



UMASS DONAHUE INSTITUTE



Otis Air National Guard  
**Economic Impact Study**

---

**July 2005**

Eric Nakajima, Senior Research Manager  
UMass Donahue Institute  
Economic and Public Policy Research

Prepared for  
Steven Wolfe Associates, LLC



## Acknowledgements

Eric Nakajima, Senior Research Manager  
UMass Donahue Institute  
Economic and Public Policy Research

With

Michael Goodman, Director  
Rebecca Loveland, Research Manager  
Kate Modzelewski, Project Coordinator  
James Palma, Research Manager

The authors would like to acknowledge the contribution of the following people to the completion of this report: Lt. Ken Nunley and his colleagues, 102<sup>nd</sup> Fighter Wing, Otis ANG; Captain David Brimblecom, U.S. Coast Guard; Mark Forest, Office of Congressman William Delahunt; Arthur Robert, Massachusetts Executive Office of Economic Affairs; Bill Burke, MassDevelopment; Steven Wolfe, Steven Wolfe Associates; Marie Oliva, Executive Director of the Cape Cod Canal Chamber of Commerce; and, the Save Otis Committee.



# Contents

**Executive Summary.....1**  
**Section I: Economic Impact of the Otis ANG Base .....4**  
**Section II: Fiscal Impact of Base Closure .....9**  
**Section III: Impact on U.S. Coast Guard & Coastal Communities..15**  
**Appendix A: Background.....20**  
**Appendix B: Methodology & Data Sources.....22**  
**Appendix C: Supplemental Data .....26**



## Executive Summary

### Economic Impact of the Otis ANG

The 102<sup>nd</sup> Fighter Wing of the Massachusetts Air National Guard (Otis ANG), through its payroll, contracting and other expenditures, had a direct, indirect and induced economic impact on the Commonwealth of Massachusetts in FY 2004 of \$82.3 million. The economic impact is largely driven by the salaries and benefits paid to Otis ANG Base employees. In FY04, Otis ANG directly employed 559 full-time and 421 part-time workers who reside in Massachusetts. Total spending by the base and its employees is responsible for creating an additional 742 total jobs statewide with over \$32.9 million in additional payroll. If the Otis ANG Base were a private employer, it would be one of the 12 largest employers in Barnstable County.

The UMass Donahue Institute conducted a thorough quantitative and qualitative analysis of the economic impact of payroll and expenditures at the Otis ANG Base. The analysis incorporated full payroll, contracting and other expenditure data from the 102<sup>nd</sup> Fighter Wing. The Donahue Institute interviewed staff from the 102<sup>nd</sup> Fighter Wing of the Otis ANG, U.S. Coast Guard, Massachusetts Army National Guard as well as representatives and officials from the adjacent communities and the fishing industry. The Donahue Institute utilized IMPLAN, an industry standard econometric modeling system for specifying indirect and induced economic impacts.

### Statewide Economic Impacts of the Otis ANG

- In FY04, Otis ANG entered into \$17.8 million in contracts with Massachusetts firms. Spending by these contractors and their employees generated an additional \$12.4 million in economic activity across the Commonwealth.
- In FY04, the Otis ANG's largest in-state contracts were in Worcester County. Contracts in Worcester County generated a total of 229 jobs. Overall, Otis ANG payroll and spending had a \$22.2 million economic impact in the county.

### Economic Impacts of the Otis ANG on Cape Cod and Southeastern Massachusetts

- In FY04, Otis ANG directly employed 346 full-time and 100 part-time workers who reside in Barnstable County. Total expenditures by the Otis ANG and its Barnstable County employees created an additional 242 jobs in the county, with over \$9.4 million in additional payroll.
- In FY04, Otis ANG operations had a total direct, indirect and induced economic impact in Barnstable County of \$27.5 million. Most of the economic impact resulted from base employment and the additional jobs created in the county.
- In Plymouth County, the Otis ANG Base had an economic impact in FY04 of \$11 million. Otis ANG directly employed 128 full-time and 84 part-time workers who reside in Plymouth County.
- In southeastern Massachusetts (Bristol, Barnstable and Plymouth counties), the Otis ANG Base directly employed 531 full-time and 245 part-time workers who live in the region. Total spending in the region by the base and its employees generated an additional 421 jobs, with over \$16.2 million of payroll.

### Seasonal Impact of Otis ANG Base Employment on the Upper Cape

The Otis ANG Base provides well-paying, full-time benefited employment for hundreds of Cape Cod residents who reside mostly in the four towns adjacent to the Massachusetts Military Reservation (Bourne, Falmouth, Mashpee and Sandwich). Base employment has a modest but measurable seasonal impact on the four adjacent



towns. In 2004, Otis ANG employment ranged from a low of 1.05 percent of total employment in the four towns in August 2004 to a high of 1.30 percent of employment in February 2004.

### **The Role of the Otis ANG on the Massachusetts Military Reservation**

The Otis Air National Guard Base, home to the 102<sup>nd</sup> Fighter Wing of the Massachusetts Air National Guard (Otis ANG), is located on the Massachusetts Military Reservation (MMR). The MMR covers about 22,000 acres, or approximately 30 square miles, on the upper western portion of Cape Cod, including parts of the towns of Bourne, Mashpee and Sandwich and abutting the town of Falmouth. The U.S. Coast Guard, Army National Guard and Otis ANG occupy the southern portion of the reservation. The northern 14,700-acre section of MMR is used primarily by the Army National Guard for training exercises. The MMR also includes nonmilitary tenants, including the Barnstable County Sheriff's Office, two public schools, the U.S. Department of Agriculture, and a municipal Integrated Solid Waste Management Facility, among others.

- The Otis ANG, in its role as host tenant on the MMR, provides basic services to all MMR tenants, including: electricity, water, sewerage, communications infrastructure, fire protection and maintenance of main roads. MMR tenants reimburse the Otis ANG for the cost of the utilities consumed; the Otis ANG pays for all maintenance and capital costs for upkeep of the infrastructure. In FY 2004, the Otis ANG paid for over 76 percent (\$6.5 million) of the cost of MMR basic services, including utilities, of \$9.5 million.
- The Otis ANG pays 100 percent of the cost of operating the air field used by the U.S. Coast Guard and Army National Guard to execute their core missions.

### **Estimated Leave-Behind Costs**

- The total annual cost of maintaining Base Operating Services (BOS) in FY 2005 dollars is estimated to be \$15.8 million. The BOS is for baseline operating costs and does not include additional costs for capital spending, which vary from year to year. The U.S. Coast Guard estimates that it would need 129 additional FTE personnel to maintain full air field and base operations. The Army National Guard is currently evaluating the costs that it may have to absorb if the 102<sup>nd</sup> Fighter Wing leaves.

### **Estimated Fiscal Impact on the U.S. Coast Guard**

- In FY 2005, the total budget for Coast Guard Air Station Cape Cod was \$5.06 million. The U.S. Coast Guard would need an additional appropriation of \$15.8 million, or 300 percent of current funds, to meet the total cost of air field and host tenant services.
- In addition to U.S. Coast Guard air operations, the MMR houses core Coast Guard services that support Coast Guard stations from Boston to Rhode Island. Many of those services – housing, medical services – cannot be readily relocated in the event that base operating services at the MMR are withdrawn.

### **Impact of the Closure on the U.S. Coast Guard and Coastal Communities**

Air Station Cape Cod is located at the geographic center of the First District, between the Canadian border and northern New Jersey, and serves the region with the most intense fishing and boating activity in the northeast. Air Station Cape Cod protects New Bedford, the nation's top seafood port in terms of dollar value of catch and is a lifeline for off-shore fishing fleets. The Coast Guard is the emergency responder in inclement weather to Nantucket and Martha's Vineyard, New England's largest inhabited islands.

- The majority of Search and Rescue (SAR) responses in the First District occur between Cape Ann and Block Island.
- The Coast Guard averages over 50 medical evacuations by helicopter from the Islands every year.
- Air Station Cape Cod provides basic housing, medical and support services for Coast Guard Boat Stations throughout Massachusetts and Rhode Island.

The loss of the Otis ANG will place a significant burden on the U.S. Coast Guard to absorb some or all of the costs of the air field and MMR host tenant services. If the cost of providing base services proves prohibitive, one possible effect of base closure could be the relocation of the Coast Guard Air Station off Cape Cod. In interviews, the U.S. Coast Guard stated that under no circumstances would emergency response times increase above the maximum acceptable time of two hours. According to the Coast Guard, Cape Cod is the optimal location for the Coast Guard Air Station given its location at the geographic center of the First District and its proximity to the majority of the region's demand for Coast Guard search and rescue activity.

## Section I: Economic Impact of the Otis ANG Base

In May 2005, it was announced that the 102<sup>nd</sup> Fighter Wing of the Massachusetts Air National Guard located at the Otis Air National Guard Base (Otis ANG) was listed on the preliminary base closing list of the Base Realignment and Closure (BRAC) Commission. The Otis ANG Base is held in high regard in the Commonwealth of Massachusetts due to its history and importance to the region's security. Subsequent to the BRAC Commission's announcement, the UMass Donahue Institute was asked to prepare an analysis of the economic impact of the Otis Air National Guard Base on the state, Barnstable County and southeastern Massachusetts. The core of this report in Section I consists of the economic impact analysis. In the course of preparing the economic impact analysis, additional questions were posed regarding the unique role of the Otis ANG in support of other operations at the Massachusetts Military Reservation. Sections II and III of the report consist of an analysis of the cost of services provided by the Otis ANG to tenants at the MMR, the impact of the proposed closure on adjacent municipalities, and the role of the U.S. Coast Guard Air Station Cape Cod in the region.

### Section I: Economic Impact of the Otis Air National Guard Base

The Otis Air National Guard Base (exclusive of Combat Communications, which is not slated for closure by the BRAC Commission) had an economic impact in Massachusetts of \$82.3 million in FY 2004. The economic impact is measured through the impact on the state of all direct expenditures by the Otis ANG, including: full and part-time payroll, contracts for supplies, equipment and services and other expenditures. Table 1, shown below, summarizes the direct expenditures and economic impact of the Otis ANG.

**Table 1: Summary of Economic Impacts of Otis ANG, FY 2004**

		Massachusetts	Barnstable	Bristol	Plymouth	Balance of MA
Direct Employment	Full-Time	559	346	57	128	29
	Part-Time	421	100	61	84	176
	Total	980	446	118	212	205
Employment Generated	Total	742	242	83	96	281
Direct Payroll	Total Payroll	\$39,642,239	\$22,363,040	\$4,400,516	\$8,878,993	\$3,999,691
Payroll Generated	Total Average Payroll per New Employee	\$32,974,987	\$9,433,113	\$2,948,707	\$3,848,042	\$12,627,937
		\$44,435	\$38,983	\$35,641	\$40,011	\$44,960
Direct Spending	Contracts	\$14,284,224	\$6,278	\$1,330,498	\$4,320	\$12,943,128
	Purchases	\$3,481,906	\$977,485	\$216,258	\$167,517	\$2,104,574
	Total	\$17,766,130	\$983,763	\$1,546,756	\$171,837	\$15,047,702
Overall Impact	Employment	1,722	688	201	308	482
	Total	\$82,257,054	\$27,478,126	\$5,837,039	\$10,999,358	\$29,024,349

Source: UMass Donahue Institute.



The economic impact of the Otis ANG on the Massachusetts economy is largely driven by the salaries and benefits paid to Otis ANG Base employees. In FY04, Otis ANG directly employed 559 full-time and 421 part-time workers who reside in Massachusetts.

The highest concentration of Otis employees reside in the towns closest to the MMR (Plymouth, Bourne, Mashpee, Falmouth and Sandwich). However, full and part-time employees live in communities throughout eastern Massachusetts. Figures 1 and 2 show the distribution of full and part-time Otis ANG employees in statewide (figure one) and in southeastern Massachusetts (figure two). Total spending by the base and its employees is responsible for creating an additional 742 total jobs statewide with over \$32.9 million in additional payroll. The distribution of the economic impact statewide largely mirrors the distribution of Otis ANG employees by town of residence, with the exception of the impact of contracts and purchases, particularly in Worcester County.

### **Regional Impacts**

Over half of the economic impact of the Otis ANG is in southeastern Massachusetts (Barnstable, Bristol and Plymouth counties). In FY 2004, the Otis ANG had an economic impact of \$44.3 million in southeastern Massachusetts. The Otis ANG directly employs 531 full-time personnel who reside in the region. The greatest economic impact occurs in Barnstable County, home to the Otis ANG Base. The second largest economic impact is in Worcester County. Almost all of the economic impact in Worcester County can be accounted for by \$12.8 million in construction contracts awarded in FY 2004 to firms located in that county.

#### *Barnstable County*

Barnstable County is home to the largest percentage of employees in the region (65 percent) and experiences the most substantial economic impact, \$27.5 million. The Otis ANG is a significant local employer providing year-round, benefited jobs in a region with seasonal fluctuations in employment levels. If the Otis ANG Base were a private employer, it would be one of the 12 largest employers in Barnstable County.<sup>1</sup> The Otis ANG has a modest but measurable seasonal impact on employment on the Upper Cape. During the summer months, when employment in the four towns adjacent to the MMR is at its peak, the Otis ANG employment represents 1.05 percent of total employment. During the winter, when employment in the Upper Cape is at its annual low, Otis ANG employment is 1.30% of the four-town total.<sup>2</sup>

#### *Worcester County*

The economic impact of the Otis ANG in Worcester County illustrates the economic benefit to Massachusetts of construction and maintenance projects contracted through the MMR. The Otis ANG had an economic impact on Worcester County in FY 2004 of \$22.2 million. \$21.6 million of that impact is related to contracts (mostly construction related) awarded to firms based in Worcester County. The Otis ANG employed 34 people who reside in Worcester County and directly supported the employment of 147 workers through contracts. Otis ANG payroll and expenditures in Worcester County generated 88 additional jobs in the county.

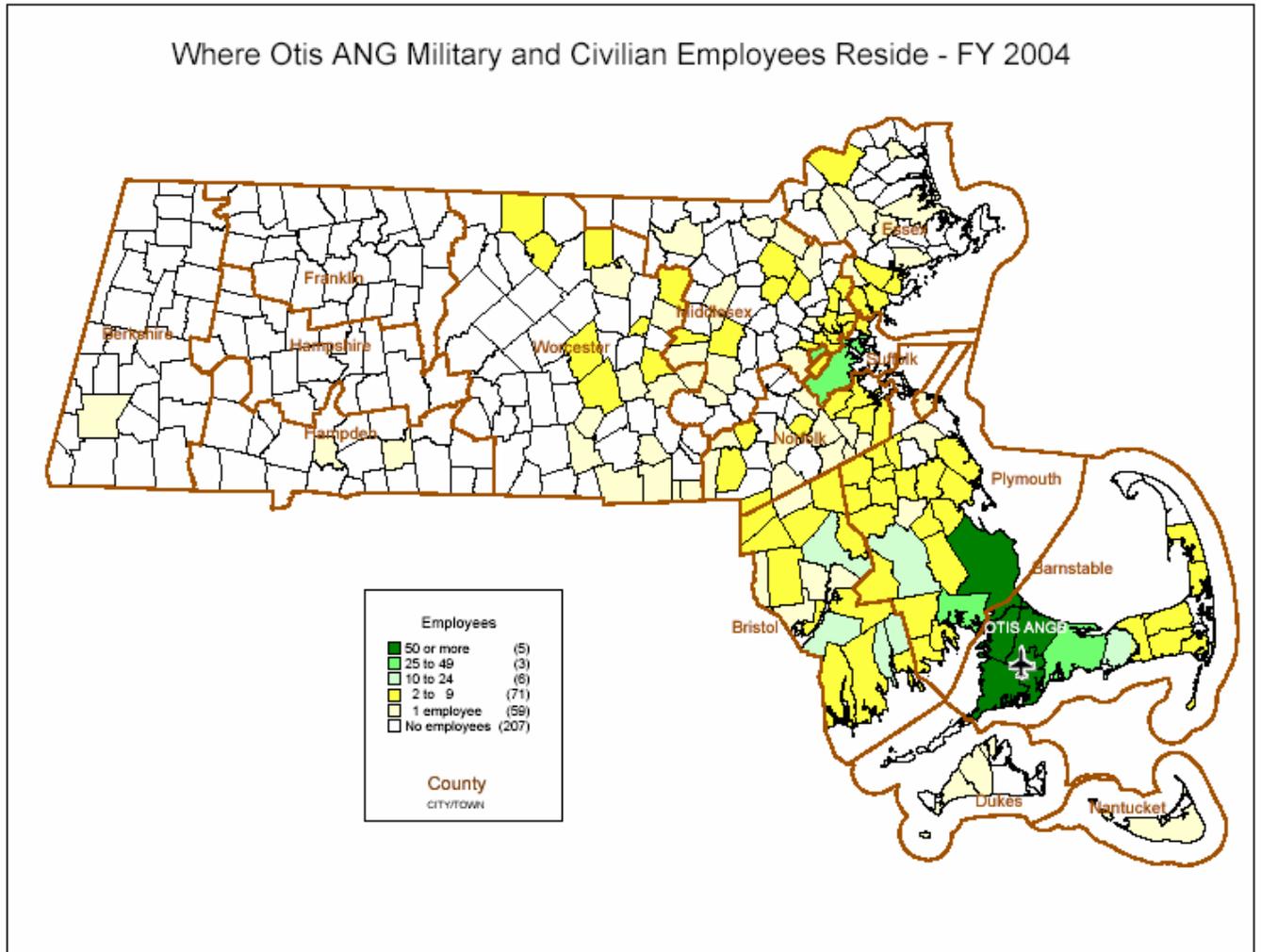
#### *Bristol and Plymouth Counties*

The Otis ANG employs 128 full-time personnel in Plymouth County and 57 full-time personnel in Bristol County. In FY 2004, the economic impact in the two counties was \$16.8 million, with two-thirds of this impact experienced by Plymouth County. 95 percent of the economic impact in Bristol and Plymouth Counties was generated by the spending by Otis ANG personnel who reside in those counties.

<sup>1</sup> This estimate is based on U.S. Census County Business Patterns for 2002, recording firms in Barnstable County by number of employees.

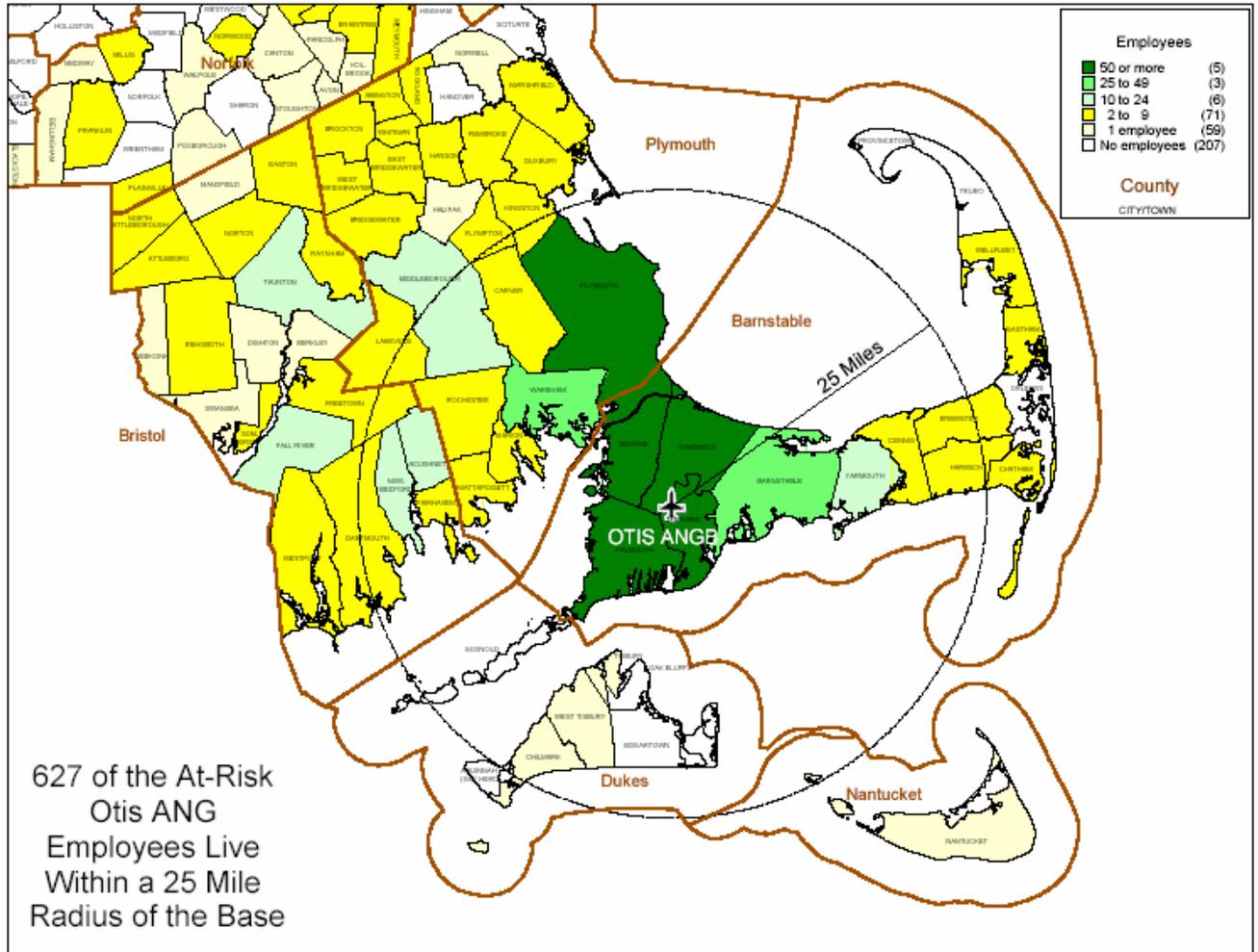
<sup>2</sup> Seasonal employment figures are based on D.U.A. 2004 employment in the towns of Bourne, Falmouth, Mashpee and Sandwich for the months of February and August.

Figure 1.



Source: UMass Donahue Institute

Figure 2.



Source: UMass Donahue Institute

**Conclusion**

In the context of the state and regional economy, the Otis ANG has a modest but notable economic impact on the state and southeastern Massachusetts. This is primarily due to Massachusetts' limited role in manufacturing the equipment and products purchased by the Otis ANG. However, the Otis ANG is a significant employer in Barnstable County. Full-time employment at the Otis ANG represents more than one percent of jobs in the adjacent communities of Falmouth, Bourne, Mashpee and Sandwich. In the absence of robust job growth on the state and regional level, the loss of full-time, benefited employment at the Otis ANG is meaningful.

## Section II: Fiscal Impact of Base Closure

### Introduction

The proposed closure of the Otis Air National Guard Base would have a clear impact on the ability of other tenants at the Massachusetts Military Reservation to fulfill their core missions. The 102<sup>nd</sup> Fighter Wing of the Massachusetts Air National Guard is the host tenant at the Massachusetts Military Reservation. In this host capacity, the Air National Guard provides basic services such as electricity, water and sewerage and fire protection throughout the MMR. In addition, the Air National Guard operates and maintains the air field utilized by the U.S. Coast Guard and Army National Guard. The Otis ANG is responsible for 100 percent of the costs of maintaining basic MMR infrastructure and for the operation and maintenance of the air field. In the absence of the 102<sup>nd</sup> Fighter Wing, MMR tenants will have to assume some of the costs and duties currently performed by the ANG. This section evaluates the fiscal and operational impacts of the proposed closure of the Otis Air National Guard Base on tenants at the MMR and adjacent municipalities.

### *The MMR and Base Operating Services*

The 102<sup>nd</sup> Fighter Wing of the Massachusetts Air National Guard serves as the host tenant of over 25 organizations that share resources and facilities at the Massachusetts Military Reservation (for a full list of tenants, see Appendix C). The Otis Air National Guard (Otis ANG) provides basic services to all MMR tenants, including: electricity, water, sewerage, communications (lines), fire protection, and maintenance of most of the main roads on the MMR. MMR tenants reimburse the Otis ANG for the cost of utility consumption (electric, water, sewerage) on a metered basis; however, the Otis ANG pays for all of the cost of operating and maintaining the utility infrastructure. The Otis ANG pays the full cost of operating the Otis fire department.

The scale of the Otis ANG host tenant services operations at the Massachusetts Military Reservation is best appreciated through an understanding of the size of the MMR. At 34.4 square miles, the Massachusetts Military Reservation is equivalent in size to the largest Massachusetts towns. As shown in Table 2, the Otis ANG maintains 70 miles of electric utility lines, 2,068 utility poles and 610 transformers. The Otis ANG maintains 57 miles of sewage lines and operates a wastewater treatment facility. In addition, Otis ANG personnel maintain 27 miles of MMR roadways and staff a fire department with 57 firefighters and 11 vehicles. The host tenant services provided by the Otis ANG support every tenant at the MMR and would have to be maintained whether or not the air field continues to be operated.

Table 2: Summary of Host Tenant Infrastructure &amp; Equipment

<b>I. INFRASTRUCTURE AND MAINTENANCE</b>	<b>Unit of Measure</b>	<b>Miles</b>
<b>A. ELECTRICITY</b>		
Electric Utility Lines Total (linear feet)	372,636	70.6
Utility Poles (EA)	2,068	
Transformers (EA)	610	
<b>B. AIRFIELD LIGHTING (linear feet)</b>		
	170,800	
<b>C. ROADWAYS TOTAL (linear feet)</b>		
	144,013	27.3
<b>D. WASTE WATER TREATMENT PLANT</b>		
<b>E. SEWER TOTALS (linear feet)</b>		
	303,204	57.4
<b>F. WATER DISTRIBUTION TOTALS (linear feet)</b>		
	520,027	98.5
<b>G. ENGINEERING AND MAINTENANCE PERSONNEL</b>		
	22 Persons	
<b>II. FIRE PROTECTION</b>		
<b>A. FIRE FIGHTING VEHICLES</b>		
	11	
<b>B. EQUIPMENT</b>		
Foam Trailer	1	
Haz-Mat Trailer	1	
Mule	1	
Tech Rescue Trailer	1	
Brush Breakers	2	
Portable Compressor (Breathing Air)	1	
<b>C. FIRE DEPARTMENT PERSONNEL</b>		
	57 persons	

Source: Civil Engineering Division, Otis ANG Base; prepared by the UMass Donahue Institute.

**Air Field Operations**

The Otis ANG operates and maintains the base’s air field, including the F.A.A. tower, runways and all airport facilities.<sup>3</sup> The Army National Guard and U.S. Coast Guard depend upon the Otis ANG for support of all of their air operations. As shown on Table 3, the Army National Guard uses the air field to support training activities at the MMR for Guard units located throughout New England. The U.S. Coast Guard Air Station Cape Cod uses the air field to execute all of its airborne activities in the First District of the United States, from the Canadian border to northern New Jersey. Air Station Cape Cod enforces fisheries protection rules in New England and provides emergency rescue and safety services from the coastline to the off-shore fishing fleet at George’s Bank.

**Table 3: Air Field Uses by MMR Tenants (excluding 102nd Fighter Wing)**

Branch	Type of Aircraft	Mission
U.S. Coast Guard	4 HH-60J Helicopters 4 HU-25 Falcon Jets	Search and Rescue Homeland Security Fisheries and Law Enforcement Aids to Navigation Support Counter-Narcotics Migrant Interdiction Maritime Tactical Vertical Delivery Training
MA Army National Guard	8 Blackhawk helicopters 1 C-26 turboprop	Training Guard Units from New England States

Sources: Army Air National Guard; U.S. Coast Guard, Otis Air Station

**Base Operating Service Costs**

The host tenant and air field operations provided by the Otis ANG are called Base Operating Services (BOS). The UMass Donahue Institute estimate of BOS costs was determined through the combined analysis of the Otis ANG, U.S. Coast Guard and the UMass Donahue Institute. The Otis ANG provided the U.S. Coast Guard with its analysis of BOS costs by service provided. The U.S. Coast Guard narrowed the set of BOS by excluding costs that it did not deem essential to supporting MMR infrastructure or the air field. Excluded costs include services such as the Precision Measurement Equipment Laboratory (PMEL) which calibrates sensitive electronic equipment and Explosive Ordnance Disposal (EOD).<sup>4</sup> The UMass Donahue Institute worked with the Otis ANG to further refine the BOS cost estimate by developing a detailed accounting of BOS expenses. The final figure presents the best estimate of Base Operating Services available without the development of base closure scenarios that are beyond the scope of this analysis.

Out of a total budget in FY 2005 of \$137.9 million, the Otis Air National Guard estimates that it is spending \$18.6 million on annual Base Operating Services. The UMass Donahue Institute baseline estimate of BOS (leave behind costs) is \$15.8 million, which includes a net increase for the remaining MMR tenants of 129 FTE personnel. The UMass Donahue Institute estimate of BOS costs does not include the cost of capital projects that are subject to appropriation and vary from year to year (F.A.A. tower reconstruction, runway resurfacing, and lighting). The UMass Donahue Institute estimate of BOS is summarized in a table on the following page.

<sup>3</sup> The Army National Guard and the U.S. Coast Guard operate separate facilities to maintain their aircraft and have taxiways linked to the air field. The Air National Guard funds and operates the air field.

<sup>4</sup> The ANG makes the case that PMEL and EOD services will have to be assumed by another base and are thus not pure savings as presented by the BRAC. This report does not evaluate that claim.

**Estimated Annual Base Operating Costs (Leave Behind Costs)**

If the Otis ANG base is closed, it would leave behind an estimated \$15.8 million in annual costs for the remaining tenants of the MMR. Approximately two-thirds of these leave-behind costs would be associated with the personnel required to maintain the infrastructure and operate the air field. The Otis ANG currently employs 165 FTE personnel to perform base operating services. The U.S. Coast Guard estimates that it would need 129 full-time equivalents to maintain base operations. The Facility Engineering Costs in Table 4 include the cost of maintaining the electric utility infrastructure on the MMR, the roads and grounds, wastewater treatment plant and full system of sewage lines and water mains. Transportation includes the full cost of supporting the fleet of vehicles required to maintain the MMR. Air field operations include the cost of managing the air field, paying the costs of the F.A.A. and maintaining the emergency generation and power supply to the air field.

The Otis ANG estimates that a minimum of \$10.3 million in capital expenditures are required in the immediate future. The urgent capital expenditures include: \$1.3 million in approach lighting, \$2 million in taxiway slab repairs and \$7 million for a new F.A.A. control tower. The capital expenditures are not included in the \$15.8 million estimate of annual base operating costs.

**Table 4: Base Operating Costs at the Massachusetts Military Reservation, FY 2005**

<b>Department/Cost</b>	<b>Personnel</b>	<b>Personnel Cost</b>	<b>Supplies, Equipment &amp; Other Costs</b>	<b>Total (\$K)</b>
<b>A. Facility Engineer Costs</b>				
Electrical	11	\$810,128	\$54,000	\$864,128
Roads & Grounds	10	\$579,110	\$137,000	\$716,110
Fire Department	49	\$3,712,240	\$85,000	\$3,797,240
Water and Wastewater Treatment Plants	5	\$383,855	\$28,000	\$411,855
Other Engineering	19	\$1,263,129	\$248,000	\$1,511,129
<b>B. Utility Costs</b>				
	N/A		\$785,000	\$785,000
<b>C. Civil Engineering Costs</b>				
	6	\$570,780	\$68,000	\$638,780
<b>D. Transportation</b>				
	7	\$444,668	\$133,000	\$577,668
<b>E. Security</b>				
	N/A		\$250,000	\$250,000
<b>F. Air Field Operations</b>				
	4	\$989,200		\$989,200
<b>G. Support / Misc</b>				
	18	\$1,148,724	\$28,000	\$1,176,724
<b>H. Annual Civil Engineering Maintenance</b>				
	N/A		\$4,078,000	\$4,078,000
<b>I. Acquisition, Construction and Improvements</b>				
			<b>NOT INCLUDED</b>	
<b>Total</b>	<b>129</b>	<b>\$9,901,834</b>	<b>\$5,866,028</b>	<b>\$15,795,834</b>

Sources: U.S. Coast Guard Air Station Cape Cod; 102nd Fighter Wing, Otis ANG; UMass Donahue Institute.

### **Impact on Municipalities**

The communities directly adjacent to the Massachusetts Military Reservation have historic connections to the installation. Municipal officials interviewed for this report expressed pride in the work of the 102<sup>nd</sup> Fighter Wing and noted that the families and staff people associated with the MMR add to the diversity and vitality of their communities. The MMR has a positive presence within the region and the Towns of Bourne, Mashpee, Sandwich and Falmouth have an active presence at the MMR. The towns have cooperative agreements with the MMR to provide mutual aid for fire protection and emergency services. The MMR is home to the four-town Integrated Solid Waste Management Facility, which transfers the waste from the MMR and four towns to an off-Cape Cod incinerator plant. The Town of Bourne operates a public school (Otis Memorial) on the MMR and the Cape Cod Collaborative provides educational services to children with special needs from throughout Barnstable County. In addition, the recently constructed Barnstable County Sheriff's Office is located on the MMR.

Municipal officials from throughout the four towns note that the impact of the Otis ANG on local communities is far deeper than the provision of host tenants services that benefit facilities located on the MMR. The adjacent communities expressed strong support for the flying mission of the 102<sup>nd</sup> Fighter Wing and, in the context of the events of September 11, 2001, express comfort and pride from knowing that the Otis ANG secures the air space over New England. Municipal and school officials noted that communication and cooperation with the Otis ANG is at a high level in the history of the MMR. The MMR was designated a Superfund site in 1989 and the Cape Cod communities have had a long and contentious debate about the effect of reservation activities on the region's sole-source aquifer. All officials and local residents interviewed for this report expressed great satisfaction with the clean-up effort to-date and the ongoing efforts to monitor water quality on the MMR. In short, there is no evidence of local dissatisfaction with the 102<sup>nd</sup> Fighter Wing and strong anecdotal evidence to the contrary showing support for the Otis ANG and the MMR generally.

### ***Fiscal Impact on Municipalities***

The analysis in Section I showed the economic impact of the Otis ANG in Barnstable County. This section provides a preliminary assessment of the known fiscal impacts the potential Otis ANG base closure. The closure of the Otis ANG would likely have a modest direct fiscal impact on adjacent municipalities and Barnstable County facilities on the MMR. The municipal and county facilities located on the MMR would have to work with other MMR tenants to resolve the operation and finance of host tenant services. Most of those services – roadway clearance, sewer and water maintenance – are beyond the scope of any one municipal tenant to support. However, the municipal tenants also do not constitute a large proportion of MMR activities (by share of land or number of employees). In fact, the Bourne Public Schools is currently planning to vacate its facility on the MMR in fall of 2007. The Otis Memorial Elementary School will be closed in favor of a new school building under construction off of the MMR. The Otis Fire Department of the Otis ANG does provide mutual aid to adjacent communities, including use of specialized equipment that, according to interviews with local officials, would be prohibitively expensive for local fire departments to replace. However, a precise estimate of likely increased costs to adjacent fire departments was beyond the scope of this analysis.

The main impact facing the municipalities is uncertainty. The first uncertainty is the manner and means of resolving the provision of host tenant services if the Otis ANG base is closed. At present, the total cost and organizational structure required to provide basic services at the MMR is entirely unknown. Therefore, it is impossible to responsibly analyze or apportion the costs that would be borne by Barnstable County or adjacent municipalities. The second uncertainty is the effect of the potential withdrawal of mutual aid and specialized fire suppression equipment by the Otis Fire Department. The third uncertainty is how the closure of the Otis ANG would affect the maintenance and operation of the wastewater treatment facility. According to municipal officials, the Otis ANG and the adjacent towns have long-term plans that allow the municipalities to utilize the excess capacity of the plant if and when their own facilities prove inadequate. The towns have a long-term interest in ensuring the proper maintenance and operation of the plant.

A fourth uncertainty is the cost of obtaining electricity on the MMR in the event that the Otis ANG base closes. At present the Otis ANG finances 100 percent of the cost of maintaining and operating the utility infrastructure on the MMR. The Otis ANG receives a wholesale rate for electricity from NStar which it passes on to MMR tenants. For this report, the UMass Donahue Institute interviewed officials from the Otis ANG, NStar and the Massachusetts Department of Telecommunications and Energy to determine the most likely process for replacing the services of the Otis ANG. At a minimum, MMR tenants would face a 5 percent increase in the cost of electricity. In addition, any and all costs for managing and maintaining the utility infrastructure would be passed along to MMR tenants. Given the short time-frame of this project and the complexity of base infrastructure, a detailed analysis of utility costs was not possible.

### **Conclusion**

The Massachusetts Military Reservation is the geographic size of a medium-to-large Massachusetts town. To function, the host tenant services provided by the Otis ANG will have to be replaced if the base is closed. In addition, U.S. Coast Guard Air Station Cape Cod and the Massachusetts Army National Guard rely on the Otis ANG to manage and maintain the air field. Both service branches must have access to the air field to execute their missions at the MMR. The total cost of providing Base Operating Services at the MMR, exclusive of capital costs, is estimated to be \$15.8 million.

## Section III: Impact on U.S. Coast Guard & Coastal Communities

The proposed closure of the Otis Air National Guard (Otis ANG) Base presents fiscal and operational challenges to the remaining tenants of the Massachusetts Military Reservation (MMR). Air Station Cape Cod, the sole U.S. Coast Guard air station in the northeast, would be acutely affected by the closure of the Otis ANG. Air Station Cape Cod serves two distinct but related missions: air operations from the Canadian border to northern New Jersey; and, housing and other supportive services for Coast Guard Stations throughout Massachusetts and Rhode Island. As discussed in Section II, the annual cost of assuming responsibility for the air field and host tenants services would be a minimum of \$15.8 million excluding capital projects. The current Coast Guard budget at Air Station Cape Cod is \$5 million. According to Coast Guard staff, Air Station Cape Cod would be severely challenged to assume the full cost of operating the air field and MMR infrastructure. No other Coast Guard air station in the United States operates and maintains its air field.

This section provides an overview of the mission of Air Station Cape Cod and the station's relationship to the fishing industry and coastal communities. It is beyond the scope of this analysis to present base closure scenarios or predict impacts on the Coast Guard and coastal communities. The purpose of the section is to inform decision-makers of the fit between the safety and other needs of the maritime community and the current location and operations of Air Station Cape Cod.

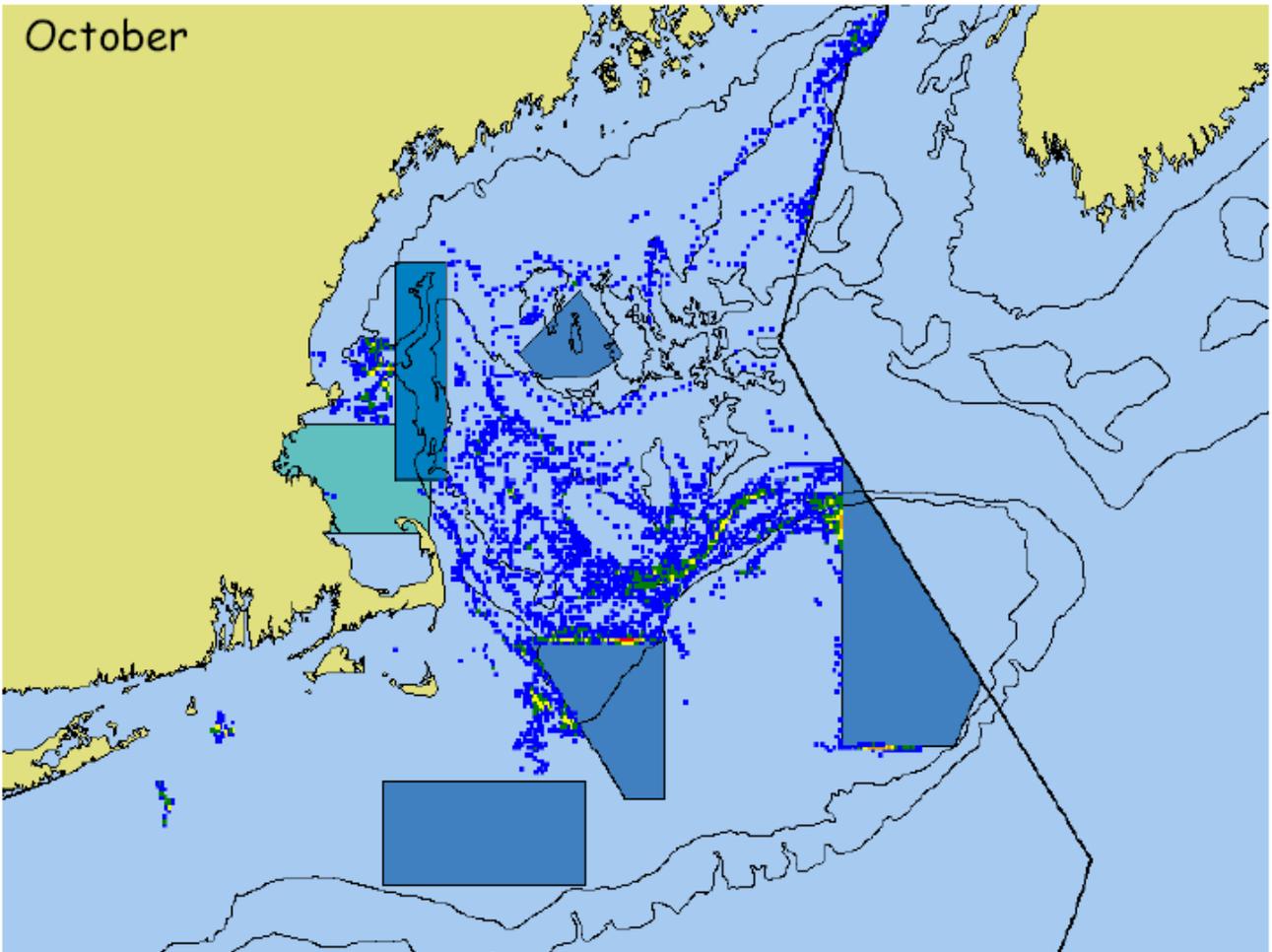
### Summary of Activities

U.S. Coast Guard Air Station Cape Cod uses the A.N.G. Base airfield to carry out a range of duties in a region extending from northern New Jersey to the Canadian border to 275 nautical miles offshore. Air Station Cape Cod is the only Coast Guard Air Unit in the northeast, with missions including: search and rescue; homeland security; fisheries and law enforcement; aids to navigation support; counter-narcotics; migrant interdiction; maritime tactical vertical delivery training. Air Station Cape Cod uses the Otis air field to operate its 4 HH-60J Helicopters and 4 HU-25 Falcon Jets. In addition to its air duties the U.S. Coast Guard manages 545 housing units at the MMR, with a medical clinic, exchange store and community facilities to serve Coast Guard and military personnel throughout eastern Massachusetts and Rhode Island.

### Importance to Commercial Fishing Industry in the Region

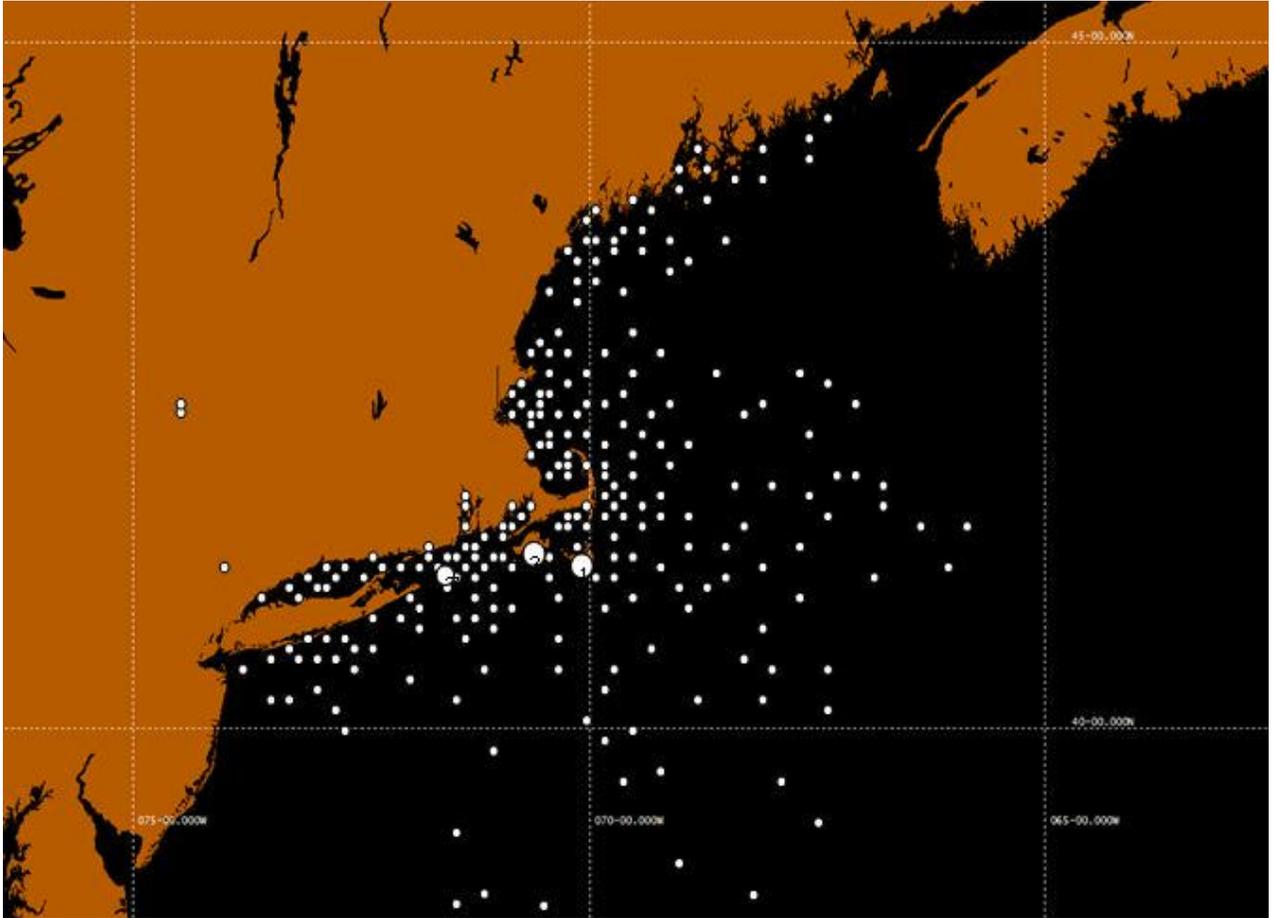
The U.S. Coast Guard often notes that it is currently located at the geographic center of its area of responsibility, the First District of the United States. It claims that if the air station moved north or south of its current location, it would have difficulty serving communities at the far end of the First District within its maximum response time of two hours. As shown in Figure 3, Air Station Cape Cod is at the geographic center of the most intense commercial fishing activity in the First District. Figure 3, prepared by the Northeast Fisheries Science Center, shows satellite tracked fishing activity in the northeast during October 2003. Due to its current location, Air Station Cape Cod can rapidly respond to the majority of the fishing boats in its service area. Figure 4, prepared by Coast Guard Air Station Cape Cod, shows the air search and rescue responses from May 2004 to May 2005. Figure 4 demonstrates that the area of greatest demand for air station services overlaps the area of most intense fishing and boating activity in the First District. Without minimizing the importance of serving commercial and recreational boaters north of Cape Ann or south of Block Island, it is clear that Air Station Cape Cod is well-situated to efficiently execute its mission.

Figure 3: Satellite Tracked Fishing Activity in the Northeast, October 2003



Source: Northeast Fisheries Science Center, Woods Hole

Figure 4: U.S. Coast Guard Search and Rescue Responses from Air Station Cape Cod, May 2004 to May 2005



Source: Air Station Cape Cod, U.S. Coast Guard

### *Commercial Fishing and Safety*

Search and rescue (SAR) responses are the most critical services provided for the fishing industry.<sup>5</sup> Commercial fishing remains one of the most dangerous occupations in Massachusetts<sup>6</sup> and helicopter rescue is often the only practical means of responding to off-shore emergencies. Air Station Cape Cod responds to a search and rescue caseload of at least 225 incidents per year, with an annual average of 50 med-evacs. SAR responses have reached an annual peak of 318 cases per year, in the years reported from FY 1996 to FY 2004.<sup>7</sup> Other critical services provided by the Air Station include enforcement of fisheries management plans designed to restore historic fishing grounds such as Georges Bank and enforce marine protection rules (for whales, for instance).<sup>8</sup>

### **The Fishing Industry in Massachusetts**

The area most immediately accessible from the Air Station - the Massachusetts coastline itself - remains one of the most important centers of commercial fishing activity in the United States. New Bedford is home to the number one port in the United States as measured by total dollar value of catch. The Port of Gloucester ranks 13<sup>th</sup> in the nation and Sandwich has the third largest lobster catch after Portland, ME and Gloucester.<sup>9</sup> More than 1,700 active commercial fishermen and 1,504 commercial lobstermen work in Massachusetts.<sup>10</sup> A 1999 study estimated that 4,100 commercial fishermen were working full time, and another 5,000 to 7,000 people were working as part-time commercial fishermen.<sup>11</sup> The same study showed that average incomes to fishermen in the state in 1999 varied by port, including, wages of \$36,000 in New Bedford, \$32,000 in Gloucester, and \$18,000 in other ports.

The Massachusetts fishing industry is an economically powerful, providing direct as well as secondary benefits to the state economy. Commercial fish landings at the state's major ports in 2003 were valued at upwards of \$236.5 million.<sup>12</sup> In 2003, commercial lobster fishing garnered commercial values of \$49 million.<sup>13</sup> The commercial fishing industry supports an extensive network of shore side suppliers for everything from supplies, equipment purchases and repairs, and financial services. The industry is a critical supplier to regional wholesalers, retailers and restaurants as well as to fish processing plants throughout the region.

### **Coast Communities and Air Station Cape Cod**

Air Station Cape Cod provides "a lifeline"<sup>14</sup> for island communities throughout the northeast. Martha's Vineyard and Nantucket, the two most-populous island communities in the northeast, rely on Air Station Cape Cod to provide air ambulance services to critically-ill patients at Nantucket Cottage Hospital and Martha's Vineyard Hospital. The hospitals rely on commercial med-evac services during clear weather. During inclement weather, commercial services will not fly to the islands and Air Station Cape Cod is the sole provider of emergency transportation services to the islands. The Coast Guard averages 50 med-evacs per year. In addition, Nantucket, Martha's Vineyard and Block Island rely on Air Station Cape Cod to respond to natural disasters and other emergencies related to its mission of homeland security. The Massachusetts Military Reservation is an optimal location from which to respond to these densely-populated island communities.

<sup>5</sup> Interviews with fishing industry representatives, June, 2005.

<sup>6</sup> Massachusetts Coalition for Occupational Safety and Health and the U.S. Bureau of Labor Statistics.

<sup>7</sup> U.S. Coast Guard Air Station Cape Cod document.

<sup>8</sup> Interviews with fishing industry representatives, June, 2005.

<sup>9</sup> Robert Gavin. *Fishing's revival stirs waterfront debate: New Bedford prospers, at a price*. Boston Globe. Boston, Massachusetts. April 3, 2005.

<sup>10</sup> Massachusetts Division of Unemployment Assistance, *ES-202 series, Annual 2003*; and Massachusetts Lobstermen's Association, Inc. *The Massachusetts Lobster Industry - Its Fishermen, Markets and Support Industries*.

<sup>11</sup> Daniel Georgianna. *The Massachusetts Fishing Industry: Proud Past, Uncertain Future*. Massachusetts Benchmarks. Summer 1999, Volume 2, Issue 3.

<sup>12</sup> NOAA Fisheries website. *Total Commercial Fishery Landings At Major U. S. Ports Summarized By Year And Ranked By Dollar Value*. [http://www.st.nmfs.gov/pls/webpls/MF\\_LPORT\\_YEAR.D.RESULTS](http://www.st.nmfs.gov/pls/webpls/MF_LPORT_YEAR.D.RESULTS)

<sup>13</sup> Massachusetts Lobstermen's Association, Inc. *Preliminary: selected landings (lbs) and effort statistics, 1999 - 2003*.

<sup>14</sup> Conversation with Chuck Gifford, Community Relations Director, Nantucket Cottage Hospital, June 22, 2005.

**Conclusion**

This analysis shows that Air Station Cape Cod is optimally located to serve its mission of protecting Massachusetts' workers, industries and communities. No one associated with Air Station Cape Cod suggests that the level of service currently provided to coastal communities and fishermen in the First District will fall below Coast Guard standards if the Otis Air National Guard Base is closed. The challenge for the Commonwealth of Massachusetts is to ensure that the proposed closure of the Otis ANG does not negatively impact a range of Coast Guard services that support island and coastal communities, the tourism and recreational boating industry, and the fishing industry.

## Appendix A: Background

For nearly seven decades, the Otis Air National Guard Base (Otis ANG) has filled key defense and security needs for the nation while providing important social and economic support to Massachusetts in general and to the Cape Cod region and communities around it. This background section provides a brief overview of the history of and operations at the Massachusetts Military Reservation, including the Massachusetts Air National Guard and the U.S. Coast Guard Air Station Cape Cod, which depends upon Otis ANG for financial and operational support.

### Massachusetts Military Reservation (MMR)

MMR covers about 22,000 acres, or approximately 30 square miles, on the upper western portion of Cape Cod, including parts of the towns of Bourne, Mashpee and Sandwich and abutting the town of Falmouth. Occupying the southern part of the reservation are facilities for the U.S. Coast Guard, Army National Guard and Otis ANG, including runways, maintenance areas, access roads, housing and support facilities. The northern 14,700-acre section of MMR is used primarily by the Army National Guard for training exercises. The 750-acre Veterans Administration Cemetery sits on the southwestern corner of the reservation. The Barnstable County sheriff's office is also located on MMR, as is a solid waste transfer station jointly owned and operated by the towns of Bourne, Falmouth, Mashpee and Sandwich. The MMR is located above Cape Cod's sole source aquifer for its drinking water supply. In 1989, MMR was placed on the EPA Superfund list due to the presence of contaminants that threatened the integrity of Cape Cod's drinking water. Millions of dollars have been spent to clean-up and monitor the quality of the water supply under MMR. The Air Force Center for Environmental Excellence located on MMR has the responsibility to ensure the continuation of the clean-up effort.

MMR was established by the Commonwealth in 1935 as a National Guard training camp. In 1938, the landing field area at Camp Edwards was named Otis Field in memory of a Boston flight surgeon and pilot who died while on a training mission. MMR was leased to the federal government in 1940 in preparation for World War II. From 1955 through 1972, the U.S. Air Force operated Otis Air Force Base on MMR, which until 1973 was the largest Aerospace Defense Command base in the world. In 1977, Otis AFB was divided into several installations: the Otis Air National Guard Base, Camp Edwards and the U.S. Coast Guard Air Station Cape Cod.

MMR is the largest training field for the Army in all of New England, training Guard units throughout the northeast on the upper portion of the reservation, most of which is open space reserved for live fire exercises. The Army National Guard has eight Blackhawk helicopters and one C-26 aircraft, all of which use the airfield operated by Otis ANG's 102<sup>nd</sup> Fighter Wing. The Army National Guard relies upon the Air National Guard for basic services, such as maintenance of roads, utilities, water and sewage.

### 102nd Fighter Wing

Headquartered at Otis Air National Guard Base on Cape Cod, the 102<sup>nd</sup> Fighter Wing of the Massachusetts Air National Guard utilizes F-15 fighter aircraft that are on continuous, 24-hour daily mission to help protect the northeast United States from armed attack by other nations or terrorists and to defend against other activities, such as smuggling, illicit drug activity and illegal immigration. The wing is also immediately deployable to support U.S. Air Force requirements elsewhere in the nation or world. Otis ANG pilots are either full-time military or civilian professional pilots.

As the only active air defense base on the east coast between the Canadian border and the nation's capital, Otis ANG plays a lead role in homeland defense. Otis F-15s were the first to respond to the September 11 terrorist attacks on New York City.

As host tenant, Otis ANG provides basic services to other base tenants at little or no charge. It maintains important infrastructure, including roads, water lines, sewage treatment facility, electrical cables and communications lines, including utility poles. It also operates the air field utilized by the U.S. Coast Guard for air operations in the northeast. While it is not the focus of this report, military and other experts have noted Otis ANG's strategic importance to homeland security and defense. Closure of Otis ANG Base could also jeopardize continued operation of the U.S. Coast Guard Air Station Cape Cod since the operational costs and maintenance of that facility are currently covered by Otis ANG, which also pays for Federal Aviation Administration operations in the air base's control tower.

### **U.S. Coast Guard Air Station Cape Cod**

The core of the Coast Guard operations on MMR is Air Station Cape Cod, which provides all air operations for the First District of the United States, an area running from the Canadian border to northern New Jersey. The station is responsible for search and rescue operations along the coast and out to George's Bank. The U.S.C.G. conducts regular patrols to enforce fisheries regulations and environmental laws. It also serves to enforce maritime laws, including interdiction activities.

The USCG owns and manages 545 housing units for Coast Guard personnel and their families, as well as unaccompanied Coast Guard employees and personnel from the 102<sup>nd</sup> Fighter Wing of the Massachusetts Air National Guard. The housing office also manages Coast Guard housing programs for Rhode Island, southeastern Massachusetts and the Cape and Islands. The Coast Guard also operates various Morale, Welfare and Recreation (MWR) facilities for active duty military personnel from all U.S. military branches, as well as reservists and retirees throughout Cape Cod and southeastern Massachusetts. The Coast Guard operates a medical clinic (Kaehler Memorial Medical Clinic), golf course, theater, recreational club, gas station and a supermarket and department store.

## Appendix B: Methodology & Data Sources

### Methodology: The IMPLAN Modeling System

The indirect and induced economic impacts of the Otis Air National Guard Base of the 102<sup>nd</sup> Fighter Wing (Otis ANG) was 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 UMass Donahue Institute has used IMPLAN in various 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.

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.<sup>15</sup> 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).

---

<sup>15</sup> 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.

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 UMass Donahue Institute built input-output models using the IMPlan Professional 2.0 model building software and data packages. The data used in the model are for 2002, which is the latest available. Model outputs are reported in 2004 dollars.

It is possible to estimate the economic impacts operations and capital expenditures by the Otis ANG 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 Otis' 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 specify a long list of changes in the output of each industry that is a beneficiary of Otis' 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 UMass Donahue Institute 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 Institute 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 the Otis ANG.

### **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 the Otis ANG is a mature facility with on-going maintenance, construction, and building repair operations, these expenditures were included as part of the facilities' annual operations.

### **Payroll Expenditures**

The Otis ANG provided the UMass Donahue Institute with their total payroll expenditures by employee type, which allowed the assignment of actual expenditure amounts to National Guard personnel and permanent, full-time base personnel for purposes of calculating induced impacts. Otis also provided the location of each employee by type and zip code, which allowed the Institute to assign each employee to a county, allowing a detailed county-by-county analysis of the effects of payroll spending. To calculate the amount of payroll going to

each county, the Institute calculated an average payroll by employee type and multiplied that by the total number of employees in each county by type (guard or other).

### **Fringe Payments for Employees**

While much of the money paid for fringe benefits for employees would not have a direct effect on the economy of Massachusetts, a certain portion of that fringe is spent on medical care for the employees and their families, an expenditure that would have an economic impact. After reviewing other, similar studies, the Institute found that approximately 35 to 37 percent of fringe benefit payments were usually spent on employee health benefits. The Institute chose the midpoint of 36 percent of fringe payments as an adequate approximation of health expenditure from fringe benefits, and apportioned that amount equally between the *Offices of physicians, dentists, and other health practitioners* (IMPLAN industry 465) and *Hospitals* (IMPLAN industry 467). The resulting economic impact of this spending was included in the final totals.

### **Taxes and Savings**

The IMPLAN model does not take taxes and savings into account when the effects of household spending are calculated. Therefore, the UMass Donahue Institute calculated out the amount of payroll that would be expected to go towards paying local, state, and federal taxes, as well as money that would be expected to flow into savings accounts. As the actual amount of taxes paid by Otis employees was not available, the Institute used average Massachusetts tax burden data for 2004 obtained from the Tax Foundation, a non-profit organization that tracks tax payment data by state. In 2004, the average state and local tax burden for Massachusetts' residents was 9.9 percent of income, while the average Federal tax burden was 20.5 percent, for a total of 30.4 percent of income. In addition, one percent of spending was subtracted for savings, as data from the Bureau of Economic Analysis (BEA) for 2004 suggested that this was the average national savings rate for that year. The remaining 68.6 percent of payroll was used in the IMPLAN model as household spending.

However, just as a certain portion of fringe benefits stays in Massachusetts and has an effect on the economy, state and local taxes also stay in Massachusetts and have their own effect. The Institute took the 9.9 percent of payroll spent on state and local taxes and calculated the impact of that spending on Massachusetts and the various counties. To properly apportion the tax payments between education and non-education spending, the Institute calculated that the state average payment of all state and local expenditures for education in 2004. This value, 19.67 percent of all combined state and local spending, was used to apportion the tax payments between Implan sectors 503 (*State and Local Education*) and 504 (*State and Local Non-Education*). The resulting impacts of this spending were included in the final totals.

### **Regional Purchases**

In addition to the direct payroll expenditures for on-base operations, the Otis ANG makes both contracts with and purchases from private companies for a variety of products and services. Contract expenditures for 2004 by Otis were obtained from the air base staff. The list of contracts identifies the company receiving 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, and each of these contracts was also located by county for the county impact analysis. Purchases from vendors outside the statewide impact area were excluded from the calculation of economic impacts.<sup>16</sup>

---

<sup>16</sup> 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, Otis ANG might purchase computers (office equipment) from Dell Computer in Austin, Texas, which would then purchase semiconductors 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.

The same procedure was followed for purchases made by the base from various retail outlets and companies, but the various IMPLAN industry sector codes were hand-coded by the Institute prior to analyzing the data as the purchase information did not contain NAICS codes. As with the contract information, purchases from organizations outside of Massachusetts were not included in the analysis.

### **Trade and Freight Margins**

When the Otis ANG purchases 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 UMass Donahue Institute. 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 the Otis ANG’s procurement data identifies purchases by NAICS Code, it was possible to model the indirect and induced impacts of the base’s contracted purchases with a high degree of detail. Also, due to the level of detail included in the purchasing data, the Institute was able to derive the industry sector from the information provided for each individual purchase in Massachusetts.

## Appendix C: Supplemental Data

### Massachusetts Military Reservation Tenants

- Massachusetts Army National Guard Training Site
- Massachusetts Environmental & Readiness Center
- Veterans Administration National Cemetery
- U.S. Army Environmental Center Impact Area Groundwater Study Program
- 253rd Combat Communications Group
- 267th Combat Communications Squadron
- U.S. Coast Guard Air Station Cape Cod
  - Exchange/Commissary
  - Golf Course
  - MWR
  - Family Housing
  - Storage for ships in Boston
- U.S. Air Force 6th Space Warning Squadron PAVE PAWS
- Air Force Center for Environmental Excellence / Installation Restoration Massachusetts Army National Guard Army Air Facility #1
- Massachusetts Army National Guard Regional Training Institute
- U.S. Department of Agriculture
- Environmental Management Commission
- Senior Environmental Corps
- Barnstable County Sheriff's Office / Correctional Facility
- Massachusetts Disaster Preparedness Safe Haven Facility
- U.S. Air Force Auxiliary (Civil Air Patrol)
- Massachusetts Maritime Academy (classrooms)
- Federal Aviation Administration, North Atlantic Region
- Bourne School System
- Coast Guard Communications Station, Boston
- Coast Guard Electronic Systems Support Detachment
- Coast Guard Marine Safety Field Office
- Coast Guard Northern Regional Fisheries Training Center
- Coast Guard LANT Area Armory
- Coast Guard Port Security Unit
- Motorcycle & canine training areas for state and local police
- Northeast Regional Fisheries Training Center (Coast Guard)
- Upper Cape Trash Transfer Station / Bay Colony Railroad
- U.S. Geological Survey
- Volpe Test Center
- Buzzards Bay Project
- FAA Cape Approach

**Massachusetts Military Reservation Services Provided by Otis Air National Guard****Environmental Support**

- Joint Land Use Study
- AICUZ Study
- Tenant Recycling
- Public Water Supply Monitoring
- Natural and Cultural Resource Mgt
- Clean Water Act & Safe Drinking Water Act Compliance Permitting
- Waste Water Treatment Plant Analytical Monitoring
- Grassland Restoration

**Emergency Services Owner Operator**

- 911 Call Center
- Aircraft Fire Fighting
- Structural Fire Fighting
- Explosive Ordnance Disposal
- Confined Space Rescue
- Space Shuttle Support
- Local/Regional Mutual Aid
- Alarm System Owner
- Fire Suppression Systems
- HazMat Spill Response
- Emergency Standby Ops
- Extensive Wildland Fire Management
- Emergency Medical Services
- Technical Rescue
- Water Rescue
- Joint Readiness Training

**Utility Owner Operator**

- High Voltage Electrical
- Waste Water Management
- Public Water Supplier
- Storm water Management
- Communications Infrastructure

**Airfield Owner Operator**

- Air Traffic Control
- Re-Fueling Services
- Airfield Management
- Airfield Repair/Maintenance
- Snow Removal
- Training
- Emergency Divert
- Weather Services

## Key Informant Interviews

*The following individuals provided information and assistance for the project:*

### **Barnstable County Sheriff's Office**

Dave Neal

### **Cape Cod Canal Chamber of Commerce**

Marie Oliva, Executive Director

### **Commonwealth of Massachusetts, Dept. of Telecommunications & Energy**

Tim Shevlin, Executive Director

### **Massachusetts Air National Guard, 102<sup>nd</sup> Fighter Wing**

Randy B. Bonneau, TSgt, 102FW/FMB, 4251

Alan A. Collette, Civ, 102FW/FMB, 4229

Greg A. Nancarrow, Civ, 102CES/CERF, 4232

Kenneth S. Nunley, 1Lt, 102FW/FM, 4230

Sean D. Reilly, Maj, 102FW/FM, 4228

Christopher Segura, Civ, 102CES/CERR, 4962

William L. Stirling, Civ, 102CES/DEA, 4960

### **Massachusetts Army National Guard**

Lt. Col. Thomas Devine, Comptroller

### **Massachusetts Fishermen's Partnership**

Ron Borjeson, Board Member

### **Massachusetts Lobsterman's Association**

Bill Adler, Executive Director

### **Nantucket Cottage Hospital**

Chuck Gifford, Community Relations and Development

### **NSTAR Electric**

Pam Pandolfi, Account Executive

### **Town of Bourne, Massachusetts**

Brent Goins, Head of Waste Transfer

Thomas Guerino, Town Administrator

Edmond Lefleur, Superintendent of Schools

### **Town of Sandwich, Massachusetts**

George H. "Bud" Dunham, Town Administrator

Greg Fayne, Harbormaster

### **US Coast Guard Air Station Cape Cod**

Vincent Bowman, Assistant Comptroller

Captain David Brimblecon, Base Commander

Tom Maine, Commanding Officer





University of Massachusetts Donahue Institute  
225 Franklin Street, 12<sup>th</sup> Floor  
Boston, MA 02110  
[www.donahue.umassp.edu](http://www.donahue.umassp.edu)