

More than Dollars Alone:

The Economic and Security Significance
of Hanscom Air Force Base and the
Natick Soldier Systems Center

September, 2004

PREPARED BY



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WORKING TO PRESERVE AND EXPAND THE MISSIONS OF HANSCOM AFB AND NATICK SOLDIER SYSTEMS CENTER

MassDTI is a coordinated public-private partnership created by the Massachusetts High Technology Council, Inc. to successfully influence the Base Realignment and Closure (BRAC) 2005 process. Its primary objective is to preserve and enhance the missions of the state's two largest and most valuable defense technology centers, **Hanscom Air Force Base** (Bedford, MA) and the **U.S. Army Soldier Systems Center** (Natick, MA).

MassDTI has argued that having both Hanscom and Natick Labs as centerpieces of Massachusetts's premier defense technology cluster - home to world class academic, scientific, research and development centers - is vital to our nation's defense system as well as the region's economy. On September 8, MassDTI unveiled a comprehensive plan to expand the mission of Hanscom Air Force Base – designed to make the base more competitive in the eyes the Department of Defense through the BRAC 2005 and beyond.

Led by **co-chairs Senator Edward Kennedy** and **Governor Mitt Romney** – and the state's Congressional delegation – and supported by leaders in the technology and academic community, MassDTI is working to ensure that these bases' unique characteristics and their contribution to military value are fully recognized and carefully assessed during the BRAC 2005 process.

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EXECUTIVE SUMMARY

Hanscom Air Force Base and Natick Soldier Systems Center are major contributors to the economy of the Commonwealth and its regions. Directly and indirectly, these two military installations are responsible for more than 33,000 jobs and a total payroll of nearly \$2 billion. The overall direct, indirect and induced economic activity generated by the operational and procurement activities of Hanscom AFB and Natick SSC exceeds \$3.2 billion. Significantly, much of this activity involves technology and other innovative activities that are critically important to the state economy, with an impact felt in cities and towns and economic sectors across the state.

OVERALL IMPACT ON MASSACHUSETTS ECONOMY

HANSCOM AFB AND NATICK SSC: ECONOMIC IMPACT SUMMARY CHART			
Federal FY03	Hanscom AFB	Natick Labs	Grand Total
Employment (total jobs)			
Direct	4,147	1,254	5,401
Indirect ¹	9,989	320	10,309
Induced ²	16,084	1,384	17,468
Total Employment Impact on MA	30,220	2,958	33,178
Payroll (in millions of dollars)			
Direct ³	342	86	428
Indirect	709	19	728
Induced	670	58	728
Total	1,721	163	1,884
Procurement and Services Contracts (in millions of dollars)			
Total Contracts	3,200	558	3,758
Overall Impact on the Massachusetts Economy (in millions of dollars of output generated)			
Direct	342	86	428
Indirect	1,077	33	1,110
Induced	1,571	135	1,706
Total	2,990	254	3,244

¹ Receiving procurement and service contracts

² Employment generated by consumer spending of those employed by the installation and its vendors

³ Based on information provided by each installation

⁴ Based on data from the Directorate for Information Operations and Reports (DIOR) of the DOD

MORE THAN DOLLARS ALONE

Natick Soldier Systems Center and Hanscom Air Force Base — good for the Massachusetts economy and critical to security and defense for the nation

INTRODUCTION

The importance – economic and strategic – of Hanscom AFB and Natick SSC can be measured two different ways, each of which offers impressive outcomes. The first measures the direct and indirect contributions made by these two military installations to the Massachusetts economy. (See Appendix A for a brief description of the history, functions and roles of Hanscom AFB and Natick SSC). The results of the quantitative analysis prepared by the Center for Policy Analysis at the University of Massachusetts Dartmouth make clear that Natick and Hanscom have a significant positive impact on the state, regional, and local economies. Directly and indirectly, they are among the state’s leading employers, providing technology-driven jobs at higher-than-average wages to workers across the state.

The second part of this report, which is based on interviews with leading industry, military and other experts, tells of a critical role of Hanscom and Natick that reaches beyond these immediate payroll and jobs numbers. This is the role these installations serve as catalysts, fueling future economic growth in the Commonwealth. This role lies in the enormous range of formal and informal opportunities and relationships constantly being forged between these state-of-the-art military facilities and Massachusetts businesses that run across all parts of the Commonwealth and its sectors, from high-end technology to specially designed and stitched fabrics.

A clear finding of our research is that in the case of Hanscom AFB and Natick SSC, what is good for the Massachusetts economy is also essential to national security and defense. The technology developed through and the business relationships formed with these two important military facilities provide direct benefits to troops in the field today and to the nation’s military and homeland security needs of tomorrow.

Part I:

THE ECONOMIC IMPACT ON MASSACHUSETTS OF HANSCOM AFB AND NATICK SSC

Hanscom and Natick, individually and together, have a significant positive impact on the state, regional, and local economies. Taking together the direct employment they provide and the employment and other activity indirectly generated as a result of their service and procurement contracts, Hanscom and Natick are among the state's leading employers, with employment and payroll impacts that are spread by both geography and economic sector across Massachusetts. Because the most significant impacts are in the high technology and professional services sectors, the employee payrolls generated by Hanscom and Natick operations and contracts are substantially above the state average for all industries. (See Appendix B for details about the methodology used to develop the quantitative component of this economic impact analysis and the IMPLAN model upon which it is based).

The following sections highlight the findings of this quantitative analysis. Supporting charts, tables and other information appear in Appendix C.

SUMMARY OF HANSCOM AFB ECONOMIC IMPACT ANALYSIS

- ▶ The Hanscom Air Force Base complex directly employs 4,391 persons (ES-202 basis) 4,147 of which reside in Massachusetts, with this direct employment generating an annual payroll of approximately \$342 million. Though employment is spread across the state, the most significant impacts are on communities along the Route 128 and I-495 beltways;
- ▶ Of \$3.2 billion in procurement and service contracts awarded by Hanscom AFB in 2003, \$957 million was awarded in the form of 714 contracts to different Massachusetts companies, universities, and medical facilities that operate in 41 of the state's 351 municipalities. The biggest share – about 90 percent – of these contracts went to 25 contractors, primarily the Massachusetts Institute of Technology, the MITRE Corporation, Titan Systems Corporation and Raytheon Company;
- ▶ This \$957 million in procurement and service contracts from Hanscom – which was spread across 38 different sectors of the state economy – generates an estimated 9,989 jobs in Massachusetts, with an annual payroll of \$709 million;
- ▶ Combined, the 14,380 jobs supported directly and indirectly by Hanscom operations would make it the 13th largest private employer in Massachusetts if it operated as a single integrated firm. And the average annual wage of Hanscom-related employees is \$56,259, which is more than 20 percent higher than the statewide average of \$46,332 for all industries;
- ▶ Consumer expenditures of Hanscom employees and the employees of its contractors support another 16,084 jobs in Massachusetts, with a total payroll of \$670 million. This induced impact is felt most significantly in sectors providing consumer goods and services.

When one considers direct, indirect, and induced impacts, Hanscom AFB is responsible for 30,220 jobs and an annual payroll of \$1.7 billion, representing approximately one percent of total ES-202 employment in Massachusetts. Due to the high average wages of its employees and those of its contractors within the state, Hanscom operations have a significant multiplier effect on the state economy — for every 100 persons directly or indirectly employed by Hanscom, an additional 130 jobs are created by other business establishments in the state. Overall, in federal FY03 the total economic impact of Hanscom AFB on the Massachusetts economy was an estimated \$2.99 billion.

SUMMARY OF NATICK SSC ECONOMIC IMPACT ANALYSIS

- ▶ Natick SSC directly employs 1,254 persons (ES-202 basis), generating an annual payroll of approximately \$86.4 million. The employment impacts are widely distributed among numerous sectors of the state's economy, with the most significant impacts in the professional and technical services sector;
- ▶ In 2003, Natick SSC awarded \$557.8 million in procurement and services contracts, of which \$27.2 million was awarded to 202 different Massachusetts companies, universities, and medical facilities with operations in 87 of the state's 351 municipalities, though more than 80 percent of the contract monies were awarded to Natick's top 25 contractors;
- ▶ Natick's \$27.2 million in procurement and service contracts generates an estimated 320 jobs in Massachusetts, with an annual payroll of \$19.1 million. This indirect employment generated by Natick's contract expenditures is distributed among 66 different sectors of the state's economy, with the largest expenditures occurring in the areas of construction, specialized manufactured goods, and professional and technical services;
- ▶ The 1,574 jobs supported directly and indirectly by Natick's operations would place it among the 50 largest private employers in Massachusetts if it operated as a single integrated firm. The average annual wage (ES-202 basis) of Natick-related employees is \$51,558, which is more than 11 percent higher than the statewide average of \$46,332 for all industries;
- ▶ The consumer expenditures of Natick's employees and the employees of its contractors support another 1,384 jobs in Massachusetts, with a total additional payroll of \$57.9 million. The most significant induced employment impacts occur in sectors providing consumer goods and services.

When one considers direct, indirect, and induced impacts, Natick SSC is responsible for 2,958 jobs with an annual payroll of \$162.3 million. This is approximately one-tenth of one percent of the state's total ES-202 employment. Natick's operations have a moderate multiplier effect on the state economy: For every 100 persons directly or indirectly employed by Natick an additional 90 jobs are created by other business establishments in the state. Overall, in federal FY03 the total economic impact of Natick SSC on the Massachusetts economy was an estimated \$254 million.

PART II:

The greater impact of Hanscom AFB and Natick SSC on future economic growth in Massachusetts – and on the security needs of the nation

Beyond the impressive numbers of jobs and other economic activity they directly and indirectly create, Hanscom AFB and Natick SSC are an essential piece of the foundation for future economic growth in the Commonwealth. This same foundation also helps support the current and future security needs of the nation.

Take, for example, the relationship between Malden Mills Industries Inc. and Natick SSC. Revenue from military contracts helps the Lawrence-based company maintain jobs and support research essential to its growth. For its part, the military gains access to technology and products it might otherwise be unable to obtain. In collaboration with Waltham's Foster-Miller Inc., Malden Mills is under contract with the U.S. Army at Natick SSC to adapt its famous Polartec fabric into a sophisticated electronic textile, with conductive fibers that can be used to transmit physiological data such as heart rates. In a battlefield context, this will enable medics to instantly assess which soldiers most need their help. The built-in sensors can also be used to monitor body temperature, blood pressure and EKG.

While developed for military use, this technology has broader applications for homeland security and other first responder uses, especially for fire fighters, said Malden Mills spokesman David Costello. Without its relationship with Natick SSC – which provides both dollars and opportunities to connect to other firms such as Foster-Miller – financially-strapped Malden Mills, with annual revenues of about \$174 million, including about \$25 million in military contracts, might not be as able to make such a contribution. “We don't have \$2 million lying around right now to keep in R&D,” said Costello. “This contract with Natick allows us to focus like a laser on electronic textiles. It helps keep 1000 people employed and it gives our technology people enormous pride.”

Such work has the added benefit of helping revitalize the state's historic but moribund textile industry. “That industry has left this region with people who understand materials and composites,” said Costello. “We're now leading the world in electronic textiles. And if there's going to be a textile industry left in Massachusetts, it will be focused on this kind of advanced technology and fabrics.”

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Natick SSC and Hanscom AFB are good for the regional economy. And the regional economy, in turn, is essential to the critical missions of these state-of-the-art military facilities.

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Executives of a wide range of Massachusetts companies – from smaller businesses such as SJR Foods in New Bedford, which provides food rations to troops, to technology powerhouses such as MITRE Corp., whose \$284 million annual contract with the Air Force’s Electronic Systems Center is centered at Hanscom AFB – tell a single story: Natick SSC and Hanscom AFB are good for the regional economy. And the regional economy, in turn, is essential to the critical missions of these state-of-the-art military facilities.

“It is an enormous advantage for us to be in an association with Natick SSC, which is recognized throughout the Department of Defense as the innovative leader,” said Michael McCormack, Foster-Miller’s business development manager. “It’s a true partnership that advances our technologies and their intended applications in new and innovative ways.”

FROM MASSACHUSETTS LABORATORIES TO IRAQ

Far from theory, such innovation is already in the field, being used by the military and its front-line personnel. Much of the technology and engineering behind the sophisticated Air Force and other weapons now utilized in combat were developed and shaped by MIT Lincoln Laboratory, MITRE and other Massachusetts brain power partnering with the Electronic Systems Center at Hanscom AFB. The direct, in-the-field payoff of such collaborations isn’t limited to such large operations, however. In Iraq right now, for example, the fabric of the outer shell of the tactical vests worn by army personnel soldiers was dyed and coated by Duro Industries of Fall River. That’s just one example of the pay-off from these built-up ties between regional companies and the military. “Who knows what happens to this wealth of experience if you try to transfer” Hanscom and Natick, said Dan Pezold, Duro’s vice president for military and government fabrics. “There are a lot of man years and a lot of knowledge in those folks at Natick and Hanscom and the people like us who work with them.”

PROXIMITY MATTERS

Business partnerships with Hanscom AFB and Natick SSC are driven by – and dependent upon – the close physical proximity between the two facilities and what James Regan, chairman, president and CEO of Dynamics Research Corp., calls “an intellectual eco-system” of academic institutions, laboratories, technology firms, military and other facilities “all located in proximity to one another with inner workings that have evolved over time and which you could never reconstruct. It cannot be taken apart and reassembled somewhere. And it cannot be virtualized through information technology.”

Rather than just a matter of convenience, this geographic closeness is essential to the success of both the contractors and the military missions of Hanscom AFB and Natick SSC:

- ▶ Geographic proximity enables regional firms to develop personal, eyeball relationships that cannot be duplicated by even the best virtual technology. This physical closeness enables contractors to rapidly respond and adapt to military and security needs, which can change abruptly;
- ▶ This drive-up-the-road capability also means military procurement officials can easily meet – informally or otherwise – with commercial and other vendors to make sure that research and development plans, contract specifications and other mission requirements make sense even before they are officially issued;
- ▶ This “intellectual eco-system” provides the military with an experienced, reliable pool of talent and firms from which to choose and which can adapt quickly and efficiently to changing technology or security factors.

Dynamics Research’s largest customer is the Air Force, said Regan. “We’ve been providing support to the Air Force Electronics Systems Center at Hanscom since 1984. It is critical to our business because it’s one of our primary markets.” About \$35 million of DRC’s approximately \$250 million in annual revenues is linked to Hanscom, of which about \$30 million is based in Massachusetts. About 200 DRC employees and another 100 sub-contractors work on ESC programs every day, said Regan, a product of MIT who spent 23 years managing technology acquisition for the Navy before coming to DRC.

“Massachusetts is different than other regions,” he said. “I know San Diego and I know Monmouth and I know military technology. I understand what a truly innovative and productive eco-system we have here. The technology from the region should be shared with all the defense services, not just the Air Force. In fact, there should be much more jointness and Massachusetts is the best-positioned location to support those activities.” DRC is big and mobile enough to survive if Hanscom’s mission were to be relocated, Regan said. But he worries how the mission itself would handle such disruption.

So does William F. Flanagan, vice president and general manager of the Systems Management Services Division of Titan Corporation, which has Hanscom contracts worth about \$100 million a year and which

accounts for about 900 total positions at the base. Flanagan, who was Hanscom AFB's commander from 1986 to 1987, said Titan would likely close its Billerica operation if the Electronic Systems Center were relocated. But he and others said the greatest harm would be to the Air Force itself, which would lose an irreplaceable source of expertise and first-hand knowledge.

"Titan has recruited all of us retired acquisition specialists who know the business and are the experts," Flanagan said. "All of us are in our 40s to 60s and we're not going to move" to follow Hanscom work to wherever it might be transferred. "All this corporate knowledge does not move — we have our feet firmly planted in Massachusetts."

HANSCOM AFB AND MITRE: Linked by history, innovation and success

Hanscom AFB and the MITRE Corp. both came into existence in the 1950s — and their missions and successes have been intertwined ever since. MITRE, which operates as a private, not-for-profit corporation, is located in Bedford, just a few miles from Hanscom AFB and the Air Force's Electronic Systems Center. That proximity "is extremely important" to MITRE's success in working with the government to apply systems engineering and advanced technology to address issues of critical national importance, said MITRE Senior Vice President and General Manager Robert F. Nesbit.

MITRE's annual contract with ESC is worth about \$280 million, about \$200 million of which is attributable to MITRE work in Massachusetts. MITRE has about 1600 employees based in Bedford, the majority of whom work with ESC. Because so much of its work is geared toward Hanscom, MITRE's corporate posture would be to follow the facility if Hanscom's functions were transferred, Nesbit said. But in the process, the military runs the risk of losing critical knowledge and human infrastructure, he added. "I'd imagine not all our staff would want to move and some of those who did would relocate back here over time," Nesbit said. "It is not very easy to just move and replenish a work force such as ours."

As former MITRE president and CEO Victor DeMarines put it, "MITRE folks gather experience about the user's needs over the years. This results in an institutional history that's invaluable to the military, whose officers typically get reassigned to new areas every three years."

Nesbit noted that in its first decade, technology at Hanscom largely involved radar, "so most of the people at MITRE were radar engineers." Then, in the 1970s and 1980s, satellites, air-to-ground and other communications work dominated Hanscom. In the 1990s and beyond, information technology and software created the need for a new generation of people and skill sets. "What's so good about being in this area is that you can go through generations of changes such as that and the universities, businesses and other resources here allow you to replenish your talent pool. You might not be so able to do that if you pick Hanscom up and move it somewhere else."

Besides such technological capacity, the U.S. military would lose something less tangible but equally important if Hanscom AFB were to close, said Gen. Ron Fogleman (ret.), who was chief of staff of the U.S. Air Force from 1994 to 1997. “Hanscom is the last active duty military installation in New England,” he said. “It provides important support to active personnel from all branches of the military for recruiting and other purposes, and it supports the retired military community as well. If, for the wrong reason, the military withdrew completely from New England, the result would be a great deficiency in the overall support for and understanding of the U.S. military in the very region where this country was born.

“You can’t pick this up in a data call, but the intellectual capacity of New England, combined with the broader support of the overall citizenry, simply makes for a stronger military,” Fogelman said.

ECONOMIC OPPORTUNITIES CREATED BY HANSCOM AND NATICK ALSO BOOST NATIONAL SECURITY

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Moving either Natick or Hanscom operations would put at risk not only immediate contracts with Massachusetts companies, but future opportunities for regional businesses to meet critical needs of military and homeland security.

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Moving either Natick or Hanscom operations would put at risk not only immediate contracts with Massachusetts companies, but future opportunities for regional businesses to meet critical needs of military and homeland security. Flanagan and other interviewees stressed that while their and other Massachusetts businesses might be economically hurt by the loss of either base’s operations, the longer term damage – to both the economy and national interests – is the potential disruption of a technology and product system that can also yield great results for other needs. Titan, for instance, is also involved in homeland security work, noted Flanagan. “Titan’s homeland security people talk to us all the time (at Hanscom) about that technology. If Hanscom closes, that technology scatters to the wind and is lost. The expertise would disappear from Massachusetts.”

While disruption of the public sector-private sector synergy between Massachusetts companies and Hanscom/Natick would most immediately and adversely affect regional companies with military contracts, it would also jeopardize the broader mission of the military as well as the emerging needs of homeland security.

- ▶ As a result of their contracts with Hanscom or Natick, regional companies are able to identify and develop broader commercial and other applications for their products and technology;
- ▶ In many cases, these applications – which might not otherwise emerge – fill homeland security and other priority needs;
- ▶ Rather than reinventing such applications, the relationships between Hanscom and Natick and Massachusetts’ technology base can offer dual use, meeting the force protection requirements of DoD while serving to protect critical infrastructure such as police stations and hospitals.

MIT Lincoln Laboratory demonstrates such short-term and long-term benefits to the nation from the close linkages between Massachusetts and the military. “During World War II and since, MIT has been strongly coupled to national security needs,” said lab director Dr. David Briggs. Lincoln Lab has 2500 people based at Hanscom, including about 1400 technical people, about half of whom hold doctorates. “Our mission is technology in support of national security. The regional high-tech cluster and Hanscom AFB have been, and continue to be, critical to our success.

“Lincoln Laboratory fits into that critical gap between early-stage academic research and military acquisition. We are positioned between the academic research side and the Hanscom-based military acquisition community and their MITRE and industrial-base support. We are a joint service laboratory and have been since our founding – we provide substantial technology support to the missions of the Air Force, the Army and the Navy. Where our technology expertise applies, we also support non-DoD activities, including air traffic control, NOAA and NASA, and homeland defense.”

TECHNOLOGY DEVELOPED FOR HANSCOM AND NATICK MULTIPLIES INTO GREATER VALUES

Far smaller than MIT Lincoln Laboratory, Konarka Technologies – a spin-off enabled by University of Massachusetts Lowell researchers – also demonstrates multiple bangs for the military buck. Under an Army contract to Natick, with UMass Lowell as a subcontractor, a team of scientists led by former university provost Dr. Sukant Tripathy developed a breakthrough process that, for the first time, opens the road to a low-cost manufacturing process for photovoltaic technology (the direct conversion of light into electricity). “Next to security, power is the biggest problem facing soldiers, who can carry up to 50 pounds of batteries into the field,” said Paul Wormser, a Konarka founder who is now Entrepreneur-in-Residence in Commercial

Venture Development at UMass Lowell. Developing a durable, lightweight and affordable power source had been seen as an intractable problem, he said — until the collaboration with Natick.

“Because of the invention that came out of the funding through Natick to the university and licensed to Konarka, we have a versatile technology that is substantially lower cost than other solar technologies and which is also relatively easy to manufacture in high volume,” said Wormer. “That is huge for the Commonwealth, but what was developed under the auspices of Natick also has implications that literally reach the end of the earth, including the two billion people who do not have access to electricity. Without that contract with Natick, this breakthrough process would not have been developed. Period.”

As Bridger McGaw, an expert in national security issues, put it, “Beyond its economic impact, closing Hanscom may have the unintended consequence of making us less safe. We have this partnership between public and private entities and all these tools just sitting at Hanscom waiting to be fully drawn upon for homeland security and national defense missions.”

Woburn-based Solectria Corp., which develops power electronics and control systems used in battery-electric, hybrid electric, and fuel cell vehicles, is another example of how the loss of Natick and Hanscom would hit both the corporate bottom line and technological innovation. Solectria Vice President for Sales and Marketing Mark Federle explained that his firm’s technology has important applications in a battlefield context and beyond. Power, for example, can be directly exported from a military vehicle to a medical or other shelter. While Solectria is under contract with Natick SSC to build the power electronics component for chemical-biological protection shelters for medical units, the military sees broader applications for Solectria’s technology.

THE NATICK SSC STAMP OF APPROVAL: CREDIBILITY AND CONTRACTS

Like many metal working companies, KomTeK of Worcester has faced difficult economic times, losing nearly half of its workforce after September 11, 2001. But some good news came about two years ago when a former KomTeK employee who had gone to work at Natick SSC said the Army was looking for domestic forging suppliers capable of making particular parachute hardware components.

“Natick’s quality requirements were very high level, but they matched the kinds of things we did,” said KomTeK President and CEO Robert B. Kervick. The firm was awarded a couple of initial contracts for parachute hardware through Natick, but Kervick sees greater potential, both in military work and in commercial markets that the firm’s relationship with Natick SSC has helped open up. “As a result of our work with Natick, we have been able to meet other firms and players in the parachute industry marketplace,” he said. “Natick’s approval process is very extensive and thorough, and it’s offered credibility of our quality and competencies.”

Military contracts now make up only a small portion of KomTeK’s revenues, but the potential market for military and recreational parachute hardware and other military hardware, such as buckles and tie downs for cargo aircraft, is up to \$7 million a year, Kervick said. “There’s a potential for us to do \$1 million a year with Natick and another \$1.5 million in the broader market.”

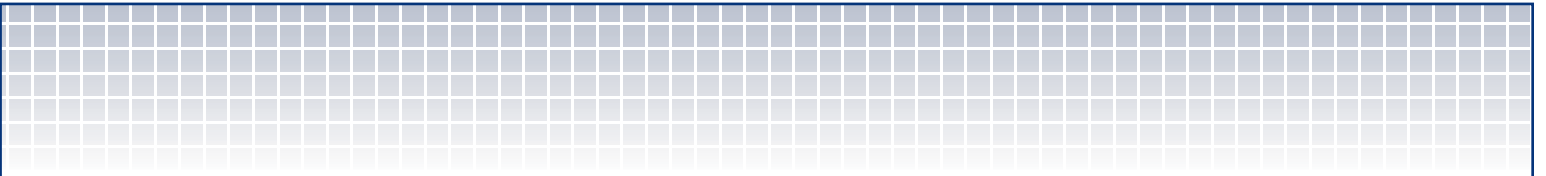
Solectria’s contract with Natick accounts for about \$950,000 of the firm’s \$6 million in annual revenues. “This contract has a significant impact both to our bottom line and to our 56 employees,” said Federle. “We just submitted a quote for \$5 million to build more of these units, which would enable us to hire more people. Without the credibility that comes from our work with Natick, there is no way we could even make that bid. If Natick wasn’t here, it would hurt us and we think we provide some great solutions in military, homeland security and commercial contexts.”

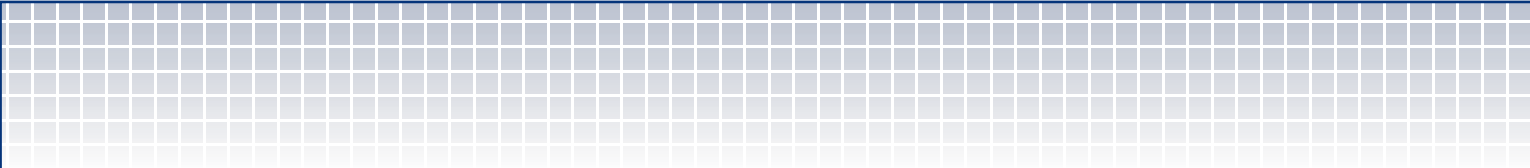
SMALL BUSINESSES GAIN TOO

Business relationships with Hanscom and Natick aren't limited to technology-oriented firms such as Solectria and large corporations such as Titan and Raytheon. Small businesses, such as SJR Foods, which has production operations in New Bedford and subcontractors in Chelsea, also benefit – and contribute. Natick is a major booster of small businesses, said Robyn Baras, majority owner of SJR, whose unique food products include bagels filled with Spanish omelet, pizza grinders and other rations that troops can eat in the field without utensils. Baras said her military work, which now represents about 25 percent of SJR's total revenues, also saves the government money since it helps create a competitive bidding environment.

“Natick has been more successful than other entities and agencies at creating real opportunities for small or disadvantaged businesses,” said Baras, whose firm employs between 10 and 45 people, depending upon the workload. “Natick helps enable a company such as ours to get on the playing field” with larger companies. “Without Natick, we would not have sold our first dollar in product to the government.”

From a small business providing food rations to technology and engineering giants such as Raytheon Corp., the story is the same. Contracts with Hanscom and Natick boost the bottom lines, payrolls and growth of Massachusetts companies. Those companies, in turn, help advance the military mission of today and help to meet the nation's defense and security needs of tomorrow. “There are those people who think that Hanscom is just a bunch of office buildings, but it is so much more than that,” said Raytheon Senior Vice President Charles E. Franklin, who is also a former Hanscom AFB commander. “It is far more than that. Hanscom is a collection of intellectual knowledge that gives the nation and the military a critical mass to what they are doing. If you destroy that collection of intellectual knowledge, you destroy a key ingredient of the military's ability to prosecute wars in a modern day environment.”





Appendix A—BACKGROUND ON HANSCOM AFB AND NATICK SSC

BACKGROUND ON HANSCOM AIR FORCE BASE¹

Hanscom Air Force Base (AFB) occupies approximately 1,120 acres in a light industrial area of eastern Massachusetts. The site occupies land in the Towns of Bedford, Concord, Lexington, and Lincoln. In 1942, the military began using a public airfield at the site that had been built the previous year. In 1952, the Commonwealth of Massachusetts transferred 396 acres and leased 641 acres of the land to the United States Air Force (USAF). The Commonwealth retained the remaining 83 acres for its own use. Military flight operations ended in 1973 and in August of 1974, the airfield reverted to state control and was renamed L.G. Hanscom Field. It is currently operated by the Massachusetts Port Authority (MASSPORT) as a civilian airport.

The primary mission of Hanscom AFB, which is located on the 396 acres owned by the Air Force, is to support the Electronic Systems Center of the Air Force Materiel Command. The Electronic Systems Center recently entered its fifth decade as the Air Force's organization for developing and acquiring Command and Control (C²) systems. It was activated as the Electronic Systems Division (ESD) on 1 April 1961 at Laurence G. Hanscom Field in Bedford, Massachusetts and was placed under the newly established Air Force Systems Command. The Electronic Systems Division was created initially to meet a major postwar threat to the North American continent — attack by long-range, nuclear-armed bombers. At Hanscom Field, the Massachusetts Institute of Technology's new Lincoln Laboratory (1951) and its spin-off, the MITRE Corporation (1958), worked to bring the Semi-Automatic Ground Environment (SAGE) air defense system to completion. The pioneering integrated radar and computer technology that was developed for SAGE also contributed significantly to the development of air traffic control systems in the United States and around the world.

The Electronic Systems Division had an original portfolio of thirteen C³ systems, but the appearance of inter-continental ballistic missiles capable of carrying nuclear warheads spurred a second wave of defense efforts to construct the Ballistic Missile Early Warning System (BMEWS) and a survivable new command center for the North American Air Defense Command deep under Cheyenne Mountain in Colorado. New weapons systems and space platforms led to enlarged ESD programs in command, control, and communications (C³). ESD's first radar systems were ground-based, but in the 1960s the organization expanded into airborne radar systems. In overcoming the "ground clutter" problem, the 1970's Airborne Warning and Control System (AWACS) represented a technological achievement for airspace surveillance. It was joined in the later 1980s by the Joint Surveillance and Target Attack Radar System (Joint STARS). While still under development, Joint STARS was pressed into service for the Gulf War in 1991 to monitor movement on the battlefield. Other ESD programs focused on creating secure communications systems, air defense systems for allied nations, command centers, intelligence data transmission, air traffic control systems, and computer-based training systems.

In 1992, the Air Force Systems Command and the Air Force Logistics Command were merged to form the Air Force Materiel Command. ESD was re-designated the Electronic Systems Center (ESC) and the organization was placed under the new AFMC. Two years later, ESC was enlarged to become the AFMC Center of Excellence for Command and Control, with headquarters at Hanscom AFB. Several geographically-separated units were added to the Center at this time. Currently, the Standard Systems Group at Maxwell AFB, Gunter Annex, Alabama; the Materiel Systems Group at Wright-Patterson AFB, Ohio; the 38th Engineering Installation Group at Tinker AFB, Oklahoma; and the Cryptologic Systems Group at Kelly Annex, Lackland AFB, Texas; all report to the ESC Commander.

In 2001, the Air Force gave ESC the lead responsibility for integrating its command and control, intelligence, surveillance, and reconnaissance systems under the C² Enterprise Integration. Integrated C²ISR capabilities enable the development of network-centric warfare and provide an asymmetric force advantage. Today, ESC is pursuing a major initiative to standardize and upgrade C²ISR capabilities at air operations centers, with the goal of realizing the Aerospace Operations Center of the future.

¹ This information was compiled from the Hanscom AFB website: <http://www.hanscom.af.mil/>

Appendix A—BACKGROUND ON HANSCOM AFB AND NATICK SSC

BACKGROUND ON NATICK SOLDIER SYSTEMS CENTER²

The U.S. Army Soldier Systems Center (SSC) in Natick, Massachusetts is a Department of Defense (DoD) installation responsible for the technology, development, engineering, fielding, and sustenance of the food, clothing, shelter, airdrop systems, and soldier support items that protect and sustain America's military forces. The SSC has 124 buildings located on 174 acres in the Town of Natick and neighboring communities. Its facilities include administration, laboratories, maintenance, storage, and housing areas. A self-contained city, the SSC also has a shopette, cafeteria, barbershop, credit union, recreation center, and a travel office. The SSC has several unique facilities that give its researchers an unparalleled capability to support America's troops. One of these facilities is a Climatic Chamber that allows researchers to generate worldwide extreme climatic conditions to test equipment, or to test human performance in extreme conditions, in a controlled environment. In addition, the SSC has several unique specialized facilities, including an Altitude Chamber, Textile Facility, Combat Rations Production and Packaging Facility, Biomechanics Lab, 3-D Anthropometrics Lab, Camouflage Analysis & Demo Lab, Raincourt, Hydro-Environmental Chamber, Shade Room, Fiber Plant, Thermal & Flame Lab, and a Military Operation in Urban Terrain Lab/Facility.

Natick Laboratories is located just 17 miles west of Boston, which gives the SSC unique access to many world-renowned universities and research hospitals that supplement its capability to further meet the military's needs. There are 136 colleges and universities, as well as 25 teaching and research hospitals, within 75 miles of Natick. The region is also home to many technology-based private sector companies with capabilities in biotechnology, information technology, nanotechnology, etc., which provide additional opportunities for SSC research and development teams to network and share technology. The SSC has more than 100 agreements with these universities, hospitals, and private companies in the form of Cooperative Research and Development Agreements (CRADA), Memoranda of Understanding (MOU), and Memoranda of Agreement (MOA), that leverage technology and resources to accelerate technological development and get improved products to the military in a shorter period of time.

²This information was compiled from the Natick SSC website: <http://www.natick.army.mil/>



Appendix A—BACKGROUND ON HANSCOM AFB AND NATICK SSC

Appendix B — DEFINITIONS, METHODOLOGY & SOURCES FOR ECONOMIC IMPACT ANALYSIS

DEFINITIONS

Economic impacts measure the importance of an economic activity primarily in terms of the output, employment, and personal (labor) income generated by that activity:

Output is the value of goods and services produced at the identified establishment or construction project.

Employment is the number of people employed at the identified establishment or construction project, including wage and salary employees and self-employed persons.

Personal income is the wages, benefits, and other income derived from employment that is linked geographically to the identified workplace site.

Economic impacts consist of direct impacts, indirect impacts, induced impacts, and total impacts. *Direct impacts* are the economic activities carried out at a business establishment or construction project and are therefore an immediate consequence of the economic activity that would not have occurred in the absence of the business establishment or construction project.

Indirect impacts derive primarily from off-site economic activities that are attributable to the identified business establishment. These economic activities occur mainly as a result of *non-payroll expenditures* by the business within a defined local area (i.e., town, city, county, metropolitan statistical area). Local expenditures include a range of operating expenses such as construction materials, office supplies, motor transport, horticultural services, furniture, utilities, maintenance and repairs, business machines, and so forth. Indirect impacts differ from direct impacts insofar as they originate entirely off-site, although the indirect impacts would not have occurred in the absence of the identified business establishment. *Induced impacts* are the multiplier effects of the direct and indirect impacts created by successive rounds of spending by employees and proprietors.¹ *Total impacts* are the sum of the direct, indirect, and induced impacts.

METHODOLOGY: THE IMPLAN MODELING SYSTEM

The indirect and induced economic impacts of the Hanscom and Natick facilities are specified using IMPLAN (Impact Analysis for PLANing), which is an econometric modeling system developed by applied economists at the University of Minnesota and the U.S. Forest Service. The IMPLAN modeling system has been in use since 1979 and is currently used by over 500 private consulting firms, university research centers, and government agencies. The Center for Policy Analysis has been a licensed IMPlan user since 1999 and regularly employs its econometric modeling system in conducting economic and fiscal impact analyses.

The IMPLAN modeling system combines the U.S. Bureau of Economic Analysis' Input-Output Benchmarks with other data to construct quantitative models of trade flow relationships between businesses and between businesses and final consumers. From this data, one can examine the effects of a change in one or several economic activities to predict its effect on a specific state, regional, or local economy (impact analysis). The IMPLAN input-output accounts capture all monetary market transactions for consumption in a given time period. The IMPLAN input-output accounts are based on industry survey data collected periodically by the U.S. Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations.

¹ Most of the take home-home income earned by project employees is spent locally. Some of this spending becomes income to local individuals who provide services to construction employees. Some the spending by construction employees goes to local businesses and becomes income to the business owners and their employees. Subsequently, part of these second-round incomes are also spent locally and thus become income to another set of individuals. As successive rounds of spending occur, additional income is created in the local area, region, and state.

Appendix B – DEFINITIONS, METHODOLOGY & SOURCES FOR ECONOMIC IMPACT ANALYSIS

IMPLAN also includes social accounting data (e.g., personal income and gross state product) that makes it possible to measure non-industrial transactions such as the payment of indirect taxes by businesses and households. The IMPLAN database provides data coverage for the entire United States by county and has the ability to incorporate user-supplied data at each stage of the model building process to insure that estimates of economic impacts are both up-to-date and specific to an economic impact area.² IMPLAN can construct local input-output models in units as small as five-zip code clusters.

IMPLAN's Regional Economic Accounts and the Social Accounting Matrices are used to construct local, county, or state-level multipliers specific to an impact area. Multipliers describe the response of an economy to a change in demand or production. The multipliers allow economic impact analysis to move from a descriptive input-outputs model to a predictive model. Each industry that produces goods or services generates demand for other goods and services and this demand is multiplied through a particular economy until it dissipates through "leakage" to economies outside the specified area. Thus, multipliers calculate the response of the economic impact area to a change in demand or production.

IMPLAN models *discern and calculate leakage* from local, regional, and state economic areas based on workforce configuration, the inputs required by specific types of businesses, and the availability of both inputs in the economic area. Consequently, *economic impacts that accrue to other regions or states as a consequence of a change in demand are not counted as impacts within the economic area*. The model accounts for substitution and displacement effects by deflating industry-specific multipliers to levels well below those recommended by the U.S. Bureau of Economic Analysis. In addition, multipliers are applied only to *personal disposable income* to obtain a more realistic estimate of the multiplier effects from increased demand. The reliability of these estimates has been proven through empirical testing (Department of Commerce 1981; Brucker et al 1990).

A predictive model is constructed by specifying a series of new expenditures in a specific economic area (e.g., new employment or construction), which is then applied to the industry multipliers for that particular region. Based on these calculations, the model estimates final demand, which includes employment, employee compensation (excluding benefits), and point-of-work personal income (including benefits). The initial IMPLAN data details all purchases in a given area, including imported goods and services. Importantly, IMPLAN's Regional Economic Accounts exclude imports to an economic area so the calculation of economic impacts identifies only those impacts specific to the economic impact area. IMPLAN calculates this distinction by applying Regional Purchase Coefficients (RPC) to predict regional purchases based on an economic area's particular characteristics. The Regional Purchase Coefficient represents the proportion of goods and services that will be purchased regionally under normal circumstances, based on the area's economic characteristics described in terms of actual trade flows within the area.

The Center for Policy Analysis built input-output models using the IMPLAN Professional 2.0 model building software and data packages. The data used in the model are for 2001, which is the latest available. Where necessary, all inputs were converted to 2001 dollars using appropriate deflators (producer price indices for industrial commodities and the personal consumption expenditure deflator for personal income). Model outputs are reported in 2001 dollars or, where appropriate, converted to 2002 dollars.

It is possible to estimate the economic impacts operations and capital expenditures by Hanscom and Natick simply by changing the output of the industry in the econometric model. This method assumes that the facilities' production functions are the same as the average of the various industry sectors in the state where they operate directly or through contractors. However, because specific data on Hanscom's operations and contracting was available, it was possible to use a more precise method for estimating its economic impacts. Instead of specifying a change in output for a single industry (e.g., federal military), we instead

² The IMPLAN modeling system draws on a variety of statistical sources, including the Bureau of Labor Statistics Growth Model, Bureau of the Census, ES-202 employment and earnings data, the Regional Economic Information System (REIS), and the Bureau of Economic Analysis Gross State Product data.

Appendix B – DEFINITIONS, METHODOLOGY & SOURCES FOR ECONOMIC IMPACT ANALYSIS

specify a long list of changes in the output of each industry that is a beneficiary of Hanscom's procurement and services contracts, which allows IMPlan to apply the appropriate regional purchase coefficient to each industry. Thus, what is specified as direct impacts in the model are actually the first round of indirect impacts. What is reported as indirect impacts in the analysis are what the model reports as direct and indirect impacts.

The Center for Policy Analysis also separately specifies the first round of induced impacts. The model first applies the ratio of personal consumption expenditures to employee compensation for the state to the facilities' employee compensation and that of their contractors to account for taxes and savings. The remaining disposable income is then distributed among IMPlan's 528 industrial sectors using the model's breakdown of personal consumption expenditures for medium- and high-income households, while also applying the appropriate regional purchase coefficient to each industry. What the Center specifies as direct impacts in the model are actually the first round of induced impacts so what is reported as induced impacts in the analysis are the total impacts from the model plus the induced impacts from the model of inter-industry expenditures by Hanscom and Natick.

DATA SOURCES

Economic impacts are often calculated separately for the *operations phase* and *construction phase* of an establishment. The operations phase of an establishment generates economic impacts that continue as long as the facility remains in existence. The economic impacts of construction and other capital expenditures are necessarily limited and temporary in duration and last only so long as construction and related capital purchases are underway. However, because Hanscom AFB and Natick SSC are mature facilities with on-going maintenance, construction, and building repair operations, these expenditures were included as part of the facilities' annual operations.

PAYROLL EXPENDITURES

Hanscom Air Force Base and Natick SSC provided the Donahue Institute with their payroll expenditures by major expense account subcode, which allowed the assignment of actual expenditure amounts to industry sectors in the IMPlan models for purposes of calculating induced impacts.

REGIONAL PURCHASES

In addition to the direct payroll expenditures for on-base operations, Hanscom AFB and Natick SSC contract with private companies, universities, and medical facilities for a variety of products and services. Contract expenditures for 2003 by both installations were obtained from the Directorate for Information Operations and Reports (DIOR) of the U.S. Department of Defense.³ This comprehensive database identifies the agency or facility making a contract award, the name and address of the contract recipient, the amount of the award, and the purpose of the contract by NAICS code. Only contracts with vendors located in Massachusetts were allocated to industry sectors for purposes of calculating economic impacts on the state. Purchases from vendors outside the statewide impact area were excluded from the calculation of economic impacts.⁴

³ See, "Procurement Guidance and Data," <http://www.dior.whs.mil/peidhome/guide/procoper.htm>.

⁴ An inherent weakness of a single-region input-output model, such as IMPlan, is that it cannot capture the *feedback effects* that result when purchases from a supplier outside the region leads to additional purchases within the region by that supplier or suppliers. For example, Natick might purchase computers (office equipment) from Dell Computer in Austin, Texas, which would then purchase semi-conductors from Intel Massachusetts. It is possible to construct a multi-region input-output model to capture feedback effects, but such a model requires a great deal of data collection and is not supported by the IMPlan software.

Appendix B — DEFINITIONS, METHODOLOGY & SOURCES FOR ECONOMIC IMPACT ANALYSIS

TRADE AND FREIGHT MARGINS

When Hanscom AFB and Natick SSC purchase goods or services, the expenditures cover at least the price of the goods or services, but it may also include the cost of shipping, insurance, wholesale margin, retail margin, and brokerage fees. IMPlan provides sector-specific margins to account for these “exported” expenditures, which are subtracted from the regional impact.

ASSIGNMENT TO IMPLAN INDUSTRY SECTORS

The allocation of expenditures among IMPlan’s 528 industry sectors was conducted by the Center for Policy Analysis. The *IMPlan User’s Manual* includes a detailed data sectoring scheme that identifies the equivalent NAICS Codes for each of the model’s 528 industry sectors. Since DIOR’s procurement database identifies purchases by NAICS Code, it was possible to model the indirect and induced impacts of Hanscom and Natick’s contracted purchases with a high degree of detail.



Appendix B – DEFINITIONS, METHODOLOGY & SOURCES FOR ECONOMIC IMPACT ANALYSIS

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

A. ECONOMIC IMPACTS OF HANSCOM COMPLEX

DIRECT ECONOMIC IMPACTS

Hanscom AFB's on-going operations directly produce \$342 million in annual output (2003).¹ It is estimated that the entire complex of operations at Hanscom AFB directly employs 4,391 persons with up to ninety-four percent of these employees residing in the Commonwealth of Massachusetts (see Table 1). Employment at the Hanscom complex directly generates nearly \$342 million in annual payroll, including wages, salaries, bonuses, commissions, reimbursements, temporary labor, and employer-paid fringe benefits.² The payroll covers federal military and non-military employees, the civilian base exchange and its concessionaries, a credit union, a health clinic, and other tenant organizations that provide base support services.

TABLE 1

HANSCOM AFB COMPLEX: DIRECT EMPLOYMENT IN MASSACHUSETTS, 2003				
Implan Code	Implan Description	Payroll Item	Payroll*	
505	Federal military (MA residents only)	Appropriated Fund Military**	\$ 95,438,139	1,167
506	Federal non-military	Appropriated Fund Civilian***	99,826,406	1,141
Non-Appropriated Fund				
506	Federal non-military	Civilian***	4,445,881	51
410	General merchandise stores	Civilian BX***	2,153,736	50
446	Scientific research & development services	Contract Civilians (MITRE)***	125,888,000	1,605
430	Depository credit intermediation	Hanscom Federal Credit Union***	3,709,400	12
405	Food & beverage stores	BX Concessionaires***	625,000	13
465	Offices of physicians, dentists, & other	Brighton Marine Clinic***	692,000	8
453	Facilities support services	Other Tenant Organizations***	\$ 9,000,000	100
	Total		\$341,778,562	4,147

Sources: Hanscom AFB and IMPlan. **Notes:** *Payroll includes fringe benefits paid by the employer, which normally equal 23% to 25% of compensation. **Provided by Hanscom AFG. ***Estimated by IMPlan with expenditure data from Hanscom AFB.

Data on the residence of employees was available only for federal military employees (IMPlan Code 505), but this data suggests that Hanscom has a far-reaching impact on the state's employment base. Hanscom employs 1,411 federal military employees and 1,167 (83%) of them reside in Massachusetts.³ There is at least one federal military employee from Hanscom residing in 178 (51%) of the state's 351 municipalities (see Figure 1).

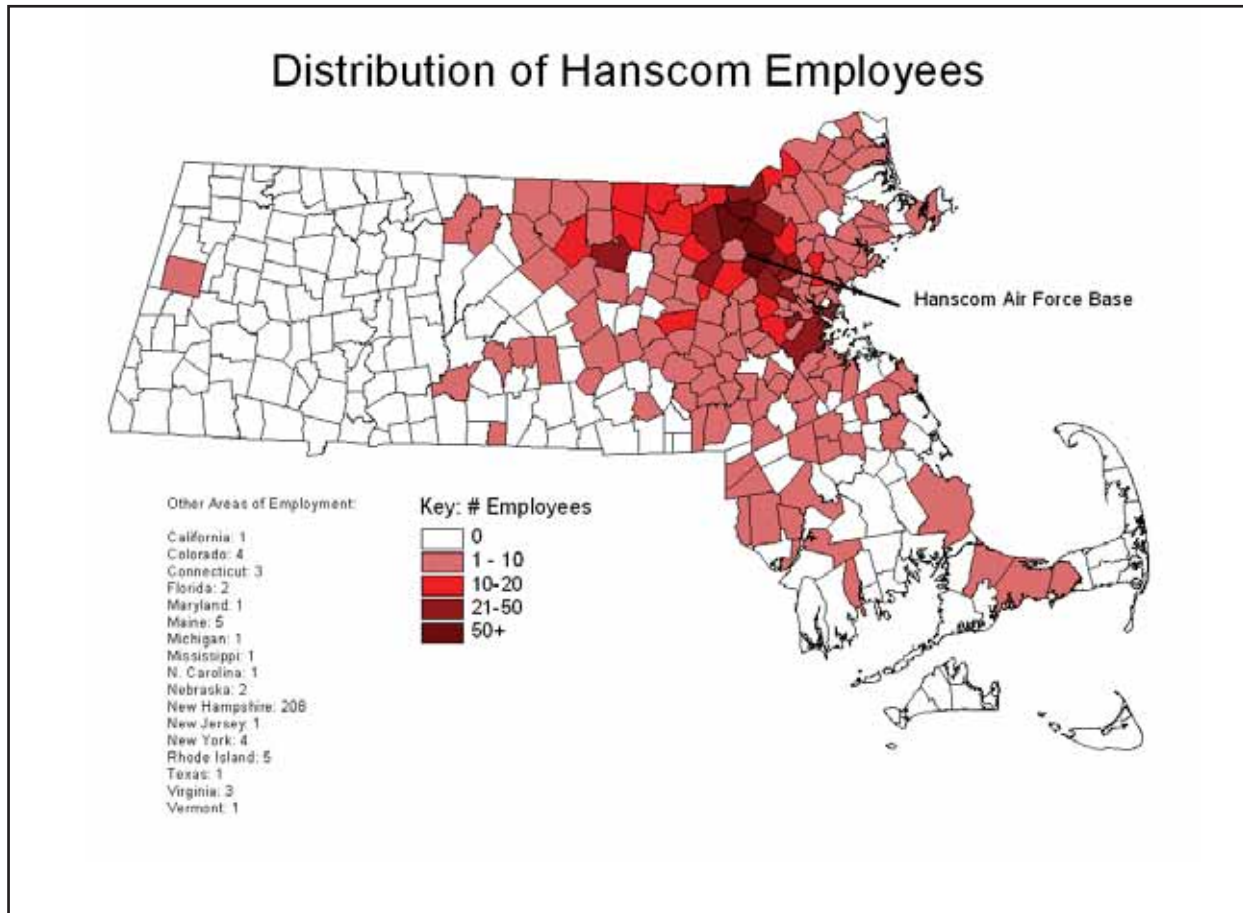
¹ The direct output of a private sector business establishment is typically measured by the total value of goods and services annually produced on-site (i.e., annual sales). However, most public sector establishments do not have "sales" and, therefore, output is measured by total on-site expenditures, which consist mainly, or even exclusively, of employee payroll. However, much of Hanscom's operations are conducted through private sector contractors, which are technically indirect impacts.

² This figure includes employment and payroll at MITRE Corporation, but excludes payroll and employment at MIT's Lincoln Laboratory, which is included in the analysis as an indirect impact

³ An additional 208 reside in New Hampshire, 5 in Rhode Island, 5 in Maine, 3 in Connecticut, and 1 in Vermont.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

FIGURE 1



INDIRECT, INDUCED, & TOTAL ECONOMIC IMPACTS

Hanscom's operations in Massachusetts also generate indirect and induced impacts within the state as a result of contracts for goods and services that are purchased from off-site vendors and as a result of off-base spending by Hanscom's employees and its contractor employees.

INDIRECT ECONOMIC IMPACTS

In 2003, Hanscom AFB awarded more than \$957 million in contracts to Massachusetts companies, universities, and medical facilities to support its on-going operations. These purchases were distributed among 38 different sectors of the state's economy with the largest expenditures for high technology and professional services, including scientific research and development, search, detection, and navigation instruments, communications equipment, management consulting services, computer system design services, custom computer programming services, environmental and technical consulting, business support services, architectural and engineering services, power generation and supply, facilities support services, and accounting and bookkeeping services (see Table 2).

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

TABLE 2

HANSCOM CONTRACT AWARDS, FY 2003

Implan Code	Implan Description	Contract Amount
19	Oil & gas extraction	\$825,000
30	Power generation & supply	\$5,834,415
39	Highway, street, bridge construction/maintenance	\$118,837
40	Water & sewer construction/maintenance	\$33,000
42	Maintenance of nonfarm residential structures	\$536,182
43	Maintenance of non residential bldgs	\$76,180
171	Other misc. chemical product mfg.	\$60,000
181	Other rubber product mfg.	\$1,244,160
271	Optical instrument & lens mfg.	\$34,980
289	Air & gas compressor mfg.	\$28,533
291	Elevator and moving stairway mfg.	\$5,508
302	Electronic computer mfg.	\$41,310
303	Computer storage device mfg.	\$6,700
307	Broadcast & wireless communications equipment	\$450,402
308	Other communications equipment mfg.	\$39,200,508
313	Electromedical apparatus mfg.	\$89,185
314	Search, detection, & navigation instruments	\$73,096,918
319	Analytical laboratory instrument mfg.	\$70,825
327	Electrical housewares & household fan mfg.	\$69,476
370	Office furniture, except wood, mfg.	\$31,340
376	Surgical appliance & supplies mfg.	\$151,050
438	Accounting & bookkeeping services	\$1,777,820
439	Architectural & engineering services	\$6,161,634
441	Custom computer programming services	\$13,531,478
442	Computer systems design services	\$27,684,422
443	Other computer related services	\$24,730,716
444	Management consulting services	\$34,283,775
445	Environmental & other technical consulting	\$13,183,572
446	Scientific research & development services	\$697,082,370
450	Other misc. professional & technical services	\$6,604,707
453	Facilities support services	\$2,664,120
455	Business support services	\$6,324,424
458	Services to bldgs. & dwellings	\$13,420
460	Waste mgt. & remediation services	\$44,800
463	Other educational services	\$631,337
466	Other ambulatory health care services	\$563,973
489	Dry cleaning & laundry services	\$61,543
Total		\$957,348,620

Source: "Procurement Guidance and Data," <http://www.dior.whs.mil/peidhome/guide/procooper.htm>.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

In 2003, Hanscom awarded 714 contracts to 83 different recipients in the state of Massachusetts, although 90 percent of the contract monies were awarded to Hanscom's top 25 contractors, especially the Massachusetts Institute of Technology, The MITRE Corporation, Titan Systems Corporation, and Raytheon Company (see Table 3).

TABLE 3

TOP 25 MASSACHUSETTS CONTRACTORS WITH HANSCOM AFB, 2003

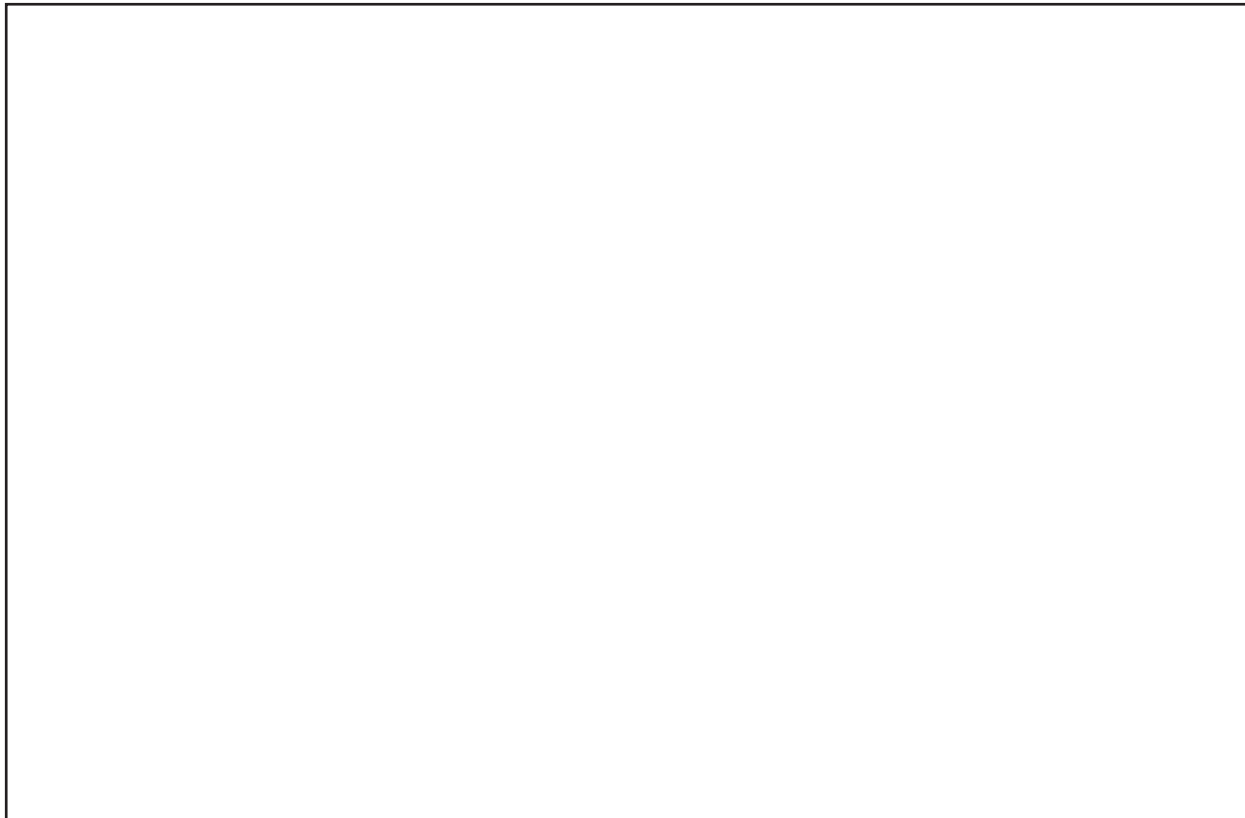
Contractor Name	Contractor Location	Amount Awarded
Massachusetts Institute of Technology	Cambridge	\$ 495,745,595
The MITRE Corp.	Bedford	\$ 186,720,776
Titan Systems Corp.	Billerica	\$ 73,856,979
Raytheon Co.	Marlborough, Sudbury, Bedford	\$ 73,478,257
BAE Systems Enterprise Systems	Bedford	\$ 19,650,842
ACS Defense, Inc.	Burlington	\$ 17,122,186
Dynamics Research Corporation	Andover	\$ 15,276,201
Textron Systems Corp.	Wilmington	\$ 9,553,520
P3I, Inc.	Hopkinton	\$ 6,962,832
General Dynamics, Inc.	Needham	\$ 5,352,039
Odyssey Systems Consulting Group	Wakefield	\$ 5,224,439
Quantech Services, Inc.	Bedford	\$ 4,748,837
Oasis Systems, Inc.	Bedford	\$ 4,125,361
Paradigm Technologies, Inc.	Bedford	\$ 3,278,486
Radex, Inc.	Carlisle	\$ 3,250,346
Boston Edison Company	Boston	\$ 3,050,000
Boston College	Chestnut Hill	\$ 2,985,600
Transcanada Power	Westborough	\$ 2,784,415
Morgan Memorial Goodwill Industries	Boston	\$ 2,430,043
Gemini Industries, Inc.	Billerica	\$ 2,231,097
Spectral Sciences, Inc.	Burlington	\$ 2,074,335
Netcracker Technology Corp.	Waltham	\$ 2,000,000
LAU Technologies	Littleton	\$ 1,408,807
Radant Technologies, Inc.	Stow	\$ 1,263,400
Mattie & O'Brien Mechanical Co.	Boston	\$ 1,238,436

Source: "Procurement Guidance and Data," <http://www.dior.whs.mil/peidhome/guide/procoper.htm>.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

Hanscom’s 714 procurement and services contracts were awarded to vendors with operations in 41 of the state’s 351 municipalities. Most procurement and service contracts were with firms operating along the Route 128 and I-495 beltways (see Figure 2).

FIGURE 2



The IMPlan model estimates that Hanscom’s \$957 million in procurement and service contracts to Massachusetts vendors generates approximately \$1.1 billion in annual output in Massachusetts and 9,989 jobs with a total payroll of \$708,875,370 (see Table 5).

INDUCED ECONOMIC IMPACTS

The consumer expenditures of Hanscom’s employees and those of its contracted employees generate an additional \$1.6 billion in annual output in Massachusetts, which supports another 16,084 jobs in Massachusetts with a total payroll of \$670,218,173 (see Table 5). The IMPlan modeling system is able to specify the sectoral distribution of these induced impacts by calculating the regional effect of purchases made by these employees based on disposable income levels and the BEA’s input-output accounts for Massachusetts. The model indicates that the induced impacts attributable to the Hanscom complex are widely distributed across the state’s economy – some employment is supported in 385 of IMPlan’s 538 sector codes – but the most significant induced impacts occur in sectors providing consumer goods and services, such as residential real estate and construction, general merchandise and clothing, automotive services, eating and drinking places, child care, health care, financial services, educational services, and local government (see Table 4):

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

TABLE 4

SECTORAL DISTRIBUTION OF INDUCED EMPLOYMENT IMPACTS, 2003

Implan Code	Implan Description	Induced Employment
33	New residential single family structures	125
35	New residential alterations & additions	115
38	Commercial and institutional building	281
41	Other new construction	185
390	Wholesale trade	358
401	Motor vehicle and parts dealers	250
404	Building materials & garden supply	152
405	Food & beverage stores	482
406	Health & personal care stores	166
408	Clothing & clothing accessories	208
409	Sporting goods, hobby, book stores	125
410	General merchandise stores	274
411	Miscellaneous store retailers	206
412	Nonstore retailers	196
422	Telecommunications	109
426	Securities, commodities contracts, investments	104
427	Insurance carriers	148
430	Banking	102
431	Real estate	277
437	Legal Services	166
439	Architectural & engineering services	148
441	Custom computer programming services	211
451	Management of companies & enterprises	106
454	Employment services	268
458	Services to buildings & dwellings	169
461	Elementary & secondary schools	141
462	Colleges, universities, & junior colleges	274
464	Home health care services	176
465	Offices of physicians & dentists	616
466	Other ambulatory health care services	132
467	Hospitals	742
468	Nursing & residential care facilities	375
469	Child day care services	153
470	Social assistance, except child day care	255
478	Other amusement, gambling, & recreation	130
481	Food services & drinking places	1436
483	Automotive repair & maintenance	208
487	Personal care services	105
493	Civil, social, professional, & similar orgs.	208
503	State & local education	1019
504	State & local education non-education	957
505	Federal military	184
506	Federal non-military	170

Note: Table only includes sectors with induced employment impacts of 100+.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

TOTAL ECONOMIC IMPACTS

Hanscom's total annual economic impact, including direct, indirect, and induced impacts, is \$3.0 billion in annual output in Massachusetts and 30,220 jobs with an annual payroll of \$1.7 billion (2003). This is approximately one percent (1%) of the state's total ES-202 employment.

TABLE 5

HANSCOM COMPLEX: TOTAL ECONOMIC IMPACTS, 2003				
	Direct	Indirect	Induced	Total
Output	\$341,778,562	\$1,077,279,704	\$1,571,058,119	\$2,990,116,385
Employment	4,147	9,989	16,084	30,220
Payroll	\$341,778,562	\$708,875,370	\$670,218,173	\$1,720,872,105

Sources: Hanscom AFB and IMPlan model.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

CONTEXT FOR EVALUATING HANSCOM’S ECONOMIC IMPACTS

The economic impact of the Hanscom Air Force Base complex is comparatively large on a statewide, regional, and local basis. This section of the report provides a context for evaluating the economic significance of Hanscom’s presence in the Commonwealth of Massachusetts. The firm’s economic significance to the state economy is evaluated in three areas: (1) its quantitative contribution to employment and wages, (2) its multiplier effect on employment and income, and (3) the quality of job creation.

CONTRIBUTION TO EMPLOYMENT & WAGES

EMPLOYMENT: DISTRIBUTION, RATIO, AND MULTIPLIER

The Hanscom Air Force Base complex directly employs 4,391 persons (ES-202 basis, 2003) and up to 4,147 of these employees reside in the Commonwealth of Massachusetts. Data on the residence of employees was available only for federal military employees (IMPlan Code 505), but this data alone indicates that Hanscom has a far-reaching impact on the state’s employment base. Hanscom employs 1,411 federal military employees and 1,167 (83%) of them reside in Massachusetts. There is at least one federal military employee from Hanscom residing in 178 (51%) of the state’s 351 towns and cities.

About 38 percent of its employees (440) are concentrated in ten town and cities, but even this list indicates that employees of the complex are distributed among many kinds of communities: Lowell, Chelmsford, Bedford, Billerica, Leominster, Dracut, Lexington, Burlington, Arlington, and Tewksbury (see Table 6). The distribution of Hanscom’s contract awards also suggests that the facility’s indirect employment is widely diffused throughout the Commonwealth, but with a geographically concentrated impact around the Route 128 and I-495 beltways.

TABLE 6

TOP 10 PLACES OF RESIDENCE FOR HANSCOM FEDERAL MILITARY EMPLOYEES	
Town/City	No. of Hanscom Employees
Lowell	77
Chelmsford	65
Bedford	56
Billerica	53
Leominster	40
Dracut	36
Lexington	32
Burlington	29
Arlington	28
Tewksbury	24

Source: Hanscom Air Force Base.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

The Hanscom AFB complex also generates a substantial amount of indirect employment (9,989 jobs) through its procurement and services contracts. The direct and indirect employment generated by Hanscom's operations is 14,380 jobs distributed across a wide variety of economic sectors, although the employment is heavily concentrated in high-wage sectors such as high technology and professional services. The consumer expenditures by these employees generate an additional 16,084 jobs in Massachusetts for a combined total economic impact of 30,220 jobs (ES-202 basis).

Hanscom-related employment (direct, indirect, and induced) accounts for approximately 1 percent of the state's total employment.

The direct employment at Hanscom AFB and the employment sustained by its procurement and services contracts would make it the 13th largest "private" employer in the Commonwealth of Massachusetts.

TOP 25 EMPLOYERS, 2003

Top 25 Employers, 2003

Rank	Company	Employees Worldwide
1	TJX Cos.	89,000
2	Raytheon	76,400
3	Staples	57,816
4	FleetBoston Financial Corp.	50,000
5	Gillette Co.	30,300
6	State Street Corp.	19,501
7	New England Medical Center	17,620
8	EMC Corp.	17,400
9	BJ's Wholesale Club	15,800
10	Friendly Ice Cream Corp.	15,000
11	Bright Horizons Family Solutions	15,000
12	Harvard University	15,000
	Hanscom AFB Complex	14,380
13	General Hospital	14,000
14	Boston Scientific Corp.	13,900
15	Iron Mountain	11,800
16	Thermo Electron Corp.	10,900
17	PerkinElmer	10,700
18	FMR Corporation	12,000
19	Talbots	10,400
20	UMass Memorial Hospitals	8,683
21	Analog Devices	8,600
22	John Hancock Financial Services	7,962
23	UniFirst Corp.	7,800
24	Brigham & Women's Hospital	7,500
25	North Shore Medical Center	7,025

Source: "Globe 100," www.boston.com/globe/business/packages/globe_100/2003/charts/employers.htm and *Comprehensive Annual Financial Report* (Boston: Office of the Comptroller, 2003), p. 125.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

The IMPlan model for Massachusetts calculates a multiplier effect of 2.3 for Hanscom’s operations, which means that for every 100 persons directly or indirectly employed through Hanscom’s operations an additional 130 jobs are created by business establishments elsewhere in the state.

WAGES & INCOME: RATIO AND MULTIPLIER

Hanscom’s operations directly and indirectly generate approximately \$1.1 billion in annual payroll with approximately \$809 million of this amount paid out as wages and salaries (ES-202 basis).⁴ These employees’ purchases and consumer expenditures generate an additional \$670.2 million in labor income (i.e., induced impacts) for a combined total of \$1.7 billion in Hanscom-related payrolls.

The IMPlan model for Massachusetts calculates a multiplier effect of 1.9 for Hanscom’s operations, which means that for every \$100 in Hanscom-generated payroll (direct and indirect) an additional \$90 in wages and salaries is generated by business establishments elsewhere in the state.

JOB QUALITY

The annual average wages paid by a business establishment or industry is a key measure of job quality. The estimated annual average wage paid by Hanscom AFB (direct and indirect) is well above the state average. The average annual wage of Hanscom-related employees is \$56,259 (ES-202 basis, 2003) compared to the statewide average annual wage for all industries of \$46,332. The average annual wages generated by Hanscom’s operations is 21 percent higher than the average for all industries in Massachusetts.

⁴ It is estimated that approximately 23 percent of total payroll is employer matching contributions for health care, retirement, social security, and other fringe benefits.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

B. ECONOMIC IMPACTS OF NATICK SOLDIER SYSTEMS CENTER

DIRECT ECONOMIC IMPACTS

Natick SSC's on-going operations directly produce \$86 million in annual output (2003).⁵ It is estimated that Natick's operations directly employ 1,254 persons (see Table 7). Employment at the Natick facility directly generates more than \$86 million in annual payroll, including wages, salaries, bonuses, commissions, reimbursements, temporary labor, and employer-paid fringe benefits, and on-site contractors. The payroll covers federal military and non-military employees, public safety, property management, environmental management, scientific research and development, personnel support, logistics, and information services.

TABLE 7

NATICK SSC: DIRECT EMPLOYMENT, 2003.			
Implan Code	Implan Description	Payroll*	Estimated Employment***
439	Architectural & engineering services (environmental management)	\$3,200,000	41
441	Custom computer programming services (information services)	\$2,000,000	28
446	Scientific research & development services	\$63,670,000	824
452	Office administrative services (personnel support)	\$700,000	21
453	Facilities support services	\$9,800,000	206
457	Investigative & security services (public safety)	\$1,300,000	39
505	Federal military	\$5,705,000	95
	Total	\$86,375,000	1,254

Sources: Natick SSC and IMPlan. Notes: *Payroll includes fringe benefits paid by the employer, which normally equal 23% to 25% of compensation. **Provided by Natick SSC. ***Estimated by IMPlan with expenditure data from Natick SSC.

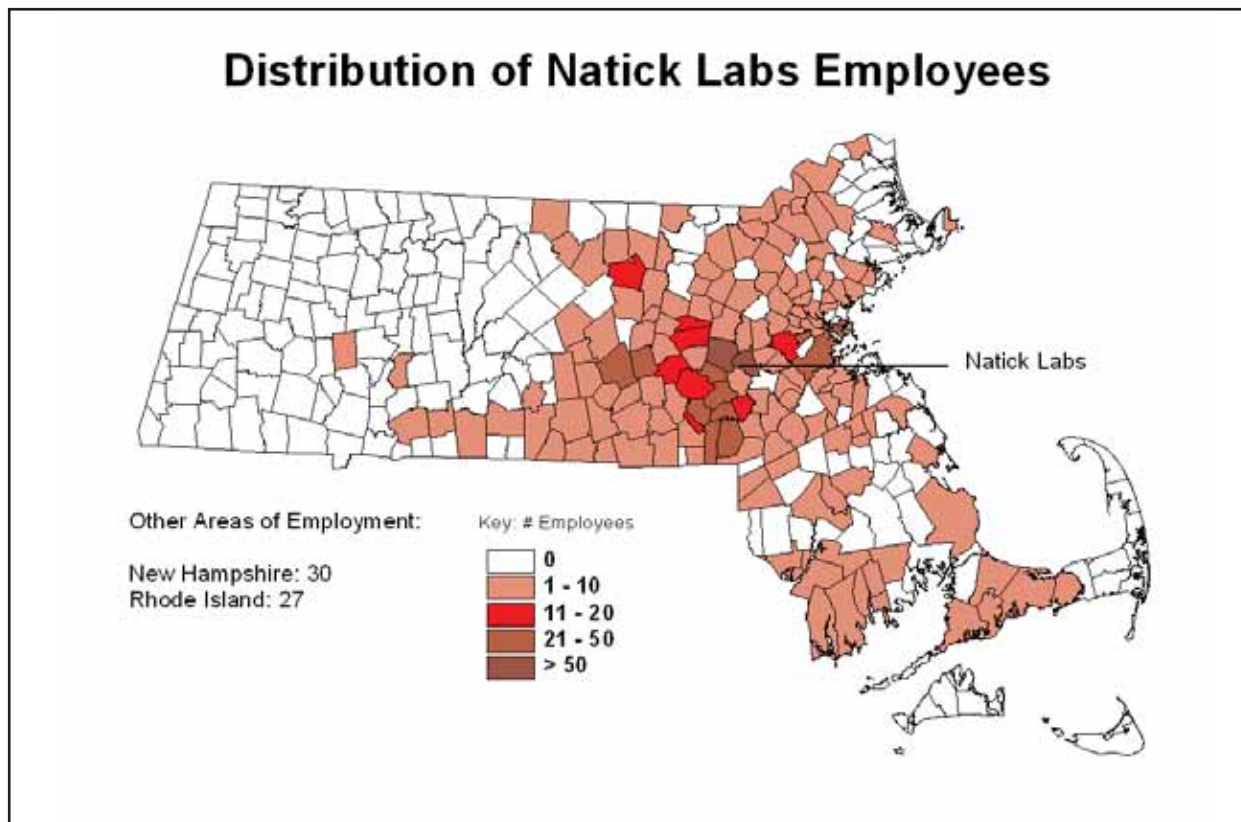
Data on the residence of most on-site employees was available from Natick SSC and this data suggests that Natick has a far-reaching impact on the state's employment base. Natick employs 1,254 persons, including on-site contractors a substantial number of them reside in Massachusetts.⁶ There is at least one employee from Natick residing in 178 (51%) of the state's 351 municipalities (see Figure 3).

⁵ The direct output of a private sector business establishment is typically measured by the total value of goods and services annually produced on-site (i.e., annual sales). However, most public sector establishments do not have "sales" and, therefore, output is measured by total on-site expenditures, which consist mainly, or even exclusively, of employee payroll. However, much of Hanscom's operations are conducted through private sector contractors, which are technically indirect impacts.

⁶ 970 employees reside in Massachusetts, 30 in New Hampshire, 27 in Rhode Island, while 227 addresses are not available.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

FIGURE 3



INDIRECT, INDUCED, & TOTAL ECONOMIC IMPACTS

Natick's operations in Massachusetts also generate indirect and induced impacts within the state as a result of contracts for goods and services that are purchased from off-site vendors and as a result of off-base spending by Natick's employees and its contractor employees.

INDIRECT ECONOMIC IMPACTS

In 2003, Natick SSC awarded approximately \$27.2 million in contracts to Massachusetts companies, universities, and medical facilities to support its on-going operations. These purchases were distributed among 66 different sectors of the state's economy with most of the expenditures for construction, manufactured goods, and professional services. The five largest areas of contract purchases are architectural and engineering services, scientific research and development services, apparel manufacturing, fabricated metal products, and rubber products (see Table 8).

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

TABLE 8

NATICK CONTRACT AWARDS, FY 2003

Implan Code	Implan Description	Contract Amount
28	Support activities for oil & gas operations	\$10,000
42	Maintenance & repair of residential structures	\$11,100
43	Maintenance & repair of nonresidential bldgs.	\$69,138
45	Other maintenance & repair construction	\$634,364
93	Broadwoven fabric mills	\$26,318
99	Carpet & rug mills	\$4,139
103	Other miscellaneous textile product mills	\$19,222
106	Other apparel knitting mills	\$657
107	Cut & sew apparel manufacturing	\$2,942,375
108	Accessories & other apparel manufacturing	\$31,640
119	Other mill work including flooring	\$2,629
141	Prepress services	\$3,020
152	Plastics material & resin manufacturing	\$9,177
160	Pharmaceutical & medicine manufacturing	\$6,652
161	Paint & coating manufacturing	\$6,562
164	Polish & other sanitation goods manufacturing	\$12,500
169	Custom compounding of purchased resins	\$65,954
171	Other miscellaneous chemical product mfg.	\$63,294
173	Plastics, pipe, fittings, & profile shapes	\$65,359
180	Rubber & plastics hose & belting mfg.	\$11,651
181	Other rubber product manufacturing	\$582,681
205	Iron, steel pipe, & tube from purchased steel	\$48,693
255	Miscellaneous fabricated metal product mfg.	\$876,806
265	Textile machinery manufacturing	\$68,469
267	Food product machinery manufacturing	\$41,460
269	All other industrial machinery manufacturing	\$3,805
270	Office machinery manufacturing	\$25,542
273	Other commercial & service industry machinery	\$17,577
276	Industrial & commercial fan & blower mfg.	\$13,725
282	Special tool, dye, jig, & fixture mfg.	\$24,000
298	Industrial process furnace & oven mfg.	\$54,326
303	Computer storage device mfg.	\$12,865
309	Audio & video equipment manufacturing	\$8,740
312	All other electronic component manufacturing	\$223,297
322	Software reproducing	\$24,500
343	Misc. electrical equipment manufacturing	\$114,433
368	Wood office furniture manufacturing	\$13,750
370	Office furniture, except wood, mfg.	\$782,795
374	Laboratory apparatus & furniture mfg.	\$107,108
390	Wholesale trade	\$418,925
400	Warehousing & storage	\$95,288
414	Periodical publishers	\$23,213
432	Automotive equipment & leasing	\$12,220
434	Machinery & equipment rental & leasing	\$10,500
437	Legal services	\$18,056
439	Architectural & engineering services	\$9,123,136
440	Specialized design services	\$203,657
442	Computer systems design services	\$5,020

Continued on next page

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

CONTINUED... NATICK CONTRACT AWARDS, FY 2003

Implan Code	Implan Description	Contract Amount
443	Other computer related services	\$294,323
444	Management consulting services	\$106,460
445	Environmental & other technical consulting	\$139,820
446	Scientific research & development services	\$8,495,788
448	Photographic services	\$4,080
450	Other misc. prof. & technical services	\$70,952
452	Office administrative services	\$15,507
453	Facilities support services	\$5,878
455	Business support services	\$1,959
459	Other support services	\$28,925
460	Waste mgt. & remediation services	\$379,195
462	Colleges, universities, & junior colleges	\$206,396
467	Hospitals	\$112,760
473	Independent artists, writers, & performers	\$5,650
481	Food services & drinking places	\$308,537
484	Electronic equipment repair & maintenance	\$13,945
485	Commercial machinery repair & maintenance	\$30,636
	Total	\$27,171,149

Source: "Procurement Guidance and Data," <http://www.dior.whs.mil/peidhome/guide/procooper.htm>.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

In 2003, Natick SSC awarded 539 contracts to 202 different recipients in the state of Massachusetts, although 82 percent of the contract monies were awarded to Natick's top 25 contractors (see Table 9).

TABLE 9

TOP 25 MASSACHUSETTS CONTRACTORS WITH NATICK SSC, 2003

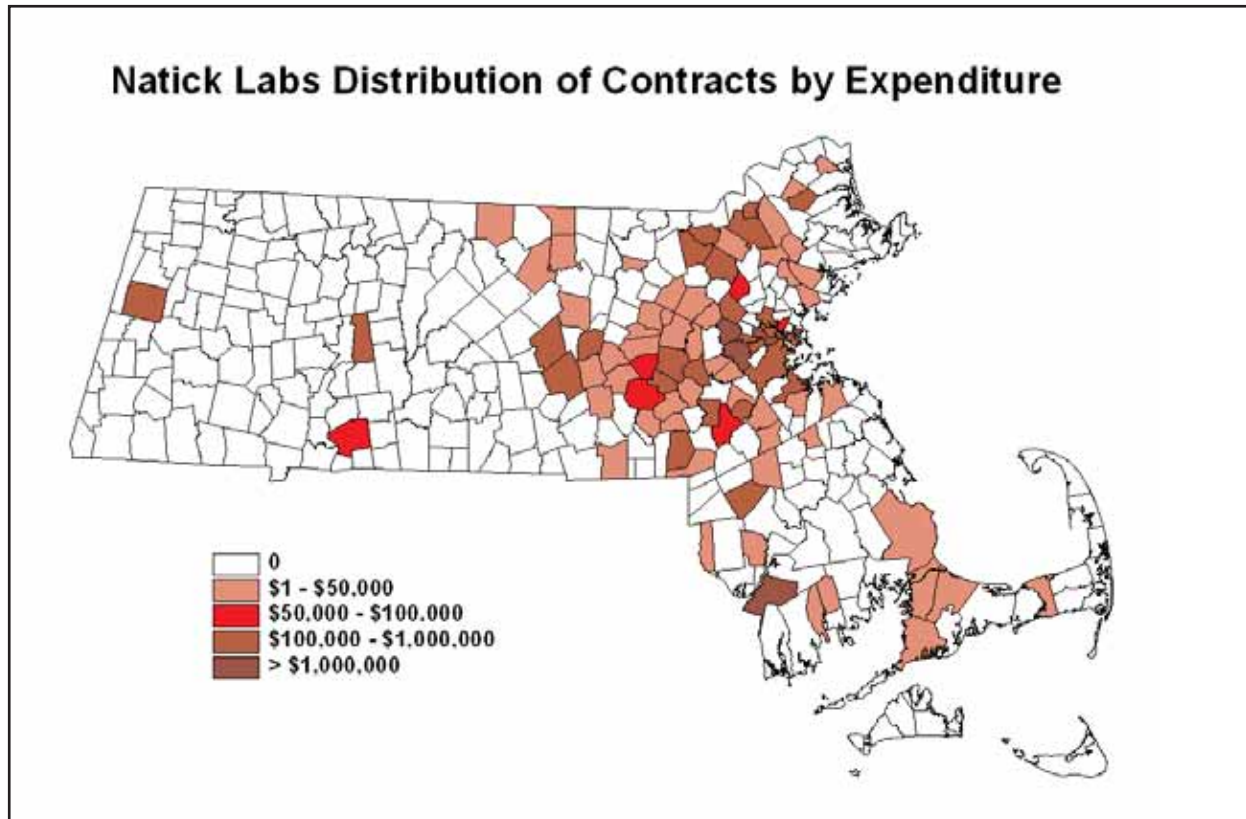
Contractor Name	Contractor Location	Amount Awarded
Geo-Centers	Newton	\$5,529,976
American Power Source, Inc.	Fall River	\$2,922,375
Charles Stark Draper Laboratory	Cambridge	\$2,045,000
Foster-Miller, Inc.	Waltham	\$1,724,007
Boston Dynamics, Inc.	Cambridge	\$1,105,000
University of Massachusetts	Amherst, Boston, Lowell	\$999,741
Yankee Scientific, Inc.	Medfield	\$941,358
Protech Armored Products	Pittsfield	\$829,560
Roseanne Kelleher	Medford	\$777,391
Physical Sciences, Inc.	Andover	\$757,197
ICF Consulting Services	Lexington	\$609,397
UFP Technologies, Inc.	Georgetown	\$586,581
Tiax LLC	Cambridge	\$563,652
Oatsystems, Inc.	Watertown	\$455,300
Bruker Biospin Corp.	Billerica	\$402,000
Work, Inc.	Quincy	\$304,036
Triumvirate Environmental, Inc.	Somerville	\$303,430
Technical Products, Inc.	Framingham	\$290,609
Titan Systems, Inc.	Chelmsford	\$239,093
Duffy Plumbing Corp.	Natick	\$232,331
Boston College	Chestnut Hill	\$186,935
Matthew Foster	Worcester	\$164,144
Megawave Corporation	Boylston	\$149,993
R S Wells Ent Enterprises	Ashland	\$146,673
Applied Epidemiology, Inc.	Amherst	\$146,447
		Total \$22,412,226

Source: "Procurement Guidance and Data," <http://www.dior.whs.mil/peidhome/guide/procoper.htm>.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

Natick's 539 procurement and services contracts were awarded to vendors with operations in 87 of the state's 351 municipalities (see Figure 4).

FIGURE 4



The IMPlan model estimates that Natick's \$27 million in procurement and service contracts to Massachusetts vendors generates approximately \$33 million in annual output in Massachusetts and 320 jobs with a total payroll of \$19,077,447 (see Table 11).

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

INDUCED ECONOMIC IMPACTS

The consumer expenditures of Natick’s employees and those of its contracted employees generate an additional \$135 million in annual output in Massachusetts, which supports another 1,384 jobs in Massachusetts with a total payroll of \$57,904,129 (see Table 11). The IMPlan modeling system is able to specify the sectoral distribution of these induced impacts by calculating the regional effect of purchases made by these employees based on disposable income levels and the BEA’s input-output accounts for Massachusetts. The model indicates that the induced impacts attributable to Natick SSC are widely distributed across the state’s economy – some employment is supported in 277 of IMplan’s 528 sector codes – but the most significant induced impacts occur in sectors providing consumer goods and services, such as residential real estate and construction, general merchandise and clothing, automotive services, eating and drinking places, child care, health care, educational services, and local government (see Table 10):

TABLE 10

SECTORAL DISTRIBUTION OF INDUCED EMPLOYMENT IMPACTS, 2003

Implan Code	Implan Description	Induced Employment
33	New residential single family structures	11
35	New residential alterations & additions	10
38	Commercial and institutional building	25
41	Other new construction	16
390	Wholesale trade	39
401	Motor vehicle and parts dealers	21
404	Building materials & garden supply	13
405	Food & beverage stores	41
406	Health & personal care stores	14
408	Clothing & clothing accessories	17
409	Sporting goods, hobby, book stores	11
410	General merchandise stores	23
411	Miscellaneous store retailers	17
412	Non-store retailers	17
427	Insurance carriers	12
431	Real estate	24
437	Legal Services	14
439	Architectural & engineering services	13
441	Custom computer programming services	19
454	Employment services	24
458	Services to buildings & dwellings	14
461	Elementary & secondary schools	12
462	Colleges, universities, & junior colleges	23
464	Home health care services	15
465	Offices of physicians & dentists	52
466	Other ambulatory health care services	11

Continued on next page

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

(CONTINUED...) SECTORAL DISTRIBUTION OF INDUCED EMPLOYMENT IMPACTS, 2003

Implan Code	Implan Description	Induced Employment
467	Hospitals	63
468	Nursing & residential care facilities	32
469	Child day care services	13
470	Social assistance, except child day care	21
478	Other amusement, gambling, & recreation	11
481	Food services & drinking places	121
483	Automotive repair & maintenance	17
493	Civil, social, professional, & similar orgs.	17
503	State & local education	92
504	State & local education non-education	87
505	Federal military	16
506	Federal non-military	15

Note: Table only includes sectors with induced employment impacts of 10+.

TOTAL ECONOMIC IMPACTS

Natick's total annual economic impact, including direct, indirect, and induced impacts, is \$254 million in annual output and 2,958 jobs with an annual payroll of \$162.3 million (2003). This is approximately one-tenth of one percent (0.1%) of the state's total ES-202 employment.

TABLE 11

NATICK SSC: TOTAL ECONOMIC IMPACTS, 2003

	Direct	Indirect	Induced	Total
Output	\$86,375,000	\$32,670,694	\$134,987,536	\$254,033,230
Employment	1,254	320	1,384	2,958
Payroll	\$86,375,000	\$19,077,447	\$57,904,129	\$162,296,576

Sources: Natick SSC and IMPlan model.

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

CONTEXT FOR EVALUATING NATICK'S ECONOMIC IMPACTS

This section of the report provides a context for evaluating the economic significance of the Natick Soldier Systems Center's presence in the Commonwealth of Massachusetts. The center's economic significance to the state economy is evaluated in three areas: (1) its quantitative contribution to employment and wages, (2) its multiplier effect on employment and income, and (3) the quality of job creation.

CONTRIBUTION TO EMPLOYMENT & WAGES

EMPLOYMENT: DISTRIBUTION, RATIO, AND MULTIPLIER

The Natick Soldier System Center directly employs 1,254 persons (ES-202 basis, 2003). Data on the residence of employees indicates that Natick has a far-reaching impact on the state's employment base. There is at least one Natick employee residing in 178 (51%) of the state's 351 towns and cities.

About 43 percent of its employees (446) are concentrated in ten towns and cities, but even this list indicates that employees of the complex are distributed among many kinds of communities: Natick, Framingham, Franklin, Holliston, Medway, Milford, Ashland, Worcester, Bellingham, and Shrewsbury (see Table 12). The distribution of Natick's contract awards also suggests that the facility's indirect employment is widely diffused throughout the Commonwealth.

TABLE 12

TOP 10 PLACES OF RESIDENCE FOR NATICK SSC EMPLOYEES	
Town/City	No. of Natick Employees
Natick	108
Framingham	69
Franklin	46
Holliston	40
Medway	39
Milford	35
Ashland	30
Worcester	29
Bellingham	26
Shrewsbury	24

Source: Natick SSC.

The Natick SSC also generates indirect employment (320 jobs) through its procurement and services contracts. The direct and indirect employment generated by Natick's operations is 1,574 jobs distributed across a wide variety of economic sectors, although the employment is heavily concentrated in high-wage sectors such as scientific research and development and professional services. The consumer expenditures of these employees generate an additional 1,384 jobs in Massachusetts for a combined total economic impact of 2,958 jobs (ES-202 basis).

Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC

Natick-related employment (direct, indirect, and induced) accounts for approximately one-tenth of one percent (0.1%) of the state’s total employment.

The direct employment at Natick SSC and the employment sustained by its procurement and services contracts would place it among the 50 largest “private” employers in the Commonwealth of Massachusetts if it operated as a single integrated business establishment.

The IMPlan model for Massachusetts calculates a multiplier effect of 1.9 for Natick’s operations, which means that for every 100 persons directly or indirectly employed through Natick’s operations an additional 90 jobs are created by business establishments elsewhere in the state.

WAGES & INCOME: RATIO AND MULTIPLIER

Natick’s operations directly and indirectly generate approximately \$105.4 million in annual payroll with approximately \$81.2 million of this amount paid out as wages and salaries (ES-202 basis).⁷ These employees’ purchases and consumer expenditures generate an additional \$57.9 million in labor income (i.e., induced impacts) for a combined total of \$162.3 million in Natick-related payrolls.

The IMPlan model for Massachusetts calculates a multiplier effect of 1.5 for Natick’s operations, which means that for every \$100 in Natick-generated payroll (direct and indirect) an additional \$50 in wages and salaries is generated by business establishments elsewhere in the state.

JOB QUALITY

The annual average wages paid by a business establishment or industry is a key measure of job quality. The estimated annual average wage paid by Natick SSC and its contractors (direct and indirect) are well above the state average. The average annual wage of Natick-related employees is \$51,558 (ES-202 basis, 2003) compared to the statewide average annual wage for all industries of \$46,332. The average annual wage generated by Natick’s operations is 11.3 percent higher than the average for all industries in Massachusetts.

⁷ It is estimated that approximately 23 percent of total payroll is employer matching contributions for health care, retirement, social security, and other fringe benefits.



Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC



Appendix C—THE ECONOMIC IMPACTS OF HANSCOM AFB AND NATICK SSC