Appendix Four

SBIR/STTR Awards as the Basis of an Index of Innovation in Emerging or Highly Diversified Industry Sectors

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OVERVIEW:

Methodology

The use of keywords (Sea; Ocean; Submarine; Oceanographic; Coastal; Aquaculture; Seawater; Marine; Oceanic; and Marine Organism) were evaluated with respect to their capacity to identify relevant awards across award programs. In aggregate, this set of keywords were collectively used in 609 awards, representing about 0.7% of the awards reported to be in the IDI database. More relevant to the immediate goals of this analysis is the finding that four funding agencies (The Department of the Navy; the National Atmospheric and Space Administration; the National Science Foundation; and the Department of Commerce) have historically contributed 75% (44%, 11%, 10% and 10%) of the awards containing our sector keywords.

The target area subtended by the New England Ocean Science and Technology Sector has been reported to extend from Bath, Maine to Groton, Connecticut (Battelle Institute / MassInsight).

The list of 72 uniquely identified businesses from the analysis of these five programs is in shown Table Five in the article below.

Abstracts that were retrieved from searches of the Innovation Development Institute database were individually reviewed by a senior scientist trained in commercial technology management and broadly experienced in technology application. Provisional classifications of product codes to abstracts were assigned using the top level and the secondary level coding for new product categories as developed by the CorpTech Company of Concord, Massachusetts (www.corptech.com**;** coding scheme reported in Figure 1).

Findings

Massachusetts receives 12 % of its total SBIR funding through product development projects that we have mapped to the marine science and technology sector under the Navy Program. Massachusetts receives about 13% of all national SBIR awards and genrally converts about 63% of its SBIR Phase I awards into Phase II awards.

The overall frequency with which product codes were assessed to apply to the award set is as follows (ranked in descending order): Defense (47%); Advanced Materials (38%); Subassemblies & Components (35%); Test & Measurement (32%); Computer Software (31%); Transportation (29%); Manufacturing Equipment (23%); Telecommunications & Internet (20%); Photonics (19%); Factory Automation (16%); Energy (9%); Environmental (7%); Chemicals (7%); Computer Hardware (5%); Medical (2%); Biotechnology (1%); Pharmaceuticals (1%); and Holding Companies (0%).

Based upon the view created in this analysis, innovation in the ocean science and technology sector is significantly supported through integration across traditional technology fields. Only 7 of 196 abstracts were coded with a single code, while the average abstract was coded with codes from 3 fields.

INTRODUCTION

The work undertaken in this report is part a collaborative effort to define an industry sector in New England that is based on ocean science and technology. Efforts to capture opportunity in the form of high-value, sustainable employment for citizens, and to anchor that value to regional economy, frequently lead to examination of technology-based sectors. In such efforts, an initial challenge lies in defining the sector – specifically in terms of businesses that 1) compete within a shared principal market, 2) use the same core technologies, and/or 3) need the same essential, technically-trained talent pool. For example, medical biotechnology is a familiar technology-based sector with companies competing for diagnostic and therapeutic markets, using cellular, biochemical and molecular biology technologies, and drawing upon scientific, engineering, and clinical technologists. The challenge of defining a sector becomes problematic, however, as the sector becomes more "diversified" along these three dimensions. This current study involves the ocean science and technology sector which is diversified in terms of market dynamics for products and services that are used in, on, or under ocean waters, core technologies embodied in those products, and classes of technologically-trained workers enabling those core technologies. This diversity raises challenges for defining the core and the boundaries of the sector based upon traditional SIC codes, existing and emerging trade associations, and primary interviews with selected industry thought leaders. In this report we present results from a novel approach for rapidly framing an overview of a highly innovative diversified technology sector.

The rational for the approach used in this analysis is that all technology sectors compete based upon shortening the cycle between the next generation of incrementally-improved or radically-innovative products. If possible, a direct survey of product development activity within a region would index both all established firms and all new companies that are in, or are planning to enter, the target sector. Of course, such a view is a privileged view that is never fully within the public domain. To approximate this view, it is possible to survey new product development in the ocean science and technology domain based upon a review of public records of abstracts of companies that have won new product development awards through the national Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) programs.

The analysis reflects a region's capacity to respond to product solicitations under federal industry-directed funding programs. In effect, this analysis is using the "call" placed by the funding agencies as a means to monitor the response of the sector. Such a view certainly has its bias: the view is shaped both by the expressed needs of the funding agency(s) and also by the traditions of the reviewers recruited by the agencies to make the award selections. For example, if the recreational boating industry were to open solicitations for innovative product design, we may or may not observe a distinct patter of successfully responding technology proposals. As a result, this current view of the sector can only be considered as a partial view that may have value in complementing views of the sector constructed with established investigative means.

STUDY METHODOLOGY

Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) abstract records were accessed through the commercial database managed by the Innovation Development Institute (IDI) of Swampscott, Massachusetts (www.Inknowvation.com). This contract resource states that, as of September 27, 2004, its database includes 82,562 award abstracts compiled from 22 federal granting authories (see Table 1 to the right).

Table 1. Federal Agencies Which Make SBIR-STTR Awards

Agency Code	Agency Name
DOD	Department of Defense
Air Force	Department of Air Force
Navy	Department of Navy
Army	Department of Army
MDA	Missile Defense Agency
DARPA	Defense Advanced Research Projects Agency
DTRA	Defense Threat Reduction Agency
OSD	Office of Secretary of Defense
SOCOM	Special Operations Command
NGA	National Geospatial-Intelligence Agency
CBD	Chemical & Biological Defense
NIH	National Institutes of Health
NASA	National Aeronautics and Space Administration
DOE	Department of Energy
NSF	National Science Foundation
	Smaller agencies
DOT	Department of Transportation
USDA	Department of Agriculture
DOC; NOAA; NIST	Department of Commerce
EPA	Environmental Protection Agency
DoEd	Department of Education
	Inactive agencies
NRC	Nuclear Regulatory Agency
SBA	U.S. Small Business Administration

For the purposes of rapidly generating an overview of the sector, a goal was set to review ~200 recent abstracts. An operating definition of "recent" was established as "within the last three reported years" (2001-2003). The target area subtended by the New England Ocean Science and Technology Sector has been reported to extend from Bath, Maine to Groton, Connecticut (Battelle Institute / MassInsight). Preliminary results indicated that almost 2000 "recent" awards were received in the State of Massachusetts alone (see below). For this reason, strategies to focus the search were constructed.

Preliminary work was designed to identify which award programs were most likely to include awards related to the ocean science and technology sector. To capture this view, a set of key word searches were run for all of the award program and results were broken down by program for each New England state. Keywords included: Sea; Ocean; Submarine; Oceanographic; Coastal; Aquaculture; Seawater; Marine; Oceanic; and Marine Organism. The frequency of keyword use within specific programs was then used to call forward specific programs for deeper investigation. At the outset, it was expected that awards made under the Department of the Navy would have considerable relevance to the target sector.

Abstracts that were retrieved from searches of the Innovation Development Institute database were individually reviewed by a senior scientist trained in commercial technology management and broadly experienced in technology application. Provisional classifications of product codes to abstracts were assigned using the top level and the secondary level coding for new product categories as developed by the CorpTech Company of Concord, Massachusetts (www.corptech.com**;** coding scheme in Figure 1).

RESULTS

As of September 27, 2004, query of the Innovation Development Institute (IDI) database reports that 11,818 SBIR & STTR awards were won within the Commonwealth of Massachusetts alone in the twenty year span from 1983 to 2003 (the most recent year for which records were available during this survey). For all of New England, 15,102 awards were granted over this time. Using the IDI count of 82,562 awards, we calculate that historically about 18% of all of the national awards have come to the New England states, with 14% coming to Massachusetts alone. In the three most recent reported years, the Commonwealth captured 1,962 awards from across 19 agencies (see Table 2 to the right). The target for screening awards in overview to be crated in this analysis was arbitrarily set at 200, thus the search image must be narrowed.

Table 2. Recent Awards in Massachusetts

	2003	***2002***	***2001***
AF	45	103	84
ARMY	53	73	75
CBD	7	6	7
DARPA	20	25	14
DHS	0	0	0
DOC	7	11	4
DOE	34	55	58
DOED	0	2	0
DOI	0	0	0
DOT	0	1	1
DTRA	2	2	2
EPA	3	3	9
MDA	64	83	32
NASA	20	62	53
NAVY	40	82	77
NGA	0	0	0
NIH	167	169	181
NRC	0	0	0
NSF	46	48	34
OSD	33	30	10
SOCOM	4	5	6
USDA	4	2	4
sum	549	762	651

The use of keywords was evaluated with respect to their capacity to identify relevant awards across award programs (Table 3). In aggregate, the keywords were collectively used in 609 awards, representing about 0.7% of the awards reported to be in the IDI database. In comparison, an exact match of the phrase "environmental monitoring" was represented in 629 awards, "environmental-monitoring" was represented 1467 awards, and the word "biotechnology" was found in 1,279 awards. If, and only if, funding programs equally funded these three sectors and the applied keywords captured an equal portion of those funded awards, then innovation in the ocean science and technology sector may approximate half of the level of innovation of the environmental monitoring sector and the biotechnology sector. More relevant to the immediate goals of this analysis is the finding that four funding agencies (The Department of the Navy; the National Atmospheric and Space Administration; the National Science Foundation; and the Department of Commerce) have historically contributed 75% (44%, 11%, 10% and 10%) of the awards containing our sector keywords. A set of 484 abstracts for awards from these four agencies were retrieved for the three most recent reported years for the state of Massachusetts (Table 4).

Table 3. Distribution of Keyword Use across All Program, All Years, All States

	sea	ocean	submarine	oceanographic	coastal	aquaculture	seawater	maritime	oceanic	marine organism
TOTAL	**162**	**129**	**102**	**52**	**47**	**43**	**39**	**23**	**8**	**4**
NAVY	81	41	86	19	10		25	7	2	
NASA	12	20	4	7	10	5		6	1	
NSF	9	18		11	2	10	7		2	
DOC	15	20	2	7	8	6				
DARPA	14	5	5	2	1		1	1		
USDA				2	2	20	1			
AF	6	5	2	1	2			4		
DOT	5	4		2	2			1	2	
DOE	2	5		1	3		1			
ARMY	7		2				1	1		
MDA	4	4	1					1		
OSD	1	3			2		2	1	1	
NIH	2	1			2	1				4
SOCOM	4						1	1		
NGA		2			2					
EPA		1			1	1				

Table 4. Awards for Massachusetts

	2003	2002	2001	sum	Unique "Hits"
TOTAL	**113**	**203**	**168**		**36%**
NAVY	40	82	77	199	167
NASA	20	62	53	135	0
NSF	46	48	34	128	2
DOC	7	11	4	22	4

Abstracts were initially screened for what was judged to be a strong connection to activities in the marine environment, and thereby were designated as "hits." Abstracts that represented continuation funding through a Phase II award were combined with their parent Phase I award to generate counts of "unique" hits. The tally of unique hits for all 4 sentinel award agencies over each of the three years examined in this study is summarized in Table 4.

About 36% of the reported abstracts are represented in a list of 173 relevant new product development initiatives for the state of Massachusetts. For this state and this time frame, an additional set of 59 DARPA (Defense Advanced Research Projects Agency) awards were also screened and contributed another 3 abstracts, and a set of 10 USDA (United States Department

of Agriculture) awards were screened without contributing any additional abstracts. The list of 72 uniquely identified businesses from the analysis of these five programs is in shown Table 5.

Table 5. Businesses Identified as Within the Sector Through SBIR/STTR Screening. This list counts businesses and lists the number of distinct product development awards that they received during the 2001-2003 reporting period, along with the agency(s) that made those awards.

1 Aerodyne Research Inc. (1) NAVY
2 Agiltron Inc (2) NAVY
3 AirBeams LLC (1) NAVY
4 Alphatech Inc (8) NAVY
5 Aptima Inc (3) NAVY
6 Aztex Inc (2) NAVY
7 Beacon Interactive Systems (1) NAVY
8 Benthos Inc (3) NAVY
9 Bodkin Design & Engineering LLC (2) NAVY
10 Boston MicroSystems Inc (1) NSF
11 Cape Aquaculture Technologies Inc (1) DOC
12 Cape Cod Research Inc (3) NAVY
13 Ceranova Corporation (1) NAVY
14 Charles River Analytics Inc (4) NAVY
15 Cymfony Inc (1) NAVY
16 CyTerra Corporation (1) NAVY
17 Diversified Technologies Corporation (3) NAVY
18 E Paint Company (1) DOC
19 EIC Laboratories Inc (3) NAVY
20 Eikos Inc (1) NAVY
21 Energen Inc (1) NAVY
22 Exa Corporation (1) NAVY
23 Ferro Solutions (2) NAVY
24 Fibersense Technology Corporation (1) NAVY
25 Foster-Miller Inc (23) NAVY
26 Fractal Antenna Systems Inc (1) NAVY
27 Giner Inc (2) NAVY
28 Haleakala Research & Development Inc. (1) NAVY
29 Harris Acoustic Products Corporation (1) NSF
30 Hittite Microwave Corporation (1) NAVY
31 Idolon Technologies (1) NAVY
32 Image Acoustics Inc (2) NAVY
33 Implant Sciences Corporation (1) NAVY
34 JAMCORP (1) NAVY
35 Jentek Sensors Inc (2) NAVY
36 KaZak Composites Inc (10) NAVY
37 Kernco Inc (1) NAVY
38 Linden Photonics Inc. (1) NAVY
39 Mak Technologies Inc (4) NAVY
40 Material Systems Inc (6) NAVY
41 Mayflower Communications Company (2) NAVY
42 Mide Technology Corporation (4) NAVY/DARPA
43 MTI-Milliren Technologies inc (1) NAVY
44 Nascent Technology Corporation (1) NAVY
45 National Wireless Inc (1) NAVY
46 Ocean Acoustical Services Instrumentation (1) NAVY
47 OmniGuide Communications Inc (1) NAVY
48 Open Group & JXML Inc (3) NAVY
49 Optra Inc (3) NAVY
50 Phoenix Innovation Inc (1) NAVY
51 Phoenix Science & Technology Inc (1) NAVY
52 Physical Sciences Inc (10) NAVY/DOC
53 Polestar Technologies Inc. (1) DOC
54 Prometheus Inc (1) NAVY
55 ProSensing Inc (2) NAVY/DARPA
56 Q-Peak inc (2) NAVY
57 Radiation Monitoring Devices Inc (1) NAVY
58 Remotereality Corporation (2) NAVY
59 SatCon Technology Corporation (4) NAVY
60 Schafer Corporation (1) NAVY
61 Scientific Systems Company (4) NAVY
62 SensArray Infrared (2) NAVY
63 Sensera Inc (a Triton Systems Co.) (2) NAVY
64 SI2 Technologies (1) DARPA
65 Surmet Corporation (2) NAVY
66 Synetics Corporation (1) NAVY
67 Talking Lights LLC (1) NAVY
68 Technical Products Inc. (1) NAVY
69 Triton Systems Inc (6) NAVY
70 V Corp Technologies Inc (1) NAVY
71 Visidyne Inc (1) NAVY
72 Webb Research Corporation (4) NAVY

Within the Navy SBIR-STTR Program alone, 65 uniquely identified companies received 167 awards related to the target sector. The average number of awards won per company was 2.6, with a range of 1 to 23 awards per company.

Product code categories were scored for each individual award based upon the text of the award abstract (see Appendix 1). On average, new product development plans combined 3.2 product codes. Only 7 awards were assessed to be identifiable with a single product code (3 of which were coded for “test & measurement” products), and one award was assessed as identifiable with

7 product codes (2 other awards were assessed as identifiable with 6 product codes). The overall frequency with which product codes were assessed to apply to the award set is as follows (ranked in descending order): Defense (47%); Advanced Materials (38%); Subassemblies & Components (35%); Test & Measurement (32%); Computer Software (31%); Transportation (29%); Manufacturing Equipment (23%); Telecommunications & Internet (20%); Photonics (19%); Factory Automation (16%); Energy (9%); Environmental (7%); Chemicals (7%); Computer Hardware (5%); Medical (2%); Biotechnology (1%); Pharmaceuticals (1%); and Holding Companies (0%).

Correlation of the concurrent use of product codes is shown in Table 6. Correlation coefficients of 0.2 or greater were taken to represent "weak correlation." Both positive and negative weak correlations were identified.

Table 6. Correlation of the Assignment of Product Codes Across All Product Development Projects

	AUT	*BIO*	*CHE*	*COM*	*DEF*	*ENR*	*ENV*	*MAN*	*MAT*	*MED*	*PHA*	*PHO*	*SOF*	*SUB*	*TAM*	*TEL*	*TRN*
AUT	1.00																
BIO	-0.03	1.00															
CHE	-0.11	-0.02	1.00														
COM	-0.02	-0.02	-0.06	1.00													
DEF	0.26	-0.07	-0.15	-0.04	1.00												
ENR	-0.08	-0.02	0.00	0.03	0.08	1.00											
ENV	-0.11	-0.02	-0.07	0.05	-0.06	0.00	1.00										
MAN	-0.16	-0.04	0.20	-0.06	-0.20	-0.07	0.08	1.00									
MAT	-0.30	-0.06	0.24	-0.12	-0.31	0.01	0.04	0.45	1.00								
MED	0.15	-0.01	-0.04	-0.04	0.09	-0.05	0.12	0.01	-0.12	1.00							
PHA	-0.03	-0.01	-0.02	-0.02	0.08	-0.02	-0.02	-0.04	-0.06	-0.01	1.00						
PHO	-0.13	0.16	-0.13	0.18	-0.06	-0.10	-0.01	0.02	-0.03	0.12	-0.04	1.00					
SOF	0.21	-0.05	-0.18	0.15	0.15	-0.08	0.03	-0.28	-0.47	0.06	0.12	-0.16	1.00				
SUB	-0.28	-0.06	0.11	-0.11	-0.06	0.25	-0.20	-0.11	0.20	-0.12	0.11	0.02	-0.20	1.00			
TAM	0.03	0.11	-0.13	0.09	0.03	-0.08	0.03	-0.22	-0.21	0.15	0.11	-0.04	0.15	-0.10	1.00		
TEL	0.12	-0.04	-0.13	-0.04	0.17	0.00	-0.13	-0.20	-0.17	-0.08	-0.04	-0.05	0.02	-0.05	-0.02	1.00	
TRN	0.13	-0.05	-0.12	-0.08	0.09	-0.11	-0.01	-0.01	-0.08	0.07	-0.05	-0.17	0.14	-0.19	-0.09	-0.08	1.00

DISCUSSION

The view created in this analysis is intended to provide identification of companies active in a target industry sector that will complement views constructed through more familiar industry survey mechanisms. A common goal across methodologies is to make distinctions between companies in the primary development, manufacturing and sales position of the value chain and companies that occupy secondary or tertiary positions along the value chain. This can be a fuzzy area: nonessential components in a complex system made and sold into the ocean science and technology sector (e.g., a microchip) might easily be seen as a remote player in the supply chain; however an essential and feature-enabling component of a complex product (e.g., a new biosensor) might easily be seen as a lead player in an emerging product or product line. It is hoped that the types of innovation called forward through the federal SBIR-STTR programs is of

the later class and enriches our prospects of framing a meaningful view of leading players in our target sector.

It was anticipated that the methodology used in this analysis would be sensitive in identifying small, newly established companies and some companies that have a comparatively small product investment in the target sector. Such "marginal" players are important because they can be a key source of growth in the sector and need to be considered in overall plans for fostering the sector. For all years since 1983 and across all states, the keywords used in this study generated 1,480 hits from 8,416 awards made by the NAVY program, including an unmeasured number of redundant hits (multiple use of keywords within single proposals as well as Phase I and Phase II awards for the same proposal), suggesting that no more than 18% of all Navy awards would be scored as hits. Through a full reading of the abstracts from the Navy SBIR-STTR awards made to companies in Massachusetts over the past 3 years, all awards were judged to relate specifically to oceans, ocean vessels, or ocean activities. Predictions of the number of awards that relate to a highly diversified target sector can be poorly indexed by the use of keywords alone.

The approach used in this analysis is not the only means of identifying important marginal players in a technology sector. It is clear, for example, that the methodology used in this analysis could be substituted for, or extended by, a survey of recent patents; however, the current method has three distinct advantages over a patent search. First, the current method is timely in that it is sensitive to "design" and not dependent upon "results." Companies that are seeking to enter the sector might reasonably be first detected through a development project award; however, the recently adopted practice of publishing patent application abstracts at the time that patents are filed does shorten the cycle time for discovering innovation in the sector through patent searches. In patent searches, however, successful searching may be more critically dependent upon the keywords used in the search, and results from this study indicate that unless a set of keywords is constructed from an existing knowledge of the sector, marginal contributors are likely to be missed. Thus, there is an essential hermeneutic challenge in relying on industry sector keywords in any effort to capture a view of the boundary of a sector.

Second, not all product development activity will materialize as patents. Short of a patentable success, the interest and capacity for product development in the sector may still be mapped to companies that have successfully competed for relevant product development awards. For this reason, companies identified through the use of the current methodology may provide the means to identify resources that can be "cultivated" to accelerate new business entry into the marketplace.

Third, companies identified through patent searches may not be particularly interested in collaborative activity related to new product development plans. It is a given that companies that have sought new product awards from federal programs are openly communicative about their

general plans. As such, companies identified under the approach used in this analysis may be amenable to participate in locally assembled collaborative initiatives.

Based upon the view created in this analysis, innovation in the ocean science and technology sector is significantly supported through integration across traditional technology fields. Only 7 of 176 abstracts were coded with a single code, while the average abstract was coded with codes from 3 fields. This view of innovative new product design corroborates conventional wisdom that states that significant problems (opportunities) are multidisciplinary. Based upon suggestive evidence from correlation studies of the assessed use of product codes in this single (and admittedly biased) view of the sector, some preliminary hypotheses can be raised regarding opportunities for university research. First, innovation related to integrating progress in material science with progress in manufacturing equipment development appears most strongly valued in the sector. Second, linking automation (manufacturing-like operations automation) to defense activities appears particularly valuable. Third, linking subsystem and component innovations and energy (use and management) innovations appears valued. Universities with strongly integrative teams in this sector might find near-term partnership with local industries in the ocean science and technology sector. Conversely, negative weak correlations may represent “gaps” in integrative capacity of the sector. For example, respondents appeared poorly able (or were given poor incentive by the agency programs) to link advances in material science with advances in software or with advances in defense-specific applications; and also appeared poorly able to link advances in material science directly with advances in (manufacturing systems) automation. While instances may be rare where, for example, manufacturing use of an expanded range of new polymeric materials might require developing innovative software to control automated extrusion equipment, university teams that can “fill the gaps” in integrated product development may find emerging partnership opportunities in the sector. Dialogue across technical disciplines can be cultivated within universities. Clearly, however, a more rigorous analysis of trends in integration of product themes needs to be conducted before serious assets are invested in following hypotheses raised in this current analysis.

The intended value of the current analysis is the generation of a list of highly innovative and highly integrative companies that might lie on the fringe of the sector. The value of this list as a complement to other views of this sector cannot be assessed from the view created by this analysis along. Where companies identified in the current study are found to also appear in views constructed by other means, we might agree that we have corroborated an innovative core of the sector. Where companies identified in the current study are not found to also appear in views constructed by other means, a view of an innovative fringe is suggested. Through future interviews with such fringe companies, we can map these companies as either belonging within or beyond the sector boundary.

Attached (Figure 1; Adobe Acrobat. Appendix 1; Microsoft Word)

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ADDENDUM - The Value of SBIR Awards to Massachusetts

Massachusetts receives 12 % of its total SBIR funding through product development projects that we have mapped to the marine science and technology sector under the Navy Program. Massachusetts receives about 13% of all national SBIR awards and genrally converts about 63% of its SBIR Phase I awards into Phase II awards.

Table - Massachusetts SBIR Funding, All programs

Massachusetts	Ph.I-MA	Ph.I-USA	Competitive Share	Ph.II-MA	Ph.II-USA	Conversion Rate	National Rate	Per FY	Ph.I-MA	Ph.II-MA	$K value FY
2000	287	1898	15%	210	1404						
2001	291	2203	13%	180	1399	63%	74%	2001	291	210	301,350
2002	398	3007	13%	185	1422	64%	65%	2002	398	180	310,300
2003	432	3657	12%					2003	432	185	326,950
	352	**2691**	**13%**	**192**	**1408**	**63%**	**69%**				**312,867**
							Portion of State's total SBIR value from Navy				**12%**

Massachusetts captures 15% of the National SBIR awards from the Navy, and converts about 48% of them into Phase II Awards. California captures 20% of the National SBIR awards from the Navy, and converts about 55% of them into Phase II Awards. Nationally, about 65% of all Phase I SBIR awards are converted to Phase II awards under the Navy Program (however, the conversion frequency is highly variable year to year). For Massachusetts and California respectivey the combined new Phase I Navy SBIR awards and carried forward Phase II awards represent estimated economic investments in ocean science R&D of $28M and $38M per year, under the following assumptions: Phase I is estimted to represent $150K in federal funds and $200K in corporate in-kind investment, and Phase II awards are estimated to represent $750K in federal funds and $200K in corporate in-kind investment.

Table - SBIR Awards from the U.S. Navy, Massachusetts versus California

Massachusetts	Ph.I-MA	Ph.I-USA	Competitive Share	Ph.II-MA	Ph.II-USA	Conversion Rate	National Rate	Per FY	Ph.I-MA	Ph.II-MA	$K value FY
2000	20	143	14%	11	79						
2001	47	292	16%	12	121	60%	85%	2001	47	11	26,900
2002	48	300	16%	17	133	36%	46%	2002	48	12	28,200
2003	40	302	13%					2003	40	17	30,150
	39	**259**	**15%**	**13**	**111**	**48%**	**65%**				**28,417**
California	PH.I-CA	Ph.I-USA		Ph.II-CA	Ph.II-USA			Per FY	PH.I-CA	Ph.II-CA	$K value
2000	32	143	22%	9	79						
2001	62	292	21%	21	121	66%	85%	2001	62	9	30,250
2002	62	300	21%	28	133	45%	46%	2002	62	21	41,650
2003	49	302	16%					2003	49	28	43,750
	51	**259**	**20%**	**19**	**111**	**55%**	**65%**				**38,550**