital would fuel an acceleration in GNP growth, a surge in housing starts, and a growth in exports. The study showed that the U.S. economy would be better off in nearly every respect by the year 2000

How the Economy Would be Affected by Defense Cuts



Source: DRI/McGraw-Hill

Comparison of Two DRI Economic Projections for the 1990s

Key
Baseline data
4% cumulative military cut data are in bold

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
GNP growth (Rate of change)	2.6 2.6	1.0 1.0	3.2 3.2	2.6 2.1	2.1 1.4	2.3 1.9	2.5 2.4	2.5 2.7	2.2 2.8	2.3 3.0	2.3 2.7
Real GNP (in billions 1982 \$)	4098.2 4098.2	4140.2 4140.2	4273.7 4271.8	4386.5 4360.8	4478.7 4422.8	4582.1 4506.0	4697.9 4614.6	4816.7 4737.3	4922.3 4868.7	5035.8 5015.1	5151.8 5149.8
Housing starts (Millions of units)	1.460 1.460	1.525 1.525	1.493 1.492	1.484 1.481	1.577 1.587	1.615 1.660	1.602 1.685	1.597 1.710	1.592 1.726	1.601 1.728	1.605 1.703
Current acct. bal. (Billion \$)	-123.7 -123.7	125.6 -125.6	-119.5 -119.3	-117.9 -114.9	-106.36 -97.8	-102.0 -84.6	-99.6 -70.5	-102.2 -56.9	-111.8 -49.1	-120.5 -43.1	-131.9 -42.8
Federal funds rate (%)	9.26 9.26	7.69 7.69	8.90 8.90	8.65 8.54	7.53 7.09	7.20 6.29	7.20 5.74	7.20 5.18	7.19 4.78	7.20 4.56	7.20 4.44

Source: DRI/McGraw-Hill

with the Pentagon cuts than it would be with the base-line scenario. Although there would be some years of very slow growth in the early and mid-1990s, a decline in GNP is not projected for any year of the decade. Subsequent *Business Week* articles (Dec. 11, 1989, and July 2, 1990) have confirmed and expanded on the original study results.

Limitations of the DRI Projection

Several things must be noted about the DRI scenarios. First, the level of military cuts projected seemed "an extreme case" (to quote DRI) at the time the study was published, but is now unrealistically low. The cumulative effect of a 4 percent real cut in military spending, adjusted for inflation, would bring the Pentagon budget for the year 2000 back to about the level it was at when President Carter left office. With the end of the Cold War and with current federal budgetary stresses, much larger reductions are probable. Second, the usefulness of the study does not depend on DRI being exactly right about the future; the point of the study is to see what effect a single variable has by holding all other variables constant and changing only that one variable. Thus, there is much to be learned from the comparisons, even by those who might advocate a different level of military reduction, or who might be sceptical about DRI's ability to project interest rates for 1999.

Third, the DRI projections, which assume that all Pentagon cuts go to deficit reduction, do not represent a policy that the Task Force (or *Business Week* itself) advocates. The *Business Week* article notes that a government making these military

cuts might well earmark some of the proceeds for dislocated worker support and other conversion activity, and that a government moving into budget surplus in the second half of the 1990 would be likely to raise expenditures for education, health care, housing, infrastructure maintenance, environmental improvements, etc. The previous Task Force report demonstrated that such expenditures would be better job creators than either military spending or simply tax cuts to stimulate more personal consumption expenditure. On the basis of that analysis, the Task Force would certainly recommend conversion support and increased social spending to offset military cuts. (See *Military Production and the Minnesota Economy*, Minnesota Department of Jobs and Training, May 1989, pp. 10-13.)

The Minnesota Study: A Peace Economy by the Year 2000

In order to project the effect of 4 percent annual military cuts in Minnesota to the year 2000, the state's share of reduced U.S. military spending was transferred from its national setting to a regional setting through a proportionate sharing of all direct reductions in military-related industry production. These shares were coded and entered in the appropriate industrial sectors of the IPASS model. Projections for the decade of the 1990s were made by running the IPASS model with the national assumptions for each year (about interest rates, inflation, the value of the dollar, etc.) arrived at in the DRI national projection. The results were accumulated for each five-year period as totals and also expressed annually.

For the period 1990-1995, the results of the 4 percent cumulative cut are disastrous, with almost 56,000

Economic effects of shift from Cold War to post-Cold War military budgets: Minnesota, 1990-1995

Industry Title	Employment			Earnings			Value added			Gross output		
	Direct (no.)	Indirect (no.)	Total (no.)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)
1 Agric., forestry & fish	882	-31	854	8	0	8	51	0	51	142	1	143
2 Mining	776	-546	231	21	-15	5	23	-27	-4	60	-59	1
3 Construction	-3164	-2500	-5664	-60	-51	-111	-70	-60	-130	-205	-161	-366
4 Mfg. non-durables	468	-1114	-646	41	-27	14	54	-41	14	175	-165	9
5 Mfg. durables	-12263	-548	-12812	-325	-32	-357	-372	-70	-443	-686	-136	-821
6 Trans. comm. & util.	803	-1265	-461	14	-38	-24	21	-77	-56	-24	-165	-142
7 Wholesale trade	-1145	-1622	-2767	-29	-44	-72	-48	-74	-121	-71	-111	-182
8 Retail trade	-12956	-7626	-20582	-110	-71	-181	-173	-124	-297	-313	-199	-512
9 Fin. insur. & real est.	-333	-2404	-2737	4	-31	-27	-71	-172	-243	-82	-235	-316
10 Private services	-617	-8340	-8954	27	-133	-106	24	-196	-172	59	-332	-272
11 Government	430	-2673	-2242	6	-52	-46	14	-62	-48	15	-67	-51
Total	-27119	-28669	-55780	-403	-494	-897	-547	-904	-1450	-882	-1629	-2511

(Reflects cumulative 4 percent cut in federal military spending) (See Appendix A for detailed 75-industry breakdown.)

fewer job-years of employment than the state would have had in the base-line scenario, \$897 million less in earnings, and \$2.5 billion less in Gross Output. See table above. **These figures imply a level of social pain and economic waste that Minnesotans would be unwilling to endure.** The alternative would be to provide income support and retraining for workers wherever possible, and to pursue a vigorous, proactive state strategy of conversion, finding alternative non-military products wherever possible to save existing jobs and create new ones. The state would have benefitted from adopting such policies in the mid-1980s, before the 29 percent drop that occurred between 1987 and 1989. Those policies now need to be put in place quickly, almost on an emergency basis.

For the 1995-2000 period, the projection with the cumulative 4 percent military cuts shows a dramatic turnaround, with 329,500 more job-

years of employment in the state than the base-line military budget would have provided, a gain of \$6.2 billion in earnings, and a gain of \$24 billion in gross output. This is largely because the national conditions projected by DRI favor exports, and a relatively high proportion of Minnesota's output is for export, particularly in agriculture and durable goods. Because the accumulating 4 percent would have erased the federal deficit by the late 1990s, it would no longer be necessary to attract the foreign lenders who bought so much federal paper during the 1980s. Interest rates would be low, and the dollar could be held low, vastly improving the climate for export industries.

These conditions are reflected in the DRI national scenarios by the very large differences in the current account balance. In the base-line scenario, the model still predicts a foreign trade deficit of \$132 billion in 1999, up to near its 1988 level and

Economic effects of shift from Cold War to post-Cold War military budgets: Minnesota, 1995-2000

Industry Title	Employment			Earnings			Value added			Gross output		
	Direct (no.)	Indirect (no.)	Total (no.)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)
1 Agri. forestry & fish	5760	5428	11187	50	51	100	339	274	613	960	941	1901
2 Mining	4784	-4015	769	128	-106	22	139	-69	70	371	-248	123
3 Construction	23109	20825	43934	458	442	900	535	514	1049	1494	1339	2833
4 Mfg. non-durables	20226	6568	26792	579	210	789	871	375	1246	3027	1512	4540
5 Mfg. durables	5348	11980	17331	191	375	566	375	472	848	1265	1117	2382
6 Trans. comm. & util.	6676	13046	19721	181	398	579	344	795	1139	625	1725	2349
7 Wholesale trade	3376	16692	20068	84	439	523	140	741	881	210	1113	1323
8 Retail trade	-8012	64398	56387	-39	604	565	-47	1014	966	-194	1628	1425
9 Fin. insur. & real est.	9637	16460	26097	65	190	254	1026	1398	2425	1277	1782	3059
10 Private services	12233	66629	78864	208	1061	1269	267	1574	1841	502	2675	3178
11 Government	3067	25307	28373	44	539	584	42	574	616	51	604	656
Total	86204	243318	329523	1949	4202	6151	4032	7661	11693	9589	14188	23777

(Reflects cumulative 4 percent cut in federal military spending) (See Appendix B for detailed 75-industry breakdown.)

getting worse, whereas in the four-percent military cut scenario, the foreign trade deficit would be \$43 billion, and would be continuing to drop toward the zero point where exports and imports would be in balance. In the base-line scenario, with its much lower level of U.S. exports, the Minnesota economy would stumble along with little growth through the 1990s. In the scenario with the military cuts, Minnesota's economy would experience terrific expansion during the second half of the decade, and would be growing vigorously as the year 2000 approached. An additional reason for Minnesota's strong rebound might be that so much of its military reduction came in the late 1980s; being ahead of the nation in absorbing Pentagon reductions, it would also be ahead of the nation in recovering from them.

Easing the Pain of Economic Transition, 1990-2000

If all the revenue cut from the military could remain in the public sector and be diverted from military to social spending, the adverse effects of military cuts in Minnesota would be easier to mitigate, since most forms of public spending are better job creators than weapons spending. The Task Force's May 1989 report summed up the effects of diverting 25 percent of military procurement spending into a mix of social and infrastructure spending this way:

The IPASS model predicts that the budget-neutral shift from military spending to social

services would create 9,424 new jobs and \$667 million in additional gross output. Thus, the new domestic spending more than offsets losses caused by military cuts. (Maki *et. al.*, 1989, p. 13)

Of course, there would be a good deal of painful dislocation behind these net gains, and a need to support affected workers and industries with a state conversion program. An engineer cannot simply turn into a teacher overnight, nor can a machinist instantly change into a health technician. The table below shows that durable goods industries would particularly need conversion help. It also shows, however, that the overall economic picture would be quite good, creating a climate in which conversion and retraining would be possible.

One further benefit of increasing infrastructure spending (a benefit not accounted for in the above table), is that it tends to increase productivity and profits. The October 1987 *Chicago Fed letter* stated that "statistical analysis indicates that the level of public capital strongly influences the net return to private capital." According to the Fed analysis, a 10 percent increase in public capital would increase the profit rate in the national economy by 12.6 percent.

The point is made even more strongly in the September 1988 letter: "a root cause of the decline in competitiveness of the United States in the international economy may be found in the low rate at which our country has chosen to

Combined Effects of New Domestic Spending and a 25 Percent Cut in Procurement Spending

Industry	Employment			Earnings			Value added			Gross output		
	Direct (no.)	Indirect (no.)	Total (no.)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)
1 Agriculture, forestry	58	67	125	0.7	0.5	1.3	1.6	2.9	4.5	3.6	10.5	14.0
2 Mining	57	12	69	1.7	0.4	2.1	3.1	0.8	3.9	5.6	1.1	6.8
3 Construction	835	992	1,826	35.1	41.8	76.9	41.0	48.9	89.8	112.5	134.5	247.0
4 Mnfg., Non-durables	379	156	535	10.3	4.7	15.0	17.6	7.8	25.4	76.3	31.4	107.7
5 Mnfg., Durables	-5,242	1,009	-4,233	-195.1	23.0	-172.1	-238.4	18.9	-219.5	-442.1	44.0	-398.1
6 Transportation, communications, utilities	300	318	618	8.3	10.0	18.3	17.8	19.5	37.3	28.5	41.6	70.1
7 Trade	2,366	1,551	3,917	35.0	25.6	60.7	58.3	43.7	102.0	89.9	66.0	155.9
8 Finance, insurance & real estate	411	421	831	9.7	10.3	20.0	60.4	40.6	101.0	81.5	59.7	141.3
9 Private services	4,566	980	5,547	107.5	23.0	130.6	143.6	38.3	181.9	252.8	60.9	313.6
10 Government	81	108	189	2.2	3.0	5.2	2.5	3.3	5.7	6.4	2.4	8.7
11 Total	3,811	5,613	9,424	15.5	142.4	157.9	107.4	224.7	332.1	215.0	452.1	667.1

Source: Interactive Policy Analysis Simulation System, 1989.

add to its stock of highways, port facilities, airports, and other facilities which aid in the production and distribution of goods and services.”

Increased federal infrastructure spending, and especially increased spending on education, would increase the productivity and competitiveness of Minnesota’s economy, with its large proportion of high-tech export products. Also, according to former state Economic Development Commissioner David Speer (speaking on Minnesota Public Radio, Dec. 27, 1990), infrastructure improvements are a key factor in developing manufacturing industries outside the Twin Cities.

Unfortunately, because of the irresponsible fiscal policies of the 1980s, it is unlikely that policymakers of the 1990s will be able to shift Pentagon savings dollar-for-dollar to socially productive uses. Many of the good effects predicted in the DRI projection would come about only because the federal deficit was going down, and some portion of military savings will probably have to be applied to deficit reduction.

From the Task Force’s point of view, the best federal policy would probably be cumulative

military cuts on the order of 8 percent a year, with at least half of that applied to social and infrastructure spending, and with strong support for conversion, retraining, and dislocated worker support funded from the military cuts. To avoid a counter-Keynesian policy, a higher proportion of the military cuts should be recycled through social and infrastructure spending while the economy is in recession. In a period of expansion, more should be applied to deficit reduction.

At the state level, Minnesota must recognize the long-term trend of decline in military procurement and implement a state conversion policy as a way of keeping Minnesotans productively employed. The state must also prepare ways to mitigate the social and economic pain that is already occurring in military-dependent economic sectors and that is likely to be intense in the early 1990s, according to the DRI and IPASS projections. Minnesota will also have to monitor and assess trends in federal spending carefully, and to plan its own conversion programs accordingly. For example, Minnesota’s professional and scientific instruments industry, very hard hit by military cuts, will find it easier to convert to environmental monitoring equipment (much of it for export) if the federal deficit is in fact being reduced and the conditions for export of U.S. products are improving.

Conversion Experience

Having examined the impacts of the changes in defense spending between 1987 and 1989, and having explored the likely impacts of two alternative future scenarios, we now need to examine the nature of the conversion process itself. As these past and projected trends indicate, industries and occupations crucial to the state’s future economic development are at stake. Both scenarios give reason for general optimism about a future Minnesota economy, yet both imply the certainty of very painful adjustments for workers and industries presently depending on military production. Evidence of this has already appeared in the significant layoffs of the past two years.

Layoffs are a most cruel and inefficient effect of changes in economic circumstances. The personal trauma for the discharged workers also becomes a community trauma as the lost wages and productivity mean less money available for consumption in local supermarkets, department stores, and the like. Research into layoffs following the Vietnam War indicated that, one year after layoff, weapons industry workers had lost, on the average, half their salary — including

those who had found other jobs as well as those still unemployed.

The research also indicated that the youngest and best educated had the least trouble finding alternative employment, but those workers were also the most mobile and most often found new employment in other labor markets. Workers generally in smaller labor markets (such as Denver and Tucson, rather than Boston, New York, or San Francisco) suffered the most in unemployment and lost income, and were most likely to relocate in search of employment. (Eaton, 1973)

Job dislocations due to reductions in military spending invariably add to the public costs of the unemployment associated with plant shutdowns. A large part of the burden of worker dislocations in military production is now borne by the workers and businesses generally, rather than by the activities that directly contribute to these costs.

For these and other reasons, economic conversion in the 1990s represents a vital public policy concern. While the scenarios analyzed suggest

eventual recovery, the state would also suffer some irreplaceable losses. These would include the human cost in psychological distress, family violence, alcoholism, and suicide that accompany unemployment, and the economic waste of skilled workers whose talents were not used in new productive enterprise. They could also include a significant "brain drain" to other regions of the nation because the layoffs have included and will continue to include significant numbers of scientists, engineers, and other highly mobile technical specialists who will leave Minnesota if there is no demand for their services.

Conversion and Diversification: Case Analyses

For as long as there have been war industries, conversion has been occurring, with or without conscious, deliberate conversion policies. Conversion to weapons production, for example, occurred in the U.S. at the beginning of World War II, as did conversion back to civilian production at the end of that conflict. Though the U.S. has had a militarized economy throughout the Cold War (from the late 1940s to the late 1980s), some conversion occurred after the Korean and Indochinese wars.

There is no insurmountable technical barrier to conversion, though the complexity of modern weaponry and civilian industrial products makes conversion planning, technical assistance, and worker retraining more important than ever. The highly specialized and customized technology that has marked the path of Pentagon weapons development since the Vietnam War means that fewer and fewer weapons products can be shifted easily and directly to commercial applications. Thus, firms and workers heavily dependent on arms manufacturing are much more at risk in 1990 than they would have been in 1950 or 1960. More and more, the conversion process requires careful planning for alternative products.

The main barriers to conversion have been political and financial. The Soviet decision to end the Cold War has certainly weakened those barriers, though there is still strong political resistance to conversion in the United States. In other parts of the world, there have been some notable conversion efforts, and the list of U.S. cases is getting longer as well.

United States: Unisys

Faced with an apparently unending series of layoffs at Unisys' Shepard Road plant in St. Paul, Minnesota, officials of the International Brotherhood of Electrical Workers (IBEW) #2047 approached the Minnesota Task Force on Economic Conversion for assistance in January 1989. With the help of the Task Force, Minnesota Jobs with Peace, and the Working Group on Economic Dislocation, they began to formulate an alternative-use plan. Starting with shop floor meetings and questionnaires distributed to workers, the union produced a list of alternative products that could be made by the existing work force at the Unisys facility. Two state government grants and a small city grant were obtained to make a comprehensive study of the industry, and hire a consulting firm to evaluate the list and select the most feasible products.

One local Unisys manager dismissed conversion by saying: "We're not going to make shopping carts here," but no such product appeared on the final list. Instead, it included transportation management and control systems, intelligent vehicle highway systems, and smart irrigation systems, which would integrate various products with Unisys' existing computer and electronics capacity. The list also included low power electronic lighting ballasts, which would use the Unisys work forces' assembly skills to make a product that, when coupled with other new technologies, can help save as much as 92 percent of the electricity now used for lighting in the United States, while maintaining lighting at its existing level. The new product suggestions were announced at a press conference at the plant gates, with Governor Perpich appearing in support of the plan. Senator Paul Wellstone and St. Paul Mayor Jim Scheibel have also spoken in favor of converting to the new products.

Unisys management so far has been unwilling to cooperate in implementing the conversion plan, though it has announced plans to build and operate one of the products suggested in the June 1990 consultant's report, a satellite-based remote sensing system (*Wall Street Journal*, Nov. 30, 1990, and *Computerworld*, Dec. 13, 1990). This demonstrates that alternative-use committees can identify products management finds feasible. Unfortunately, it is not clear whether the new product will benefit the St. Paul workers or the state of Minnesota which helped pay for the consultants report, as the new facility is to be located in Salt Lake City. Even if Unisys were

willing to cooperate in conversion, there is some doubt about whether it could finance and manage the whole undertaking, as the corporation is in such disarray. Management has agreed to some limited-agenda meetings with workers, and various alternatives, including Unisys' incubation and spin-off of new products, are still actively being pursued.

United States: Frisby Airborne Hydraulics

Frisby Airborne Hydraulics, a small company with about 100 employees in Freeport, Long Island, reduced its military contracts from 95 percent of gross revenues in 1980 to 20 percent in 1990. Beginning with a personal and business decision made by brothers Greg (chairman) and Jeff (president) Frisby, the conversion was pushed along by the collapse of Fairchild, a major Long Island military contractor and purchaser of Frisby components. And the company got assistance from the Federal Small Business Industrial Research program. For the most part, Frisby did not so much change its basic products as change their applications, so they could be used on civilian aircraft. But developing a network of commercial customers and responding to their needs turned out to require fundamental change.

When Frisby produced for the military market, it had a very hierarchical corporate structure, with a factory boss whose nickname was "the General" carrying out management's orders in the plant. When the Frisby brothers decided to convert, they also decided to remove the screen between themselves and their workers; several middle management positions were eliminated as they changed over to "management by walking around" and even by sitting on the floor to discuss things with workers. Says Greg: "One has to change the company's entire culture to make the transition. Bringing employees into decision making is the single most important factor." Jeff puts it this way: "The people who operate the machines have to tell you how to make the transition." (A half-hour videotape, "The Frisby Success Story," is available from The Center for Defense Information, 1500 Massachusetts Avenue, Washington, D.C. 20005.)

United States: Kaman Corporation

This Connecticut company started out producing military helicopters, but soon saw the risks of relying on cyclical Pentagon orders, and adopted a diversification program with the strong support of the company's founder and namesake. Adapting a technology that had been used to damp vibrations in wooden helicopter blades, Kaman used it to

make guitar bodies vibrate better, and has become one of the world's largest makers of musical instruments. Even after this success, the company continued its intensive internal product development, and also began to buy small bearing firms. By 1975, bearings were Kaman's largest commercial operation, and by 1979, the company was one of the top five bearing distributors in the U.S. Through an early recognition of the need to diversify and a thoughtful commitment from the top, Kaman outgrew its military origins.

Kaman is one of the more spectacular success stories in conversion, and was featured on the "McNeil-Lehrer News Hour" on Jan. 26, 1990. But there is one drawback: most of the new activity bypassed Kaman's aerospace personnel. As Robert DeGrasse says: "The goals and standards familiar to those in defense production were not compatible with commercial success. Explains one Kaman executive, 'The thinking in the aerospace division is that performance is everything.'" (De Grasse, 1987, p. 98)

United States: Boeing Vertol

Boeing's Philadelphia plant produced Chinook helicopters during the Vietnam War. As the war ended and demand plummeted, the firm decided to produce mass transit cars. After exploratory contracts for development with the U.S. Transportation Department, Boeing secured early orders from the Boston Massachusetts Bay Transit Authority and from San Francisco's Bay Area Rapid Transit system totalling \$68 million. In order to avoid late delivery penalties, Boeing Vertol delivered the first cars to Boston before proper development and testing had been completed. Almost immediately, the cars exhibited severe reliability problems, and these persisted to the point where the MBTA refused to accept delivery on the final 40 cars.

The company's products performed better in San Francisco and Chicago, but by 1980 Boeing had left the market due to sluggish sales and reduced Transportation Department support for urban mass transit. (Rohr Industries, another aerospace contractor who tried to enter the mass transit field, had an experience very similar to Boeing's, with delayed deliveries and reliability problems; three years after entering service, Rohr's BART cars were falling apart. Like Boeing, the company did not understand the time required for development and testing.)

At the peak of the Vietnam War, Boeing employed 13,000 people in Philadelphia; by the mid-1970s, this number had dropped to 4,300. At its best, mass transit production employed no more than 550, so that most laid-off workers were not re-employed.

Almost all those who worked on mass transit were converted from helicopter production, except a few engineers recruited from other mass transit companies.

United States: Raytheon

Raytheon, a New England electronics and defense firm, followed a diversification strategy. First efforts failed for lack of commercial marketing experience. Then, in 1965, the company acquired Amana, a maker of refrigerators, freezers, and air conditioners. Raytheon used Amana to market the "Radar Range," a microwave oven spun off from Raytheon's military work. Then they acquired Caloric, maker of gas ranges and other kitchen appliances, and added clothes washers and dryers in 1979. Raytheon often outperformed other home appliance firms in these markets.

This looks like a success story, but there's an important catch: it was a diversification, not a conversion, and there was little crossover of personnel. Of the 8,000 military employees Raytheon laid off in the Boston area in the late 1960s, very few were retrained for commercial production. According to De Grasse: "The Raytheon management expressed scepticism about economic conversion. They feel that planning in advance for possible cutbacks is not appropriate because technologies change rapidly, and because money is not available for such efforts, given the strict regulations regarding defense contracting." (DeGrasse, 1987)

Britain: Lucas Aerospace

In 1975 and 1976, shop stewards working at Lucas Aerospace, which had 13,000 employees at 17 factories, drew up a detailed plan for socially useful products and new forms of employee development. The plan involved 150 products such as medical equipment and alternative energy technologies, and was put forward as a way to stop threatened layoffs and to turn away from arms production. The plan showed that credible new ideas could come from ordinary workers, and was thus a challenge not only to management and to the British government, but also to the trade union hierarchies. The plan precipitated a lengthy struggle (1976-1981) involving the Labour Party, management, the unions, and successive national governments.

In the end, the plan was not implemented at Lucas, although some of the suggested new products were successfully manufactured elsewhere. Management did, however, cancel or delay most of the planned layoffs because of worker activism, so the workers did gain

something. They ultimately changed the position of most unions and the Labour party itself toward conversion. And they made history, for the Lucas plan has become a celebrated paradigm case, discussed in numerous books, articles, and studies.

Simply creating the Central Combine Committee and articulating a credible plan was a great achievement, given the multi-site, multi-union situation at Lucas. Because engineers and other white-collar workers are also unionized in Britain, it's hard to imagine an exact Lucas parallel arising in the United States. But one important lesson to be drawn from the Lucas case is that workers threatened with job loss have the motivation, knowledge, and creativity to be the source of useful new ideas. The Lucas plan also formulated clear criteria of social utility for alternative products and became an example to conversion planners at Barrow-in-Furness, Llangenerch, and other places in Europe. It's worth noting that when Unisys workers began their shop-floor survey of new product ideas, they adapted a questionnaire from the Lucas plan to begin their efforts. (Renner, 1990, Wainwright & Elliott, 1982, and Mel Duncan, information from site visits.)

Germany: Messerschmidt-Bolkow-Blohm (MBB)

One of the 20 or so worker-initiated alternative-use committees in Germany is at the MBB plant in Augsburg. In 1988, that group was the catalyst in bringing about a unique partnership between MBB and the city government of Augsburg. The partnership is to explore how MBB's knowledge can be applied to environmental problems rather than deadly weaponry. It started with a focus on boosting energy efficiency and reducing water pollution by Augsburg's textile industry; according to the plan, it will next move on to explore environmentally safe methods of urban transportation.

Combining environmental improvement with secure employment is an explicitly stated goal of the partnership. The Augsburg project carries two important lessons: first, that local government can be involved in conversion in a creative and effective way; and second, that environmental improvement is a promising new area for converted facilities to move into. The need is great, the political support for environmental protection is strong, and the problems require technical and engineering skills comparable to those involved in military production. (Renner 1990)

Italy: Aermacchi and Galileo

Partially inspired by the Lucas plan, the three Italian metalworkers' unions have issued a joint statement supporting conversion. The unique feature of the unions' position is their demand that a clause committing weapons company management to increase the share of civilian production should be made part of collective bargaining agreements. In 1988 and 1989, contracts including such a clause were signed at the aircraft producer Aermacchi and at the optics firm Galileo. The idea of making conversion and alternate-use plans part of collective bargaining is a creative one with a great deal of potential.

In addition to the activities at these two companies, Italy has a network of "military industry observatories" affiliated with labor unions, the peace movement, and universities. Groups exist in Milan, Genoa, Florence, Bologna, and Rome. Archivio Disarmo in Rome has studied five military companies, and has formulated, in consultation with shop stewards, a local conversion plan that identifies 40 alternative products that could be manufactured with existing technologies. The Tuscany Economic and Social Research Institute in Florence is building up a local data base and helping a small aviation electronics company formulate its diversification plan. (Renner 1990 and Mel Duncan, information gathered from site visit.)

The Soviet Union: National Plan

As a result of the INF (Intermediate Nuclear Forces) Treaty and of various unilateral arms reductions undertaken by the Soviets, economic conversion is a pressing problem in the Soviet Union. Soviet leaders decided to slash arms output by 20 percent between 1988 and 1990. Further military cuts are planned, with reductions of one-third to one-half of current spending by the late 1990s. In several instances, direct conversions have been attempted, such as converting SS 20 missile launchers to self-propelled hoisting cranes, or shifting machine tool plants to making oil-drilling rigs and metal-cutting equipment.

Conversion experts in the West have tended to assume that conversion would be easier in a centrally planned economy, but so far that has not been true. According to Worldwatch Institute researcher Michael Renner, Soviet conversion has proceeded on an *ad hoc* basis; decisions on military cuts have come out of the blue, giving factory managers no time to plan for cuts. Many of the alternative civilian products selected for production by central bureaucrats have not been

well matched to the skills and equipment of the factories slated for conversion, and there has been too little attention paid to the opinions of workers and local managers.

President Gorbachev has committed his government to converting hundreds of Soviet factories during the 1990s, and some order is being introduced into the process. A National Commission on the Promotion of Conversion has been formed, and it appears that 25 billion rubles cut from the military budget will be made available to facilitate conversion. Gorbachev is aware of Minnesota's Conversion Task Force, and inquired about it during his visit here; continuing contacts have been arranged between the Task Force and the head of the Soviet National Commission. Also, the Soviet Ministry of Defense and the State Committee for Labor have established a retraining program to help discharged soldiers make the transition to civilian jobs.

There is no shortage of needs to which a Soviet "peace dividend" could be applied. A 10-billion ruble increase in housing funds, for example, would allow a 30 percent increase in housing construction. Many Soviet schools need funds for such basics as running water and plumbing. And there is an enormous shortage of quality consumer goods. The large-scale Soviet effort is of great interest, and conversion questions in the Soviet Union will now be complicated enormously by the simultaneous transition from central planning to a market economy. Perhaps the two things the United States could learn from Soviet conversion so far are the need for coordination of military budget cuts with conversion plans, and the importance of strong local input in formulating alternative-use plans. (Renner 1990, and correspondence & discussion with Soviet conversion workers)

China: National Plan

One of the most interesting large-scale conversions has occurred in China. After 15 years of intense weapons development, China found itself with excess military production capacity in the late 1970s. Chinese leaders launched an ambitious conversion effort. Military factories were told to help reduce consumer goods shortages and were made responsible for their own profits and losses. Between 1978 and 1983, military factories doubled their civilian output to 20 percent; by 1990, 70 percent of their output was for civilian consumption. Some facilities underwent complete conversion to civilian

production, while the great majority (73 percent) continued to produce both military and civilian goods, undergoing a change more aptly described as diversification.

Chinese conversion has not been an unqualified success: some plants have failed to produce any marketable civilian products, while others have been too inefficient to compete in the consumer arena. Michael Renner of Worldwatch Institute concludes: "Despite these shortcomings, China has taken a bold step worth following elsewhere. Although the particulars of the experiment may not be of much practical relevance to countries with vastly different societies, the general idea is what counts. Measured by its own yardstick, China's conversion undertaking has been fairly successful." (Renner 1990)

Conclusions from Case Studies

In examining the case studies, we found that certain features seem crucial to a successful conversion process:

1. Management understanding and willingness.

The Unisys manager quoted above, who didn't want to "make shopping carts," and the Raytheon sceptics are not alone. *Business Week* quotes Richard M. Allen, deputy director for legislation at the California Commerce Department, as saying: "What is the government going to do? Tell these people they have to make refrigerators?" (July 2, 1990). And Jim Ashton, vice-president and general manager of FMC's Fridley-based Naval Systems Division, told the *St. Paul Pioneer Press* (Dec. 17, 1990): "I'm very uninterested in trying to diversify this plant out of the defense business. It's real hard to figure out how those skills [machinists, metalworkers] apply to commercial opportunities." (Mr. Ashton was speaking from a plant that has suffered continuous layoffs since 1985.) Such remarks betray a failure to understand conversion or to take it seriously. DeGrasse and other writers have noted that management and engineers have much more trouble adapting to commercial production than do line employees.

On the other hand, at Frisby and Kaman there were owner-operators who understood that conversion could save their workers' jobs and could make them money. They committed their companies to the process early and strongly, which is an important ingredient for success.

2. Shop floor participation. Both the Lucas plan and the Unisys plan show that alternative-use committees involving labor and community

interests can be important catalysts in conversion, discovering new products and ways to make them. Frisby Airborne Hydraulics also relied heavily on input from the shop floor. It's ironic that the Soviet Union has had serious problems because of failure to include workers in the conversion process, while capitalist owners like the Frisby brothers were able to simply sit down and talk with them.

3. Labor force retraining. In too many cases of diversification, the companies did what Raytheon did—lay off military workers and hire a different work force to produce the commercial products. In many such cases, neither human nor capital resources were actually converted. Diversification often involved acquiring another firm, or developing a new plant and new labor force. The dislocations and social costs of military cutbacks can be minimized by retraining, and this seems an appropriate area for government support, both locally and nationally. As DeGrasse notes in summing up his report on case examples:

Finally, the case studies clearly suggest that diversification and adjustment require significant reorientation of employees engaged in defense-related work to the demands of the commercial market. The need for retraining is particularly important in the cases of engineers and managers. (DeGrasse, 1987)

Retraining is not, however, a panacea. Training must identify and take into account the transferable skills of the work force. And it must be carefully targeted at conversion projects where there is a high likelihood of employment being available for the retrained worker.

4. Advance planning. Planning typically begins too late, after losses in defense work. In the cases studied, successful firms needed at least two years to adjust fully and successfully to the demands of the commercial market. For many cases, this meant that people were laid off. There is considerable variability, depending on the size and financial condition of the company, the nature of its defense work, and the characteristics of new products. Rockwell, for example, began planning in 1985 for the end of the B-1 bomber program in 1988. With shrewd acquisitions and moves into non-defense electronics, computerized manufacturing, and civilian space work, Rockwell has lowered military work to about 25 percent of its total. Boeing Vertol (and many others) did not plan far enough in advance. Every major military contractor should have alternative-use plans on file, and should continuously update them in consultation with workers and affected communities.

5. Marketing and sales. In virtually every case study investigated, a reoriented sales policy was vital. The Frisby Company hired an entirely new sales staff who developed a comprehensive sales program. Marketing for one single-source customer — the Pentagon — is very different from marketing for commercial ventures.

In the conversion experiences reported by DeGrasse, market research, processing, and post-purchase service have been particularly troublesome for defense firms. Failure to meet the needs of customers for installation, service, and maintenance support have been characteristic of conversions that have not gone well, as, for example, at Boeing Vertol. In pricing, defense firms tend to base price on cost plus, rather than on an analysis of the price that will be competitive in less controlled markets. Large firms moving from military to commercial work also seem to underestimate the vigor of their competition.

6. Product development and manufacturing problems. New product development involves all facets of a firm's resources: research and development, the labor force in the shop, the sales force, and marketing. The orientation and the skills that are essential for success in commercial markets are not the same as those in military work. Military contractors have built up huge bureaucracies to market to a single customer — the Pentagon — while commercial firms must

market to dozens of buyers simultaneously. Weapons firms tend to over-design new products, striving for highly sophisticated state-of-the-art results. And they take up to five times longer than commercial companies to develop new products, according to National Science Foundation Director Eric Bloch (cited in *Business Week*, July 2, 1990). Some weapons firms just build to Pentagon specifications rather than take risks on their own designs. When seeking to perform in commercial markets, defense firms tend to encounter quality control problems stemming from inadequate testing. In defense work, a company may be producing one unit with a thousand parts; in commerce, a company is usually producing thousands of units with few parts.

7. Government assistance, community tie-ins, and socially useful products. Many successful conversion projects made use of government help. Thus, Frisby got assistance from the Commerce Department, and the Unisys alternative-use committee received state and city grants. In the Messerschmidt-Augsburg case, the company developed a formal relationship with local government to achieve certain socially desirable objectives. The Minnesota Task Force on Economic Conversion has adopted a specific set of criteria for evaluating the social usefulness and environmental soundness of proposed new products.

Appendix A — Total economic effects of the difference in final sales due to shift from Cold War to post-Cold War military budgets: Minnesota, 1990-1995

Industry Title	Employment			Earnings			Value added			Gross output		
	Direct (no.)	Indirect (no.)	Total (no.)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)
1 Livestock	279	-17	263	2.4	0	2.3	9.6	0.3	9.8	51.8	1.5	53.5
2 Food & feed grain	428	-34	395	3.4	-0.2	3.2	38.1	-0.9	37.2	83.9	-2	81.9
3 Agricultural services, forestry & fish	175	20	196	1.9	0.2	2.1	3.3	0.5	3.8	6.5	1	7.5
4 Iron ore mining	729	-518	212	19.8	-13.7	6.1	20.9	-14.4	6.5	57.1	-39.4	17.8
5 Other metal mining	4	-5	-1	0.1	-0.2	0	2	-0.2	0	0.3	-0.4	-0.1
6 Coal mining	9	-1	8	0.1	0	0	0.1	0	0.1	0.2	0	0.2
7 Petroleum & natural gas	0	-12	-12	0	-1.3	-1.3	-0.1	-11.6	-11.7	-0.1	-18.6	-18.8
8 Stone & clay	34	-10	24	0.8	-0.2	0.6	1.4	-0.4	1.1	2.6	-0.6	1.9
9 Chemicals, fertilizers & minerals	0	0	0	0	0	0	0	0	0	0	0	0
10 New construction	-3494	-2051	-5545	-68.1	-40	-108.1	-79.6	46.7	-126.3	-226.1	-132.7	-358.8
11 Maintenance, repair & construction	330	-449	-119	8.3	-11.3	-3	9.6	-13.1	-3.5	20.9	-28.5	-7.5
12 Ordnance & accessories	-6781	593	-6188	-178.4	15.6	-162.8	-205.2	-0.4	-205.5	-365.1	-0.7	-365.7
13 Meat products	87	-176	-89	2.2	-4.4	-2.3	2.6	-5.5	-2.8	19	-39.4	-20.4
14 Dairy products	131	-26	106	3.4	-0.5	2.9	6.5	-0.7	5.7	45.7	-5.2	40.4
15 Grain mill	21	-1	20	-0.5	0	0.5	1.3	0	1.3	5.7	0.1	5.9
16 Food, NEC* & tobacco	19	-206	-188	0.5	-5.6	-5.1	0.8	-10	-9.1	3.4	-41.1	-37.6
17 Textile goods	56	-25	31	1	-0.4	0.6	1.3	-0.5	0.8	4.9	-2	2.9
18 Apparel & related products	-1668	-5	-1673	-21	-1.5	-22.5	-28.4	-2.9	-31.3	-83.4	-8.5	-91.8
19 Logging	5	26	32	0.1	0.6	0.7	0.2	1	1.2	0.6	3.4	4
20 Other wood products	318	-121	197	6.7	-2.3	4.4	9.2	-3	6.2	32.3	-10.6	21.7
21 Furniture & fixtures	7	-53	-46	0.2	-1.1	-1	0.2	-1.6	-1.4	0.5	-4	-3.5
22 Paper & allied	1085	-138	946	39.8	-2	37.7	56	-2.1	54	174.7	-6.4	168.3
23 Printing & publishing	1142	-398	745	24.1	-7.6	16.6	35.3	-10	25.3	85.2	-24.2	61
24 Chemical & allied	-134	-35	-169	-3.9	-1.5	-5.4	-7.4	-2.9	-10.3	-22.6	-8.9	-31.6
25 Petroleum refining	-60	-21	-81	-2.6	-1.3	-3.9	-6.4	-3.1	-9.5	-47	-23.1	-70.1
26 Rubber & plastics	295	-32	263	6.6	-0.3	6.3	9.2	-0.2	9	24.5	-0.5	23.9
27 Leather products	-506	-51	-557	-9.7	-1.6	-11.3	-16.4	-2.8	-19.1	-35.5	-6	-41.5
28 Glass, stone, clay	423	-55	368	9.2	-0.5	8.7	12.4	-0.7	11.7	32.6	-1.9	30.8
29 Ferrous metals	0	-9	-9	0	-0.3	-0.3	0	-0.4	-0.4	0	-0.9	-0.9
30 Primary metals, NEC*	90	-18	72	2.6	-0.4	2.2	3.2	-0.5	2.7	7.8	-1.1	6.7
31 Fabricated metals NEC*	719	-200	519	21.2	-4.6	16.6	31	-6.4	24.6	75.8	-15.7	60.1
32 Computers	-2252	-461	-2714	-69.2	-21.2	-90.3	-86.2	-28.5	-114.6	-159.8	-52.8	-212.6
33 Other office equipment	-13	-6	-19	-0.4	-0.2	-0.6	-0.5	-0.3	-0.8	-1.1	-0.7	-1.7
34 Construction & mining equipment	101	-12	89	3	-0.1	2.8	3.7	-0.1	3.6	11.4	-0.4	11
35 Non-electrical machinery NEC*	-62	-255	-317	-1.8	-8.3	-10.1	-2.4	-11.3	-13.7	-5.8	-26.8	-32.6
36 Electrical industrial apparatus	-509	-55	-564	-12.3	-2.5	-14.8	-16.6	-3.7	-20.3	-37.8	-8.5	-46.3
37 Household appliances	91	-14	77	2.2	-0.2	2.1	3	-0.2	2.8	10.3	-0.7	9.6
38 Communication equipment	-1975	-338	-2313	-46.7	-11.5	-58.2	-51.1	-13.7	-64.8	-99.3	-26.6	-125.9
39 Electrical components & accessories	-498	30	-468	-12.3	-0.2	-12.5	-14.4	-0.5	-15	-38.2	-1.4	-39.6
40 Misc. electrical equipment	-113	-53	-167	-2.8	-1.7	-4.5	-3.7	-2.3	-6	-10.7	-6.7	-17.4
41 Motor vehicles	-18	-22	-40	-0.6	-0.9	-1.5	-0.9	-1.3	-2.1	-3.8	-5.5	-9.3
42 Other transportation equipment	-1051	638	-413	-24	13.7	-10.3	-23.4	13.3	-10.1	-78.5	44.8	-33.8
43 Professional & scientific instruments	-466	-38	-504	-13.3	-2.2	-15.5	-17.4	-3.4	-20.7	-31.8	-6.2	-38
44 Medical instruments & supplies	58	-46	12	1.7	-1.3	0.4	2.6	-2	0.6	5	-3.8	1.1
45 Misc. instrument products	-325	-23	-348	-9.4	-1.5	-10.9	-15.8	-2.9	-18.7	-29.5	-5.4	-34.9
46 Misc. manufacturing	-12	-56	-68	-0.2	-0.9	-1.1	-0.3	-1.5	-1.8	-0.7	-3.4	-4.1
47 Railroad transportation	220	-40	180	6.7	-0.9	5.8	8.1	-0.9	7.2	15	-1.6	13.4
48 Local & intercity transportation	276	-140	137	3	-1.5	1.5	4.4	-2.2	2.2	6.2	-3.1	3.1
49 Trucking	528	-236	292	13.3	-5.7	7.6	20.8	-8.8	12	34.9	-14.8	20.2
50 Water & pipe lines	35	-22	12	0.7	-0.4	0.3	1.7	-1	-0.7	5.3	-3.2	2
51 Air transportation	-186	-178	-363	-6.9	-7.7	-14.7	-9.6	-10.7	-20.3	-30.6	-34.3	-64.9
52 Transportation services	37	-79	-42	0.7	-1.5	-0.8	1.1	-2.4	-1.3	1.9	-4.2	-2.3
53 Communication services	-121	-360	-481	-3.8	-12.8	-16.7	-7.8	-26.3	-34.1	-10.2	-34.6	-44.8
54 Electric utilities	35	-121	-86	1.1	-4.2	-3	4.3	-16	-11.7	-8.9	-32.8	-23.9
55 Gas utilities	-15	-67	-82	-0.5	-2.3	-2.7	-1.5	-7.5	-8.9	-6.9	-34.5	-41.3
56 Water & sanitation	-6	-22	-28	-0.2	-0.6	-0.8	-0.4	-1.5	-1.9	-0.7	-2.3	-3
57 Wholesale trade	-1145	-1622	-2767	-28.6	-43.5	-72.1	-47.5	-74	-121.4	-71.3	-11.1	-182.4
58 Eating & drinking places	-7026	-2790	-9816	-47.7	-18.3	-66	-69.1	-26.6	-95.6	169.8	-65.3	235.2
59 Other retail trade	-5930	-4836	-10766	-62.2	-53	-115.2	-103.8	-97.1	-201	-143.2	-134	-277.2
60 Banking & credit agencies	95	-983	-887	2	-21.5	-19.5	2.6	-28.8	-26.1	4	-44	-39.9
61 Insurance	134	-448	-315	2.6	-8.4	-5.9	3	-10.1	-7.1	8.1	-27.5	-19.3
62 Real estate	-562	-973	-1535	-0.7	-1.2	-1.9	-76.6	-133.5	-210.1	-93.6	-163.3	-257
63 Hotels & lodging	79	-666	-587	-0.7	-5.8	-5.1	-0.9	-7.8	-8.8	2.1	-17.9	-15.8
64 Personal & repair services	-49	-1048	-1097	-0.6	-13.3	-13.9	-1.2	-25.9	-27.1	-2.2	-47.5	-49.7
65 Business services	-1148	-1666	-2814	-15.4	-22.6	-38	-26.8	-39.3	-66.1	-37.5	-55.1	-92.5
66 Professional services NEC*	-351	-1431	-1781	-6.5	-26.8	-33.3	-11.1	-45.8	-56.9	-16.8	-69	-85.8
67 Movies & amusements	-3	-481	-484	0	-3.8	-3.8	0	-5.9	-5.9	-0.1	-12.4	-12.5
68 Hospitals	625	-837	-211	14.5	-19.6	-5.2	15.2	-20.8	-5.6	30	-41	-11.1
69 Medical services NEC*	208	-141	68	34.9	-23.6	11.2	47.7	-32.3	15.4	85.5	-57.9	27.6
70 Educational services	-216	-480	-695	-2.7	-5.7	-8.4	-2.9	-6.1	-9	-5.2	-10.9	-16
71 Other services NEC*	238	-1590	-1353	1.9	-11.5	-9.5	2	-12.4	-10.4	3.3	-19.9	-16.8
72 Federal government enterprises	386	-393	-6	5.7	-5.8	-0.1	5.8	-5.9	-0.1	6.5	-6.6	-0.1
73 State & local government enterprises	44	-201	-157	0.4	-2	-1.6	0.5	-2.4	-1.9	1.3	-6.2	-4.8
74 Scrap used in second-hand goods	0	0	0	0	0	0	7.6	-9.9	-2.3	7.6	-9.9	-2.3
75 Government industry	0	-2079	-2079	0	-44.5	-44.5	0	-44	-44	0	-44	-44
Total	-27199	-28669	-55780	-402.5	-493.9	-896.8	-547.1	-903.5	-1449.6	-881.6	-1629.4	-2510.6

*Not elsewhere classified.

Appendix B — Total economic effects of the difference in final sales due to shift from Cold War to post-Cold War military budgets: Minnesota, 1995-2000

Industry Title	Employment			Earnings			Value added			Gross output		
	Direct (no.)	Indirect (no.)	Total (no.)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)	Direct (mil.\$)	Indirect (mil.\$)	Total (mil.\$)
1 Livestock	1973	2690	4662	16.7	24.8	41.5	67.5	107	174.5	366	580.6	946.6
2 Food & feed grain	2859	1303	4162	22.8	10.6	33.4	254.4	138.1	392.5	559.6	303.9	863.5
3 Agricultural services, forestry & fish	928	1435	2362	10	15.4	25.4	17.4	28.5	45.9	34.4	56.3	90.7
4 Iron ore mining	4491	-4319	172	122	-117	5	128.9	-123.7	5.3	352.1	-337.6	14.5
5 Other metal mining	25	-27	-2	0.8	-0.9	-0.1	1	-1.1	-0.1	2.1	-2.3	-0.2
6 Coal mining	56	9	65	0.3	0.1	0.4	0.5	0.1	0.6	1	0.3	1.3
7 Petroleum & natural gas	0	42	42	0	4.7	4.7	0	42.3	42.3	0.1	68	68
8 Stone & clay	212	280	492	5.1	7.1	12.2	8.9	13	21.9	15.9	23.2	39.2
9 Chemical fertilizers & minerals	0	0	0	0	0	0	0	0	0	0	0	0
10 New construction	21786	14548	36334	424.6	283.5	708.2	496.2	331.3	827.5	1409.9	941.5	2351.4
11 Maintenance & repair	1323	6277	7600	33.4	158.3	191.7	38.5	182.5	221	83.8	397.5	481.3
12 Ordnance & accessories	-13798	2824	-10974	-362.9	74.3	-288.7	-417.5	52.9	-364.5	-742.9	94.2	-648.7
13 Meat products	1351	823	2174	33.4	22.5	55.9	40.9	27.0	68.8	295.1	201	496.2
14 Dairy products	923	295	1218	23.8	9.8	33.6	45.3	20.7	66	320.5	146.6	467.1
15 Grain mill	509	236	745	13.1	7.4	20.6	31.2	19.2	50.4	138.9	85.7	224.6
16 Food & tobacco NEC*	2119	1168	3287	54.5	35.6	90.1	94.6	65.5	160.1	389.4	269.7	659.1
17 Textile goods	350	9	358	6.4	0.5	7	8.2	0.9	9	30.5	3.3	33.8
18 Apparel & related products	-1638	507	-1131	-20.6	5.4	-15.2	-27.9	6.7	-21.2	-81.9	19.8	-62.1
19 Logging	32	214	246	0.7	4.9	5.6	1.1	8.2	9.3	3.7	27.4	31.1
20 Other wood products	1869	722	2591	39.5	19	58.5	54.2	27.5	81.7	189.9	96.4	286.3
21 Furniture & fixtures	439	307	745	8.8	7.2	16	12.1	10.6	22.7	30.8	26.9	57.7
22 Paper & allied	6797	17	6814	249.1	22.7	271.8	251.2	37.5	388.7	1095	116.9	1211.9
23 Printing & publishing	6243	2442	8685	131.9	61.2	193	192.8	101.8	294.6	465.7	246	711.6
24 Chemical & allied	1071	793	1864	31.1	27.9	59	59	54.3	113.3	181	166.8	347.8
25 Petroleum refining	-27	279	252	-1.2	13.1	12	-2.9	32.4	29.5	-21.3	238.3	217
26 Rubber & plastics	2861	-204	2657	64.3	-0.3	64	89.8	1.7	91.5	237.7	4.5	242.2
27 Leather products	-333	203	-131	-6.4	3.7	-2.7	-10.8	6.3	-4.5	-23.4	13.6	-9.7
28 Glass, stone, clay	2220	209	2430	48.2	9	57.2	65.2	12.2	77.4	171.1	32	203.1
29 Ferrous metals	527	45	572	15.3	2.8	18.1	18.8	3.7	22.5	47.8	9.5	57.2
30 Primary metals NEC*	533	56	589	15.5	2.9	18.4	18.8	3.5	22.3	46.2	8.6	54.8
31 Fabricated metals NEC*	4343	547	4890	128	28.2	156.3	187.4	44.4	231.9	457.8	108.5	566.3
32 Computers	2557	911	3469	78.5	36.9	115.5	97.9	48.7	146.5	181.4	90.3	271.7
33 Other office equipment	93	39	132	2.9	1.5	4.4	3.6	2	5.6	7.8	4.4	12.1
34 Construction mining equipment	761	10	771	22.1	2.2	24.3	27.7	3.1	30.8	85.5	9.5	95
35 Non-electrical machinery NEC*	7430	1399	8830	220.7	62.1	282.9	293.5	88.2	381.7	700	210.4	910.4
36 Electrical industrial apparatus	458	469	927	11.1	13.3	24.4	14.9	18.4	33.3	34	42	76.1
37 Household appliances	420	-4	416	10.3	0.8	11.1	13.8	1.3	15.1	47.3	4.4	51.7
38 Communication equipment	-3788	958	-2830	-89.5	18.3	-71.2	-98	18.7	-79.2	-190.3	36.4	-154
39 Electrical components & accessories	-842	146	-696	-20.7	2.2	-18.6	-24.4	2.1	-22.3	-64.6	5.6	-59
40 Misc. electrical equipment	348	530	879	8.6	14.9	23.5	11.4	20.4	31.8	33	58.8	91.8
41 Motor vehicles	832	98	931	28.8	5.7	34.4	40	9.4	49.4	174	40.9	214.9
42 Other transportation equipment	-1853	823	-1030	-42.3	16.6	-25.8	-41.3	16.1	-25.1	-138.5	54.2	-84.3
43 Professional & scientific instruments	965	617	1582	27.6	21.1	48.7	36	29.1	65.1	65.9	53.4	119.3
44 Medical instruments & supplies	1005	348	1353	29.2	13.1	42.3	44.2	21.5	65.7	86.3	41.9	128.2
45 Misc. instrument products	-129	363	233	-3.8	11	7.3	-6.3	18.8	12.5	-11.7	35.1	23.4
46 Misc. manufacturing	926	349	1275	14.5	6.8	21.3	22.2	11.4	33.6	50.9	26.1	77
47 Railroad transportation	1482	1531	3013	44.9	52.5	97.4	54.2	66.4	120.7	101.2	124	225.2
48 Local transportation & intercity	135	1171	1306	1.5	12.6	14.1	2.1	18.7	20.9	3	26.4	29.4
49 Trucking	3389	3456	6845	85.5	92.8	178.3	133.2	147.4	280.6	224.3	248.3	472.5
50 Water & pipe lines	156	241	397	3.3	5.7	9	7.7	13.4	21.1	23.9	41.8	65.7
51 Air transportation	-123	1387	1264	-4.6	55.7	51.1	-6.4	77	70.7	-20.4	246.4	226
52 Transportation services	212	419	630	3.8	8.1	11.9	6	13.6	19.6	10.7	24.2	34.9
53 Communication services	518	2761	3279	16.5	97.3	113.8	33.3	199.5	232.8	43.7	261.7	305.4
54 Electric utilities	898	1100	1998	29.7	41.1	70.8	112.1	159.3	271.4	229.8	326.5	556.2
55 Gas utilities	21	801	822	0.6	26.8	27.4	2.1	87.8	90	9.8	406.4	416.2
56 Water & sanitation	-12	179	167	-0.4	5.3	4.9	-0.8	12	11.2	-1.3	19	17.7
57 Wholesale trade	3376	16692	20068	84.3	438.5	522.8	139.9	740.9	880.8	210.1	1112.6	1322.8
58 Eating & drinking places	-12091	21736	9645	-82	146.9	64.9	-118.8	212.8	93.9	-292.3	523.4	231.1
59 Other retail trade	4079	42662	46742	42.8	457.5	500.3	71.4	801.1	872.5	98.5	1105	1203.5
60 Bank & credit agencies	2656	8125	10781	55.9	180.5	236.4	73.7	243.8	317.5	112.7	372.7	485.4
61 Insurance	-14	-76	-90	-0.3	-1.4	-1.7	-0.3	-1.7	-2	-0.8	-4.7	-5.5
62 Real estate	6995	8411	15406	9	10.4	19.4	952.7	1156.3	2109	1165.3	1414.2	2579.5
63 Hotels & lodging	2207	4930	7138	19.1	42.8	61.9	25.7	57.5	83.2	59.1	132.5	191.7
64 Personal & repair services	1699	9382	11082	21.6	119.2	140.8	42	231.6	273.6	77	424.9	501.8
65 Business services	-2432	13163	10730	-32.6	177.4	144.8	-56.7	308.8	252.1	-79.4	432.3	352.9
66 Professional services NEC*	626	9747	10373	11.6	182.4	194	19.9	311.5	331.4	30	469.5	499.4
67 Movies & amusement	1265	3484	4749	9.7	27.8	37.5	14.5	43.6	58	30.5	91.9	122.4
68 Hospitals	138	6397	6535	3.2	156.2	159.4	3.3	170.2	173.5	6.6	335.5	342.1
69 Medical services NEC*	656	1309	1966	109.8	216.3	326.1	150.1	297.5	447.6	269.2	533.5	802.7
70 Educational services	-153	3997	3844	-1.9	48.4	46.5	-2	51.5	49.5	-3.7	92.3	88.7
71 Other services NEC*	8227	14220	22447	67.5	90.5	158	70.5	101.7	172.2	112.9	162.9	275.8
72 Federal government enterprises	2826	-2895	-70	41.8	-42.9	-1.1	42.7	-43.8	-1.1	47.4	-48.7	-1.3
73 S & L government enterprises	241	1852	2093	2.4	18.8	21.2	2.8	22.3	25.1	7.3	57.3	64.6
74 Scrap used in second-hand goods	0	0	0	0	0	0	-3.4	38.2	34.9	-3.4	38.2	34.9
75 Government industry	0	26350	26350	0	563.4	563.4	0	557.3	557.3	0	557.3	557.3
Total	86204	243318	329523	1948.9	4201.5	6150.7	4031.5	7661.3	11693.4	9589.2	14187.7	23776.9

*Not elsewhere classified.

Appendix C — Potential Local Economic Development Tools Applicable to Conversion

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Economic Issues Confronting Conversion

- Identifying marketable new products,
- Research and development requirements for testing technical feasibility of new product ideas,
- Access to venture capital,
- Availability of appropriate facilities and equipment for alternative production,
- Financial risk of high start-up costs,
- Transferability of labor, machines and technology.

Potential Economic Development Tools

<u>Tools</u>	<u>Funding Source</u>
• Small business Incubator	State and Local
• Public Venture Capital Fund	State and Local
• Tax Increment Financing/ Redevelopment	State and Local
• Public/Private Joint Ventures	Local
• Small Business Administration (SBA) loans and loan guarantees	Federal with local sponsor
• Economic Development Administration (EDA) loan guarantees	Federal with local sponsor
• Community Development Block Grants (CDBG)	Federal \$ allocated to local government
• Urban Development Block Grants (UDAG)	Federal matching \$ with local gov't and private sector participation
• Special Assessment Districts	State and Local
• Job Training and Networking Programs	State and Local
• Industrial Development Bonds (IDB's)	Local

Matching Tools With Economic Issues

Identifying Marketable New Products

Appropriate Tools -

- Small Business Incubators

A small business incubator is the one existing tool that local government can use to nurture new product development. The idea is for a local government to assist in providing common facilities such as office/lab space, technical and clerical support to several fledgling firms as a means of consolidating their operations and thereby lowering expenses. Small business incubators do not need to be limited to local

government. Larger private firms have also developed in-house incubators. One bold measure for local government to undertake is to provide financial incentives, i.e., property tax breaks, etc. to local defense firms to establish in-house incubators for the express purpose of identifying alternatives to military production.

Research and Development Requirements for Testing Technical Feasibility of New Product Ideas

Appropriate Tools -

- Small business Incubators

Small business incubators provide some support for research and development through lowering operating costs. It is unrealistic to expect the public sector to serve as the initiator of new products given the market driven economy that exists in the U.S. Without getting into larger macro-economic arguments here, we will assume that the economy will remain private sector oriented. However, government can realistically channel economic activity into certain sectors of the economy. One powerful tool, especially at the state level, is to establish partnerships in the university community which link research into new product development and conversion activities. Similar linkages could be established at the local level with private colleges and universities and the community college system.

Access to Venture Capital

Appropriate Tools -

- Public Venture Capital Fund

Venture capital is often the most critical missing link in turning an idea into a marketable product. Several states, most notably Massachusetts, have established statewide venture capital funds with varying degrees of success. The advantage of a publicly operated venture capital fund as opposed to a private fund is that the public fund will most likely accept a lower return on money invested. Theoretically, a venture capital fund could be developed on a local level and/or be targeted to new firms developing alternative product and/or technology. Due to the relatively high capitalization costs (\$6-8 million), venture capital funds will most likely work best at the state level, or at best in a large metropolitan area, i.e., San Diego.

Availability of Appropriate Facilities and Equipment for Alternative Production

Appropriate Tools -

- Small Business Incubators
- Venture Capital Funds

The tools listed above are most appropriate for the same basic reasons as discussed earlier. As an example, in a community where a high concentration of high-tech defense workers exist, the types of equipment may be expensive whereby a cooperative sharing of facilities and technical expertise may be crucial to success. The expense and sophistication of the research facilities and equipment required for new product development may require the cooperation of existing firms who control such equipment. State and local governments may need to provide certain incentives, such as incubators and venture capital, to serve as catalysts to private initiatives in conversion.

Financial Risk of High Start-up Costs

Appropriate Tools -

- Small Business Incubators
- Venture Capital Funds
- Tax Increment Financing/Redevelopment
- Public/Private Joint Ventures
- Small Business Administration (SBA) loans and loan guarantees
- Economic Development Administration (EDA) loans and loan guarantees
- Urban Development Block Grants (UDAG)
- Special Assessment Districts
- Industrial Development Bonds (IDB's)

In many instances small businesses need time to generate cash flow through sales. The time required often is too long to obtain conventional financing, even in the short term. Lenders view the new firm as being too risky. This is where a public venture capital fund could be of significant use to conversion. It would not necessarily reduce the

risk, but may be more willing to capitalize a new business based on social value criteria. It is likely that a publicly owned and operated venture capital fund would also require a lower return on investment than a private venture capitalist. The role of the small business incubator is simply to reduce operating costs and to provide technical support which reduces the financial risk and lends credibility to the new venture.

The remaining tools are all public finance mechanisms that in essence help reduce costs, mostly on a project basis not on an operational basis. It is not necessary to delve into the details of each program here. Instead, I will simply discuss briefly the most important points.

The increment financing is a potential tool used through state redevelopment law. A specific geographical area within a political jurisdiction can be established as a redevelopment area by determining that the area is "blighted" within certain legal criteria. This allows the local government to exercise certain powers to assemble land and bond at tax-exempt rates to construct capital improvements such as roads, sewers, buildings, etc. This tool could prove especially useful in conversion in such cases as base closures or production facility shutdowns due to the potential blighted nature of a specific area after the closures.

A public/private joint venture is another method by which a local government can encourage conversion. Joint ventures can be defined in a myriad of ways, but simply stated are arrangements whereby the public sector joins with the private sector to share resources in a way that is beneficial to both parties. Many times the public sector provides land in exchange for rent payments. It is possible for the public sector to establish incentives or requirements in such "deals" and link them to conversion activities. This could also be the case with the redevelopment activities discussed previously.

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