OMB Control Number: 0694-0119
Expiration Date: May 2013

DEFENSE INDUSTRIAL BASE ASSESSMENT:
U.S. Infrastructure for Underwater Acoustic Transduction Systems
Company Survey

SCOPE OF ASSESSMENT

The U.S. Department of Commerce, Bureau of Industry and Security (BIS), Office of Technology Evaluation (OTE), in cooperation with the U.S. Department of the Navy, Office of Naval Research (ONR), is conducting an assessment of the U.S. Underwater Acoustics Transduction industry and related institutions. The purpose of this assessment is to analyze the health and competitiveness of the infrastructure and to develop recommendations for the United States Navy to ensure the ability of the industry and related institutions to support U.S. Navy missions and programs.

RESPONSE TO THIS SURVEY IS REQUIRED BY LAW

A response to this survey is required by law (50 U.S.C. app. Sec. 2155). Failure to respond can result in a maximum fine of $10,000, imprisonment of up to one year, or both. Information furnished herewith is deemed confidential and will not be published or disclosed except in accordance with Section 705 of the Defense Production Act of 1950, as amended (50 U.S.C App. Sec. 2155). Section 705 prohibits the publication or disclosure of this information unless the President determines that its withholding is contrary to the national defense. Information will not be shared with any non-government entity, other than in aggregate form. The information will be protected pursuant to the appropriate exemptions from disclosure under the Freedom of Information Act (FOIA), should it be the subject of a FOIA request.

Not withstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number.

BURDEN ESTIMATE AND REQUEST FOR COMMENT

Public reporting burden for this collection of information is estimated to average 14 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information to BIS Information Collection Officer, Room 6883, Bureau of Industry and Security, U.S. Department of Commerce, Washington, D.C. 20230, and to the Office of Management and Budget, Paperwork Reduction Project (OMB Control No. 0694-0119), Washington, D.C. 20503.

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Introduction I	General Instructions
A.	Your company/organization is required to complete this survey using an Excel template, which can be downloaded from the BIS website: **http://www.bis.doc.gov/underwater_acoustics/index.htm**. At your request, BIS staff will e-mail the Excel survey template directly to your company/organization. For your convenience, PDF versions of both the survey and required drop-down content are available on the BIS website to aid internal data collection. DO NOT submit the PDF version of your company's response to BIS.
B.	Respond to every question. Surveys that are not fully completed will be returned for completion. Use comment boxes to provide any information to supplement responses provided in the survey form. Make sure to record a complete answer in the cell provided, even if the cell does not appear to expand to fit all the information. **DO NOT COPY AND PASTE RESPONSES WITHIN THIS SURVEY.** Survey inputs should be made manually by typing in responses or by use of a drop-down menu. The use of copy and paste can disrupt the data collection process. If your survey response is corrupted as a result of copy and paste responses, a new survey will be sent to you for immediate completion.
C.	**Do not disclose any classified relationships in this survey form.** Aggregated financials, employment, R&D expenditures, etc. are permitted.
D.	Questions related to this survey should be directed to: Matthew Sigmund, 202-482-0634; Laura DeMaria, 202-482-7804; or Mark Crawford, 202-482-8239. Alternatively, send an e-mail to: underwateracoustics@bis.doc.gov
E.	If information is not available from your records in the form requested, contact our office to see if you may furnish estimates.
F.	Upon completion, and final review and certification of the survey, transmit the survey via e-mail to: underwateracoustics@bis.doc.gov
G.	For letter correspondence to the Office of Technology Evaluation regarding the overall scope of this assessment, please write to: Brad Botwin, Director, Industrial Studies Office of Technology Evaluation, Room 1093 U.S. Department of Commerce 1401 Constitution Avenue, NW Washington, DC 20230 Please do not submit completed surveys to this address; all surveys must be submitted electronically.

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Introduction II	Definitions
Acoustic Communications (ACOMMS)	An acoustic system designed to communicate (transmit or receive) acoustical data via an acoustic medium (water or air).
Acoustic Vector Sensor	A device that concurrently measures acoustic pressure and acoustic particle motion for the purpose of estimating intensity and direction of propagation of sound at a point in an acoustic field.
Active SONAR	An underwater acoustic system capable of transmission of acoustic signals.
Active Underwater Acoustic Transducer	An underwater transducer that can be used to transmit energy into the water.
Air-Deployed Sonar Systems	Any transducer-based system used for underwater acoustic signal generation or detection and installed on or deployed from aircraft.
Applied Research	Research for the purpose of applying knowledge or technologies to improve specific problems, devices, methods, or systems. Applied research often has a known potential application.
Autonomous underwater vehicles (AUV)	A self-propelled, independent system that travels underwater without requiring input from an operator.
Basic Research	Research resulting in new knowledge or improved understanding of subject area. Such research may also result in new discovery or invention of ideas, methods or devices.
Basic Research Underwater Acoustic Systems	Any transducer-based system or subsystem component used in basic research and/or testing for underwater acoustic signal generation or detection.
Capacity	The rated production capacity of a facility or production line to manufacture a standard product within a single, 8-hour shift.
Commercial And Government Entity Code (CAGE)	Commercial And Government Entity Code (CAGE Code) - A unique identifier assigned to suppliers to U.S. government or defense agencies for the purpose of identifying a specific facility and location. CAGE Codes (also known as NCAGE codes) are used internationally as part of the NATO Codification System (NCS).
Calibration	The process of testing a transducer to determine its performance including (but not limited to) its transmit or receive sensitivity, impedance in water, directional factor, and electroacoustic efficiency.
Calibration Facilities	Specialized facilities designed for measuring various transducer system responses to specific inputs (acoustic, shakers, signal telemetry, etc.).
Ceramic	Any piezoelectric, polycrystalline material based on ferroelectric oxides, such as lead zirconate titanate (PZT) ceramics.
Command Organization	Primary military organization (e.g., NAVSEA, NAVAIR, SPAWAR, etc.).
Company	Organizations including sole proprietorships, partnerships, companies, corporations and non-profit entities that operate as businesses (does not include universities).
Distributed Netted Systems	Any underwater acoustic sensor whose local information is subsequently combined through a data fusion process with information from other sources to produce an improved estimate of the state of the target population over a broader area and over a period of time that might exceed the immediate utility of an individual sensor in the network.

Division Facilities	Specialized facilities under the direction of a division within a larger command organization.
Educational Institution	Any institution providing college-level courses for academic credit.
Educational Program	A combination of courses from an educational institution leading to a certificate or degree.
Electrode Adhesion	The degree of adhesion of the electrode (e.g., silver, nickel, etc.) to the piezo element.
Electro-Dynamic Actuators and Force Drivers	Piezoelectric and other electromechanical actuators with the principal function of delivering a force or displacement as opposed to the radiation of sound.
Elements	Refers to finished components (e.g.,C44 ceramic disks, plates, rings, tubes, hemispheres, etc.) used in underwater transducers.
Environmental Parameters	Environmental parameters influencing acoustic propagation, e.g., temperature, pressure, density, bulk modulus, shear speed, attenuation, salinity, sound speed, etc.
Environmentally Controlled Facilities	Specialized measurement facilities in enclosed areas capable of manipulating environmental factors (e.g., temperature, pressure, etc.).
Facility	A physical space for performing specific work or activity.
Institutional Facility	A specialized design/manufacturing facility directly managed/owned by an educational institution.
International Traffic in Arms Regulations (ITAR)	Products and technologies subject to the Arms Export Control Act (AECA) [See 22 U.S.C 2778]
Integrated Electronics	The assemblage of electronic components on an electronic circuit board, membrane or other medium into a system.
Lake/Ocean Facilities	Specialized measurement facilities in lakes or open ocean ranges (e.g., Lake Pend Oreille, AUTEC, etc.).
Lead zirconate titanate (PZT)	An inorganic compound (Pb[ZrxTi1-x]O3 $0 \leq x \leq 1$). This ceramic perovskite material has piezoelectric effect properties useful for electroceramics.
Magnetics Design	The steps, procedures, and results associated with designing inductive tuning elements and impedance (step-up and step-down) transformers that are often necessary in an acoustic transducer subsystem.
Magnetostrictive materials	Ferromagnetic materials that convert mechanical energy into magnetic field displacements that alter the material shape when subjected to magnetization.
Manufacturing Standards	The standards and expectations associated with quality and tolerances related to a particular manufacturing process.
Medical Acoustic Systems	Any medical procedure (or system) that utilizes acoustics through the fluid medium of the body (e.g., ultrasound imaging, gallstone high intensity ensonification, etc.).
Material Bonding	The bonding of two or more materials.
National Security	A collective term encompassing national defense and homeland security, including the military, civilian intelligence agencies, border security, etc.
National Security Systems	Any transducer-based system that utilizes underwater acoustics for purposes of national security.

Near-Equivalent	A material, component, or product with performance characteristics that are within 10% of performance leaders.
Non-U.S. Customer	Any organization or company whose principle ownership is foreign.
Oceanographic	Relating to physical features of the oceans, e.g., temperature, depth, currents, waves, etc.
Oceanographic Systems	Underwater acoustic systems designed to measure oceanographic features, e.g., acoustic Doppler profilers, hydrographic systems, bathymetric systems, etc.
Passive Underwater Acoustic Sensor	A sensor that is capable of measuring incidents of acoustic energy.
Passive SONAR	An underwater acoustic (Sound, Navigation, and Ranging) system used to detect acoustic signals with receivers only (the system does not generate a probing acoustical signal).
Piezoceramic element	A piezoelectric ceramic element (such as a bar, plate, cylinder, etc.) made from a ceramic based composition exhibiting piezoelectric properties.
Piezocrystal element	A piezoelectric crystal element (such as a bar, plate, disk, etc.) made from a crystalline composition (such as quartz or PMN-PT single crystal) exhibiting piezoelectric properties.
Piezoelectric	The physical property of a material that converts electrical energy into mechanical energy (electromech+C70anical piezoelectric effect) or mechanical energy into electrical energy (mechano-electric piezoelectric effect).
Potting	The process of enclosing (or so called potting) an acoustic transducer within a waterproof solid layer, usually comprised of polyurethane, rubber, or plastic.
Pound	16 ounces; 0.454 kilgogram (kilogram = 2.2046 pounds)
Process Control	Methods and controls associated with manufacturing (or processing) piezoelectric materials and/or transducers.
Rated production capacity	The maximum engineered output capability of your production line based on the manufacture of a standard component or product in a single 8-hour shift.
R&D	Research and Development: All steps associated with the research and/or development of a product.
Research, Development, Test and Evaluation (RDT&E)	Research, Development, Test and Evaluation (RDT&E) - All steps associated with the full cycle of research and/or development, and subsequent testing and evaluation of product.
Single Crystal	Any relaxor-based, piezoelectric single crystal material, such as lead magnesium niobate-lead titanate (PMN-PT).
Sonar Transducer Reliability Improvement Program (STRIP)	A US Navy program with emphasis on reliability improvement of sonar transducers and support of devices used in the fleet (currently administered by NAVSEA/NUWC).
Sub-assembly	Any component of a system, which may or may not work independently.
Submarine Sonar Systems	Any transducer-based system used for underwater acoustic signal generation or detection and installed on submarines or deployed from submarines.
Surface Ship Sonar Systems	Any transducer-based system used for underwater acoustic signal generation or detection and installed on surface vessels, or deployed from surface vessels.
Technical Personnel/Engineering Force	Technically trained/educated workforce personnel who are directly involved with aspects of design and/or manufacturing of transducer products and SONAR systems.

Telemetry	Systems and subsystem components that involve the transmission of acoustic signals by wire, air, or water. Such systems may include conversion of signals to higher carrier frequencies or to different forms of energy such as electromagnetic, light, mechanical, or acoustical.
Transducer	Any device that converts acoustical energy into electrical energy, and vice-versa.
Transducer Components	Also known as "elements." Refers to finished components (e.g., ceramic disks, plates, rings, tubes, hemispheres, etc.) used in underwater transducers.
Transducer Design	The design and description of acoustical transducers (projectors and receivers) and related performance predictions or estimates.
Transducer Manufacturing	The building or production of acoustic transducers for commercial and/or government customers.
Transducer Products	Any transducer device or subsystem comprising an electroacoustic transducer that may be commercially available or made available to a navy or research application or demonstration.
Underwater Acoustic Communication Systems	Any transducer-based system used for underwater acoustic communications.
Underwater Acoustic Navigation Systems	Underwater Acoustic Navigation Systems reduce navigational uncertainty by providing acoustic information regarding position relative to known objects.
Underwater Imaging/Scanning Systems	Underwater Acoustic Imaging/Scanning Systems that create high resolution images of underwater structures, the bottom, and/or objects in the water column.
Underwater Transducer	Any device capable of converting acoustical energy into electrical energy, and vice-versa in an underwater environment.
Unmanned Underwater Vehicle (UUV)	Underwater vehicles that are either remotely operated vehicles (ROVs) operated by a person, or autonomous underwater vehicles (AUVs) that do not require human control.
U.S. Customer	Any organization or company whose principle ownership is U.S.-based.
UUV/AUV Underwater Acoustic Systems	Systems specifically intended to be integrated into unmanned/autonomous underwater vehicles for any undersea warfare or oceanographic purpose.

Technical References

ANSI S1.20-2012, Procedures for Calibration of Underwater Electroacoustic Transducers

R. Bobber, Underwater Electroacoustic Measurements, Peninsula Publishing, 1990.

J.F. Zalesak, "Transfer coupler reciprocity: A new low-frequency coupler-reciprocity technique for the absolute calibration of field hydrophones under full environmental conditions," J. Acous. Soc. Am., Vol. 105, pp. 2342-2349, 1999.

J.A. McConnel, K.J. Bastyr and G.C. Lauchle, "Development of a velocity gradient underwater acoustic intensity sensor", J. Acous. Soc. Am., Vol 105, pp. 3178 - 3188, 1999.

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Section 1.a	Company/Organization Information: Who Must Respond	
A.	Has your company/organization manufactured underwater transducers and/or sonar systems from 2009-2012?	
B.	Has your company/organization directly or indirectly supplied to the United States Navy underwater transducers and/or sonar systems from 2009-2012?	
C.	Has your company/organization produced and/or assembled materials or sub-assembly components that can be used in underwater transducers and/or sonar systems from 2009-2012?	
D.	Has your company/organization designed, engineered, or performed research related to underwater transducers and/or sonar systems from 2009-2012?	
E.	Has your company/organization calibrated or performed repairs on underwater transducers and/or sonar systems from 2009-2012?	

Exemption From Survey

If you responded 'No" to each of the five questions above and believe that your company/organization should be excused from completing the survey, send your request for exemption by e-mail to: underwateracoustics@bis.doc.gov. BIS staff will contact you to review your request.

Comments:	

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Section 1.b **Company Information: Company/Organization Identification and Ownership**

A.	The following information represents a response for:	
	Company/Organization Name	
	Business Unit/Division Name (if applicable)	
	Street Address	
	City	
	State/Province	
	Zip Code	
	Website	
	Phone Number	

B.	Identify your parent company/parent organization (if applicable).	
	Company/Organization Name	
	Headquarters Street Address	
	City	
	State/Province	
	Country	
	Postal Code/Zip Code	

C.	Is your company/organization publicly traded or privately held?		

D. Point of Contact regarding this survey:

Name	Title	Phone Number	E-mail Address	State

E. From 2009-2012, has one or more **foreign governments** invested, directly or indirectly, in your company/organization and control 5 percent or more of stockholder voting shares? If "Yes," please explain the type of investment and identify the foreign government(s) below.

Foreign Government Investment	Investment Exceeds 5%

	Foreign Government	Type of Investment
1.		
2.		
3.		
4.		
5.		

Comments:	

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Section 1.c **Company Information: Company/Organization Structure and Operations (cont.)**

A. State the number of underwater sonar, transducer and/or array system design and/or fabrication facilities that your company/organization operated in the following locations from 2009-2012. Respond to each cell.

	Facility Function	Number of Facilities							
		2009		2010		2011		2012	
		Inside U.S.	Outside U.S.	Inside U.S.	Outside U.S.	Inside U.S.	Outside U.S.	Inside U.S.	Outside U.S.
1.	Sonar System Design								
2.	Transducer System Design								
3.	Underwater Acoustic Transducer Array Design								
4.	Sonar System Fabrication								
5.	Transducer System Fabrication								
6.	Underwater Acoustic Transducer Array Fabrication								

B. For each facility that your company/organization identified in **Section A** above, provide the facility name, address, type of facility, and clearance operational status. For all facilities operated in 2012 provide the corresponding Commercial And Government Entity Code (CAGE Codes)* -- if the facility operates with a U.S. Government security clearance. * Find CAGE Codes at www.logisticsinformationservice.dla.mil/BINCS/begin_search.aspx

	Facility Name	Street Address	City	State/Province	Country	Type of Facility	Operates with USG Security Clearance	Applicable Cage Code(s)	
								CAGE 1	CAGE 2
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

Comments:

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Section 1.d **Company Information: Company/Organization Structure and Operations (cont.)**

Please specify the technology sectors that your company serves through the provision of design and/or fabrication services for underwater sonar, underwater active and passive transducers, and underwater acoustic arrays. Respond to each cell.

	Company Capabilities		Underwater Sonar Design	Underwater Sonar Fabrication	Underwater Transducer Design	Underwater Transducer Fabrication	Acoustic Transducer Array Design	Acoustic Transducer Array Fabrication
1.	Air-Deployed Sonar Systems							
2.	Basic Research Underwater Acoustic Systems							
3.	Distributed Netted Systems							
4.	Submarine Sonar Systems							
5.	Surface Ship Sonar Systems							
6.	Underwater Acoustic Communication Systems							
7.	Underwater Acoustic Navigation Systems							
8.	Underwater Acoustic Imaging Systems							
9.	Underwater Obstacle Avoidance Systems							
10.	Underwater Scanning Systems							
11.	UUV/AUV Acoustic Systems							
12.	Geophysical Exploration Systems							
13.	Hydrographic Survey Systems							
14.	Object Detection Systems							
15.	Medical Acoustic Systems							
16.	Other National Security Systems (Specify)							
17.	Other National Security Systems (Specify)							
18.	Other (Specify)							
19.	Other (Specify)							

Comments:	

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Section 2.a **Transducer Materials, Component, Product Types: Designed/Manufactured for U.S. Customers**

Instruction: Complete this survey page if your company/organization designs or manufactures underwater piezoceramic transducers, underwater non-piezoceramic transducers, or related materials and components for **U.S. Customers**. Respond to each cell. If your company does not design or manufacture any of these products, components, or materials, declare so in the box at right and proceed to ***Question 2.b.*** Note: U.S. Customers are companies that are headquartered and based in the United States.

A. For each of the business lines shown, identify the underwater acoustics- and underwater sonar-related materials and products that your company/organization designs and/or manufactures for **U.S. customers**. Select "None" for any business line category that is not applicable to your company/organization. Respond to each cell.

Transducers and Related Products	**Business Lines**								
	Defense/National Security	***ITAR-Controlled***	***Petroleum Industry***	***Fishing***	***Hydrographic Surveying***	***Non-Defense Object Detection and/or Imaging***	***Oceanographic***	***Medical Acoustic Systems***	***Other (specify in comments)***
Piezoceramics for transducers									
Other piezoelectric materials for transducers (e.g., crystals, polymers, etc.)									
Magnetostrictive materials for transducers									
Transducers based on piezoceramic materials									
Transducers based on piezoelectric materials other than ceramics (e.g., piezocrystals such as PMN-PT or other single crystals, polymers, or other)									
Transducers based on magnetostrictive materials									
Transducers based on composite materials (e.g. 1-3 composites)									
Underwater Fiber-Optic Acoustic Sensors									
Transmit electronics for transducers (e.g. power)									
Data telemetry devices for acoustics									
Associated materials for sonar systems (adhesives, encapsulants, connectors, other parts)									
Other (specify)									
Other (specify)									
Comments:									

B. Estimate the percentage of your company's/organization's product types for each business line that utilize any of the listed materials. Select "None" for any business line category that is not applicable to your company. Respond to each cell.

Product Type	***Material***	**% of Business Line Products Utilizing Specified Materials**								
		Defense/National Security	***ITAR-Controlled***	***Petroleum Industry***	***Fishing***	***Hydrographic Surveying***	***Non-Defense Object Detection and/or Imaging***	***Oceanographic***	***Medical Acoustic Systems***	***Other (specify in comments)***
Piezoceramic Transducers	Using PZT ceramic materials (Lead-Zirconium-Titanate)									
	Using non-PZT ceramic materials (Barium-Titanate or other)									
Non-Piezoceramic Transducers	Using piezocrystal materials (PMN-PT or other relaxor type single crystals)									
	Using magnetostrictive materials									
	Transducers based on composite materials (e.g., 1-3 composites)									
	Underwater Fiber-Optic Acoustic Sensors									
	Other materials (e.g., polymers)									
Other Underwater Vibration Sensors	Using PZT ceramic materials									
	Using non-PZT ceramic materials									
	Using piezocrystal materials									
	Using magnetostrictive materials									
	Other materials (e.g., polymers)									
Other (specify)										
Comments:										

*International Traffic in Arms Regulations - Products and technologies subject to the Arms Export Control Act (AECA) [See 22 U.S.C 2778].

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Section 2.b **Transducer Materials, Component, Product Types: Designed/Manufactured for Non-U.S. Customers**

Instruction: Complete this survey page if your company/organization designs or manufactures underwater piezoceramic transducers, underwater non-piezoceramic transducers, or related materials and components for **Non-U.S. Customers**. Respond to each cell. If your company does not design or manufacture any of these products, components, or materials, declare so in the box at right and proceed to Question 3.a.

A. For each of the business lines shown, identify the underwater acoustics and underwater sonar-related materials and products that your company/organization currently manufactures and/or designs for **Non-U.S. customers**. Select "None" for any business line category that is not applicable to your company/organization. Respond to each cell.

Transducers and Related Products	Business Lines								
	Defense/National Security	*ITAR-Controlled*	*Petroleum Industry*	*Fishing*	*Hydrographic Surveying*	*Non-Defense Object Detection and/or Imaging*	*Oceanographic*	*Medical Acoustic Systems*	*Other (specify in comments)*
Piezoceramics for transducers									
Other piezoelectric materials for transducers (e.g., crystals, polymers, etc.)									
Magnetostrictive materials for transducers									
Transducers based on piezoceramic materials									
Transducers based on piezoelectric materials other than ceramics (e.g., piezocrystals such as PMN-PT or other single crystals, polymers, or other)									
Transducers based on magnetostrictive materials									
Transducers based on composite materials (e.g. 1-3 composites)									
Underwater Fiber-Optic Acoustic Sensors									
Transmit electronics for transducers (e.g. power)									
Data telemetry devices for acoustics									
Associated materials for sonar systems (encapsulants, connectors, other parts)									
Other (specify)									
Other (specify)									
Comments:									

B. Estimate the percentage of your company's/organization's product types for each business line that utilize any of the listed materials. Select "None" for any business line category that is not applicable to your company. Respond to each cell.

Product Type	*Material*	% of Business Line Products Utilizing Specified Materials								
		Defense/National Security	*ITAR-Controlled*	*Petroleum Industry*	*Fishing*	*Hydrographic Surveying*	*Non-Defense Object Detection and/or Imaging*	*Oceanographic*	*Medical Acoustic Systems*	*Other (specify in comments)*
Piezoceramic Transducers	Using PZT ceramic materials (Lead-Zirconium-Titanate)									
	Using non-PZT ceramic materials (Barium-Titanate or other)									
Non-Piezoceramic Transducers	Using piezocrystal materials (PMN-PT or other relaxor type single crystals)									
	Using magnetostrictive materials									
	Transducers based on composite materials (e.g. 1-3 composites)									
	Underwater Fiber-Optic Acoustic Sensors									
	Other materials (e.g., polymers)									
Other Underwater Vibration Sensors	Using PZT ceramic materials									
	Using non-PZT ceramic materials									
	Using piezocrystal materials									
	Using magnetostrictive materials									
	Other materials (e.g., polymers)									
Other (specify)										
Comments:										

*International Traffic in Arms Regulations - Products and technologies subject to the Arms Export Control Act (AECA) [See 22 U.S.C 2778].

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Section 2.c — **Transducer Materials, Component, Product Types: Non-U.S. Defense/National Security Customers (cont.)**

A. For **any of the product types** at right that were supplied by your company/ organization in years 2009-2012 to **Non-U.S. Defense/National Security-related customers**, provide the names of the purchasing companies/ organizations, their location(s), and a description of the products supplied.

Description of Transducers and Related Products

	Non-U.S. Defense/National Security-Related Customer Name	**City**	**Country**	**Transducers based on piezoceramic materials**			**Transducers based on non-piezoceramic materials other than ceramics (e.g., piezocrystals such as PMN-PT or other single crystals, polymers, or other)**					**Other Underwater Vibration Sensors**					**Other**	
				Magnetostrictive materials for transducers	Using PZT ceramic materials (Lead-Zirconium-Titanate)	Using non-PZT ceramic materials (Barium-Titanate or other)	Using piezocrystal materials (PMN-PT or other relaxor type single crystals)	Using magnetostrictive materials	Transducers based on composite materials (e.g. 1-3 composites)	Underwater Fiber-Optic Acoustic Sensors	Using materials (e.g., polymers)	Using PZT ceramic materials	Using non-PZT ceramic materials	Using piezocrystal materials	Using magnetostrictive materials	Other materials (e.g., polymers, specify in boxes below)	Associated materials for sonar systems (adhesives, encapsulants, connectors, other parts)	Other (specify in boxes below)
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
9.																		
10.																		
11.																		
12.																		
13.																		
14.																		
15.																		

Comments:

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Section 3.a **Capabilities: Design/Manufacturing of Piezoelectric Materials, Transduction Components**

Instruction: Complete this survey page if your company/organization designs or manufactures components for active transducers or passive sensors. If your company does not design or manufacture components, declare so in the box at right and proceed to **Section 4**. Respond to each cell.

A. By technical application, identify your company's/organization's capabilities to design and/or manufacture components for underwater active acoustic transducers. Respond to each cell.

Component Performance Range	Technical Application						
Technical Property	**General Purpose/R&D**	**Active SONAR Element**	**Passive SONAR Sensor**	**Mine-Hunting**	**Doppler Profiling**	**Side-Scan SONAR**	**Acoustic Communications**
Capable of operation in surf zone (< 20m)							
Capable of operation in littorals (< 200m)							
Capable of operation in deep ocean (> 3000m)							
Operational below (500 Hz)							
Operational between (500 Hz - 2 kHz)							
Operational between (2 kHz - 10 kHz)							
Operational between (10 kHz - 50 kHz)							
Operational between (50 kHz - 2 MHz)							
Omnidirectional							
Directional with 3dB beamwidth < 30 degrees							
Other (specify)							

B. Specify the transduction component geometries that your company/organization is capable of manufacturing and identify related unique product/manufacturing capabilities that reside in your company/organization. Respond to each cell. If your company/organization does not manufacture transduction components, select "None" at the box at right and proceed to Section 3.b.

Transducer Components - By Shape	Current Capability	Maximum Diameter *(Centimeters)*	Unique Manufacturing Capability?	Description of Unique Manufacturing Capabilities
Bar				
Hemispheres				
Hollow Cylinders				
Plates				
Rings				
Tubes				
Other (specify)				
Other (specify)				

Comments:

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Section 3.b **Capabilities: Design/Manufacturing of Piezoelectric Materials, Transduction Components (cont.)**

A.	Does your company/organization have the capability to do high-field testing of ceramics?	
	If "Yes," what is the maximum voltage your high-field (> 1 kvolts/cm) testing can achieve? Provide your answer in kilovolts (kV).	Voltage
	If "Yes," what is the minimum electrode separation your high-field testing can achieve? Provide your answer in centimeters.	Electrode Separation
B.	Identify the types of inventory that your company maintains for raw piezoelectric materials and/or finished transduction components.	
	What is the average supply level of manufacturing piezoelectric materials kept in inventory?	Pounds
	What is the average supply level of finished transducer components kept in inventory?	Units

C.	Does your company/organization manufacture its own piezoelectric powders?			Yes
	If "Yes," state your production capacity and the locations of your production facilities below.			
	Total Number of U.S. Production Facilities		Max. Annual Prod. Capacity - U.S. Locations- Pounds	
	Total Number of Non-U.S. Production Facilities		Max. Annual Prod. Capacity - Non-U.S. Locations- Pounds	

	Production Facility Name	City	Country
1.			
2.			
3.			
4.			

D.	State the percentage of total materials used in 2011 by your company/organization that is attributed to your company's/organization's Non-U.S. piezoelectric powder manufacturing facilities.	
	State the percentage of your company/organization's total 2011 purchases of piezoelectric materials that was fulfilled by imports. (Note: Exclude production from company-/organization-owned, Non-U.S. facilities)	

E.	State the number of Non-U.S. suppliers from which you currently import piezoelectric materials. Next, identify the locations of the production facilities for your company's/organization's Non-U.S. suppliers of piezoelectric materials.	

	Production Facility Owner	Production Facility Name	City	Country
1.				
2.				
3.				
4.				

Comments:	

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Section 3.c **Production/Usage: Piezoelectric Materials, Transduction Components for Underwater Acoustic Transducers**

Instruction: If your company/organization does not make materials or components for active transducers or passive sensors, select "Do Not Manufacture" in the box at right and proceed to Section 4.

A. Does your company/organization have the capability to design and develop new piezoceramic material formulations? If "Yes" explain in the comment box below.

B. Does your company/organization have the capability to design and develop new piezoceramic components? If "Yes" explain in the comment box below.

C. Identify the procedures your company/organization routinely uses to ensure that the piezoceramic materials identified below meet U.S. Navy-type specifications. Respond to each cell.

Material Type	Testing Procedures Utilized for Designated Materials *(Respond to Each Identified Practice)*						
	Test received samples for impedance data and compare to previous products for consistency	Evaluate samples received per purchase specification: size, capacitance, and/or dissipation	Rely on suppliers statements/representations that their materials are equivalent	Measure the piezoelectric properties of sample materials according to IEEE standards No 176 on piezoelectricity	Measure the piezoelectric properties according to other methods	Measure completed transducers to ensure they meet specifications	Other (specify in comments)
Navy Type I							
Navy Type II							
Navy Type III							
Navy Type IV							
Navy Type V							
Navy Type VI							
Polyvinylidene fluoride (PVDF)							
Single Crystal PMN-PT							
Single Crystal PIN-PMN-PT							
Galfenol							
Terfenol-D							
Lithium Sulfate							

Comments:

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Section 3.d **Supply Chain: Supply of Materials/Components for Active Underwater Transducer and Passive Underwater Sensor Products**

A. My company/organization obtains piezoceramic materials from:

Note: Respondent companies/organizations that rely on "internal production" for 100% of their material needs must complete Part 3d.B. Under "Supplier Name" state your company name. Also provide the location of eac

B. Identify your company's/organization's U.S.-based and Non-U.S. suppliers for **piezoceramic materials**. Provide the supplier name and location, identify the types of materials supplied, and specify the average lead-time (in weeks) to receive piezoceramic materials from the supplier.

	Supplier Name	City	State/Province	Country	Average Lead-Time for Delivery (in Weeks)	Material Type (Respond to each cell): Navy Type I	Navy Type II	Navy Type III	Navy Type IV	Navy Type V	Navy Type VI	Polyvinylidene Fluoride (PVDF)	Single Crystal PMN-PT	Single Crystal PIN-PMN-PT	Galfenol	Terfenol-D	Lithium Sulfate	Generic Composites (e.g.,1-3 composites)	Other (specify)
1.																			
2.																			
3.																			
4.																			
5.																			
6.																			
7.																			
8.																			
9.																			
10.																			
	Comments:																		

C. If your company/organization utilizes Non-U.S. suppliers for piezoceramic materials and/or other piezo materials, is there a near-equivalent U.S.-based supplier available?
If "Yes," identify the U.S. supplier(s), specify the material type(s), and describe your reasons for not utilizing the U.S.-based suppliers in the comment box below.

	Supplier Name	City	State	Material Type (Respond to each cell): Navy Type I	Navy Type II	Navy Type III	Navy Type IV	Navy Type V	Navy Type VI	Polyvinylidene Fluoride (PVDF)	Single Crystal PMN-PT	Single Crystal PIN-PMN-PT	Galfenol	Terfenol-D	Lithium Sulfate	Generic Composites (e.g.,1-3 composites)	Other (specify)
1.																	
2.																	
3.																	
4.																	
5.																	
	Reasons for not using U.S.-based suppliers:																

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Section 3.e **Production Capacity/Utilization: Underwater Transduction Components (Active & Passive) (cont.)**

A.	State the number of 8-hour production shifts your company/organization normally operates per day at its U.S. and Non-U.S. Facilities:	**U.S. Facilities**	
		Non-U.S. Facilities	

B.	State the annual capacity utilization rate (12-month average measure) for your U.S. and Non-U.S. based facilities that manufacture underwater transduction components for 2009-2012.*		**2009**	**2010**	**2011**	**2012**
		U.S. Facilities				
		Non-U.S. Facilities				
	Comments:					

C.	State the 2011 rated production capacity in units (using a standard component measure) for **your U.S. and Non-U.S. manufacturing facilities** that manufacture **underwater transducer components**, assuming one 8-hour shift per day and five-day-a-week operation.	**U.S. Facilities**	
		Non-U.S. Facilities	
	How many weeks would it take to achieve maximum production capacity at your **U.S. and Non-U.S. facilities**, assuming one 8-hour shift per day and five-day-a-week operation?	**U.S. Facilities**	
		Non-U.S. Facilities	
	Comments		

D.	For the period 1980-2011, in what year did your company/organization achieve its highest production of **underwater transduction components**? Estimate the total number of units produced and the number of 8-hour prodcution shifts operated per day.		**Year**	**Number of Units**	**Number of Shifts**
		U.S. Facilities			
		Non-U.S. Facilities			

E. Rank the five most critical factors that today curtail your facilities' current capabilities to produce **transducer components** for commercial and/or defense customers, "#1" being the most critical. Do not repeat critical factors.

#1	**#2**	**#3**	**#4**	**#5**

Explain:

F. Identify the most critical factors that would affect your company's/organization's ability to manufacture at maximum capacity in a times of national emergency or war, "#1" being the most critical. Do not repeat critical factors.

#1	**#2**	**#3**	**#4**	**#5**

Explain:

G.	Indicate whether all of your **transduction component** manufacturing facilities will be operating through 2015. If "No," explain below.	

Comments:

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Section 3.f **Production Capacity/Utilization: Underwater Transduction Components (Active & Passive) (cont.)**

A. By type of shape, state the number of underwater transduction components produced at your U.S. facilities in 2011.

Transducer Components - By Shape	Number of Components by Type of Material		
	Piezo-Ceramic-Base materials	Single Crystal-Base Materials	Other (specify in comment)
Bar			
Hemispheres			
Hollow Cylinders			
Plates			
Rings			
Tubes			
Other (specify)			
Comment:			

B. Does your company/organization have a long-term plan to increase or reduce the overall number of component product lines? If your response is "reduce," describe below 1) the product line changes and 2) the reasons for change.

C. Does your company/organization have a long-term plan to increase or reduce the overall volume of production for certain component product lines? If your response is "reduce," describe below 1) the affected product lines and 2) the reasons for the change.

D. Does your company's/organization's commercial business (non-military) demands severely limit its ability to supply components for products to be used by the military? If "Yes," describe these limitations below.

E. Does your company's/organization's military business (non-commercial) demands severely limit its ability to supply components to commercial/industrial sectors? If "Yes," describe these limitations below.

Comments:

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Section 4.a **Transducer Design/Manufacturing: Product Applications & Performance Ranges**

For the years 2009-2012, state whether your company/organization designed and/or manufactured any of the listed underwater acoustic transducers meeting any of the following technical specifications listed below. Respond to all cells.

A.

Specifications	Underwater Transducer Operational Ranges & Applications						
	General Purpose/R&D	Active SONAR Element	Passive SONAR Sensor	Mine-Hunting	Doppler Profiling	Side-Scan SONAR	Acoustic Communications
Capable of operation in surf zone (< 20m)							
Capable of operation in littorals (< 200m)							
Capable of operation in deep ocean (> 3000m)							
Operational below (500 Hz)							
Operational between (500 Hz - 2 kHz)							
Operational between (2 kHz - 10 kHz)							
Operational between (10 kHz - 50 kHz)							
Operational between (50 kHz - 2 MHz)							
Omnidirectional							
Directional with 3dB beamwidth < 30 degrees							
Other (specify)							

B. Identify the transducer application categories where your company/organization designs and/or manufactures products that are capable of measuring vector acoustic fields. Respond to all cells.

General Purpose/R&D	Active SONAR Element	Passive SONAR Sensor	Mine-Hunting	Doppler Profiling	Side-Scan SONAR	Acoustic Communications

Comments:

C. Assuming a 50% duty cycle, state the **maximum source level** for active underwater transducers produced by your company/organization. Respond to all cells.

Underwater Transducer Performance Capabilities & Applications						
General Purpose/R&D	Active SONAR Element	Mine-Hunting	Doppler Profiling	Side-Scan SONAR	Acoustic Comms	Other (specify in comments)

Comments:

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Section 4.b — **Transducer Design/Manufacturing: Manufacturing Process Capabilities & Locations**

A. For the U.S-based and Non-U.S.-based production facilities that your company/organization owns and operates, 1) state whether it can perform the identified manufacturing processes and whether it will maintain this capability through 2015; 2) specify the number of employees at U.S. and Non-U.S. facilities that are experienced in each process; and 3) identify the country locations of your company's/organization's three most important Non-U.S. facilities as determined by annual production revenue. Respond to all cells.

Manufacturing Process	U.S.-Based Facilities			Non-U.S. Based Facilities			Country Locations for Top Three Company/Organization-Owned, Non-U.S. Based Manufacturing Facilities (*Based on Annual Production Revenue*)		
	Company/Organization-Controlled U.S.-Based Capability	Maintain Through 2015?	Number of U.S.-based facility employees experienced in this process	Company/Organization-Controlled Non-U.S. Based Capability	Maintain Through 2015?	Number of Non-U.S.-Based facility employees experienced in this process	Country 1	Country 2	Country 3
Formulation and firing of piezoceramic materials									
Application of electrodes on piezoceramics									
Polarization of piezoceramic materials									
Determination of piezoelectric properties in piezoceramics (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.).									
Growth of piezocrystal materials									
Application of electrodes on piezocrystals									
Testing of electrode adhesion in piezocrystals									
Polarization of piezocrystal materials									
Determination of piezoelectric properties in piezocrystals (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.).									
Bonding of similar and dissimilar materials									
Hermetic Sealing of Pressure Vessels									
Integrated electronics									
Magnetics design (tuning and matching circuits)									
Miniature Electronics Assembly									
Transducer build									
Potting for submerged use									
Testing of handling requirements									
Telemetry wiring									
Calibration									

B. For each of the following transducer manufacturing steps, 1) report the number of **U.S.-based and/or Non-U.S. based vendors** that your company uses, 2) estimate how much your company's use of vendors will change by 2015, and 3) identify the country locations of your top three Non-U.S. vendors. Respond to all cells.

Manufacturing Steps	U.S.-Based Vendor		Non-U.S. Based Vendors		Country Locations for Top Three Non-U.S. Transducer Vendors Non-U.S. Based Manufacturing Facilities (*Based on Annual Purchases of Products/Services*)		
	Utilize U.S.-Based Vendor (*Number of Vendors*)	Estimated Change in Reliance on U.S. Vendors Through 2015	Utilize Non-U.S. Based Vendor? (*Number of Vendors*)	Estimated Change in Reliance on Non-U.S. Vendors Through 2015	Country 1	Country 2	Country 3
Formulation and firing of piezoceramic materials							
Application of electrodes on piezoceramics							
Polarization of piezoceramic materials							
Determination of piezoelectric properties in piezoceramics (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.).							
Growth of piezocrystal materials							
Application of electrodes on piezocrystals							
Testing of electrode adhesion in piezocrystals							
Polarization of piezocrystal materials							
Determination of piezoelectric properties in piezocrystals (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.).							
Bonding of similar and dissimilar materials							
Hermetic Sealing of Pressure Vessels							
Integrated electronics							
Magnetics design (tuning and matching circuits)							
Miniature Electronics Assembly							
Transducer build							
Potting for submerged use							
Testing of handling requirements							
Telemetry wiring							
Calibration							

Comments:

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Section 4.c **Transducer Design/Manufacturing: Manufacturing Process Capabilities & Locations**

A.	Describe the process by which final products are calibrated, and what data/analyses are provided in calibration reports to customers.	

B. Are calibration and testing activities performed in house or by outside contractors? If performed by outside contractors, list their names and locations below.

	Contractor Name	Street Address	City	State
1.				
2.				
3.				
4.				
5.				

C. Are U.S. Navy calibration facilities required and utilized to enable your testing activities? If "Yes," explain below.

D.	Describe what unique tools/machinery (large 4-axis milling machines, large ovens, etc.) that you utilize in the production of transducers or transducer systems. Describe any issues with availability of these tools/machinery.	
E.	If large systems are developed, how are these transported to customers? Identify any issues with transportation scheduling.	

Comments:	

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Section 4.d — **Transducer Design/Manufacturing: Manufacturing Process Control Methods and Standards**

Does your company/organization apply specific process controls and manufacturing standards in the design and manufacture of underwater acoustic transducers produced:

In-House	
By Contractors	

Specify the types of manufacturing process controls and standards your company/organization applies to each of the following transducer manufacturing steps identified below at left.
For each, indicate when the **last set of controls and standards** were updated. Respond to each cell.

A.

Manufacturing Process	Process Controls Applied: Internal Documentation	External Manu. Documentation	Quality Assurance Process	Statistical Process Control (SPC)	Other Process Controls Applied (specify in comments)	Last Year Updated	Manufacturing Standards Applied: ISO 9001	IEEE 176-1987	IEEE 180-1986	MIL-STD 1376B (SH)	Standard Protocols for Single Crystal Piezoelectrics	Other Standards Applied (specify in comments)	Last Year Updated
Formulation and firing of piezoceramic materials													
Application of electrodes on piezoceramics													
Polarization of piezoceramic materials													
Growth of piezocrystal materials													
Application of electrodes on piezocrystals													
Testing of electrode adhesion in piezocrystals													
Polarization of piezocrystal materials													
Bonding of similar and dissimilar materials													
Hermetic Sealing of Pressure Vessels													
Integrated electronics													
Magnetics design (tuning and matching circuits)													
Miniature Electronics Assembly													
Transducer build													
Potting for submerged use													
Testing of handling requirements													
Telemetry wiring													
Calibration													
Comments													

Does your company/organization apply specific process controls and standards in the determination of piezoelectric properties of piezoceramics and piezocrystals utilized in its transducer products?

In-House	
By Contractors	

Specify the types of process controls and standards applied by your company/organization in the determination of the **piezoelectric properties** of **piezoceramics** and **piezocrystals** utilized in transducer products.
For each properties/performance verification cited below, indicate when the last set of controls and standards were updated. Respond to each cell.

B.

Properties/Performance Verification	Process Controls Applied: Internal Documentation	External Manufacturing Documentation	Quality Assurance Process	Statistical Process Control (SPC)	Other (specify in comments)	Last Year Updated	Standards Applied: Navy Type I	Navy Type II	Navy Type III	Navy Type IV	Navy Type V	Navy Type VI	Polyvinylidene fluoride (PVDF)	Single Crystal PMN-PT	Single Crystal PIN-PMN-PT	Galfenol	Terfenol-D	Lithium Sulfate	Generic Composites (e.g.,1-3)	Other (Specify)	Last Year Updated
Determination of piezoelectric properties in **piezoceramics** (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.).																					
Determination of piezoelectric properties in **piezocrystals** (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.).																					

C. Describe how your company/organization ensures that it is meeting Navy standards.

Comments:

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Section 4.e **Transducer Design/Manufacturing: Outsourcing Of Manufacturing Tasks**

Instruction: If your company/organization does not outsource manufacturing steps for active underwater transducers or underwater passive sensors, select "Do Not Outsource" in the box at right and proceed to Section 4f.

A. For each identified transducer manufacturing step, 1) state the percentage of production work that your company/organization outsources to Non-U.S. entities, and 2) rank the top five reasons for outsourcing the manufacturing steps listed below to Non-U.S. entities. Respond to all cells.

Note: If "None" is reported for the Active Under Water Transducer or Passive Underwater Sensor, do not complete the adjoining section on primary reasons for outsourcing.

Manufacturing Steps	Active Underwater Transducer - % Outsourced	Passive Underwater Sensor - % Outsourced	Primary Reasons for Outsourcing Underwater Transducer Manufacturing to Non-U.S. Entities				
			#1	#2	#3	#4	#5
Formulation and firing of piezoceramic materials							
Application of electrodes on piezoceramics							
Polarization of piezoceramic materials							
Determination of piezoelectric properties in piezoceramics (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.)							
Growth of piezocrystal materials							
Application of electrodes on piezocrystals							
Testing of electrode adhesion in piezocrystals							
Polarization of piezocrystal materials							
Determination of piezoelectric properties in piezocrystals (including d-constants, k electromechanical coupling, elastic properties or frequency constants, dielectric properties, etc.)							
Bonding of similar and dissimilar materials							
Hermetic Sealing of Pressure Vessels							
Integrated electronics							
Magnetics design (tuning and matching circuits)							
Miniature Electronics Assembly							
Transducer build							
Potting for submerged use							
Testing of handling requirements							
Telemetry wiring							
Calibration							

Comments:

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Section 4.f **Capability and Production: Underwater Acoustic Transducer/Passive Sensor Product Manufacturing**

A.	State the number of 8-hour production shifts your company/organization normally operates per day at its U.S. and Non-U.S. Facilities:	**U.S. Facilities**	
		Non-U.S. Facilities	

B.	State the capacity utilization rate for your U.S. and Non-U.S. based facilities that manufacture **underwater transduction products** for 2009-2012.*		**2009**	**2010**	**2011**	**2012**
		U.S. Facilities				
		Non-U.S. Facilities				
	Comments:					

C.	State the 2011 rated production capacity in units (using a standard component measure) for **your U.S. and Non-U.S. manufacturing facilities** that produce **underwater transducer products**, assuming one 8-hour shift per day and five-day-a-week operation.	**U.S. Facilities**	
		Non-U.S. Facilities	
	How many weeks would it take to achieve maximum production capacity at your **U.S. and Non-U.S. facilities**, assuming one 8-hour shift per day and five-day-a-week operation?	**U.S. Facilities**	
		Non-U.S. Facilities	
	Comments:		

D.	For the period 1980-2011, specify the year your company achieved its **highest production volume** of underwater acoustic transducer/passive sensor products, and state the number of shifts that were operated per day to achieve this output. Estimate the total number of units produced.		**Year**	**Number of Units**
		U.S. Facilities		
		Non-U.S. Facilities		
		Number of Shifts Per Day		

E.	State the number of underwater acoustic transducer products manufactured at your facilities in 2011:	**U.S. Facilities**	**Non-U.S. Facilities**
	Total Number of Active Underwater **Acoustic Transducer Units** produced (all types):		
	Total Number of Passive Underwater **Acoustic Sensor Units** produced (all types):		

F. Rank the five most critical factors that today curtail your facilities' current capabilities to produce transducer products for commercial and/or defense customers, "#1" being the most critical. Do not repeat critical factors.

#1	**#2**	**#3**	**#4**	**#5**

Explain:

G. Identify the most critical factors that would affect your company's/organization's ability to manufacture **tranducer products** at maximum capacity in a times of national emergency or war, "#1" being the most critical. Do not repeat critical factors.

#1	**#2**	**#3**	**#4**	**#5**

Explain:

H.	Indicate whether all of your manufacturing facilities will be operating through 2015. If "No," explain below.	Active Transducers	
		Passive Sensors	
	Does your company/organization have a long-term plan to increase or reduce its overall active underwater transducer/passive sensor **product lines**? If your response is "reduce," describe the product line changes and the reasons for the changes.	Active Transducers	
		Passive Sensors	
	Does your company/organization have a long-term plan to increase or reduce its overall **volume of production** of active underwater transducer/passive products? If your response is "reduce," describe the affected products and 2) the reasons for the changes.	Active Transducers	
		Passive Sensors	

Comments:

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SUBMIT ONLY EXCEL VERSION--DROP DOWN CRITERIA IN EXCEL VERSION

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Section 4.g **Transducer Design/Manufacturing: Supply of Underwater Transducer Products Utilizing Select Materials**

A. Identify the types of underwater transducer products/subsystems that your company buys from outside suppliers for inclusion in underwater acoustic systems. State whether your company also makes these transducer products internally. Provide the names and addresses of outside suppliers. Estimate the average lead-time for delivery of transducer products purchased from outside suppliers. Also, specify the types of materials utilized (See list at right - Respond to all cells) in transduction products provided by outside suppliers.

	Manufacturer/Supply Sources of Transducer Products						Material Types Utilized in Survey Respondents' Manufactured/Procured Transduction Products *(Identify all that apply)*														Average Lead-Time for Delivery *(in Weeks)*
	Type of Transducer Product/Subsystem	Manufactured Internally	Outside Material Supplier Name	City	State/Province	Country	Navy Type I	Navy Type II	Navy Type III	Navy Type IV	Navy Type V	Navy Type VI	Polyvinylidene fluoride (PVDF)	Single Crystal PMN-PT	Single Crystal PIN-PMN-PT	Galfenol	Terfenol-D	Lithium Sulfate	Generic Composites (e.g.,1-3)	Other (specify in boxes below)	
1.																					
2.																					
3.																					
4.																					
5.																					
6.																					
7.																					
8.																					
9.																					
10.																					
Comments:																					

B. If your company purchases underwater acoustic transducer/passive sensor products from offshore manufacturers, is there a near-equivalent U.S.-based supplier available?
If "Yes," identify the type of transducer product/subsystem and the near-equivalent U.S. supplier; and describe your reasoning for not using the U.S.-based supplier(s). If your response is "No," proceed to Section 4.h.

	Type of Transducer Product/Subsystem	Is a Near-Equivalent U.S.-Based Supplier Available?	Name of Near-Equivalent U.S.-Based Suppliers	Reasons for Not Using Near-Equivalent U.S.-Based Suppliers
1.				
2.				
3.				
4.				
5.				
Comments:				

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Section 4.h	Underwater Transducer Design/Manufacturing: Capacity Used for Manufacturing of U.S. National Security Products			
	Allocation of Design/Manufacturing Resources	**Underwater Acoustic Product**	**Design**	**Manufacturing**
A.	What portions of your company's/organization's U.S.-based design and manufacturing capacity were used in 2011 to produce the following products for U.S. national security applications:	Active Underwater Transducers		
		Passive Underwater Sensors		
B.	What percentage of your company's/organization's U.S.-based design and manufacturing capacity is it willing to make available (assuming fair cost and profit) for future national security-related production of:	Active Underwater Transducers		
		Passive Underwater Sensors		
C.	What percentage of your company's/organization's non-U.S design and manufacturing capacity was used in 2011 to produce the following products for U.S. national security applications:	Active Underwater Transducers		
		Passive Underwater Sensors		

Comments:	

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Section 5.a **Calibration: Calibration and Testing Facility Functions**

Instruction: If your company/organization does not own facilities for the calibration of underwater acoustic transducers and sonar systems, declare so in the box at right and proceed to **Section 6.**

A.	How many years has your company/organization been involved in underwater **transducer** calibration?	
	How many years has your company/organization been involved in underwater **SONAR** system calibration?	

B. State the number of underwater transducer and underwater SONAR calibration facilities that your company/organization operated from 2009-2012. Respond to all cells.

Calibration Facilities	2009		2010		2011		2012	
	Transducer	SONAR	Transducer	SONAR	Transducer	SONAR	Transducer	SONAR
Total number of facilities								
Number of facilities capable of total system calibrations								
Number of facilities only capable of individual sensor calibrations								
Number of lake facilities								
Number of ocean facilities								
Number of environmentally controlled facilities								

Comments:

C. Specify the underwater SONAR systems that your company/organization enables or supports through the provision of calibration/test, design, fabrication, or repair services. Explain the scope of your repair capabilities in the space below. Respond to all cells.

Systems Supported	Capabilities				
	Calibration/Test	Design	Fabrication	Repair	Repair Capabilities
Submarine Sonar Systems					
Surface Ship Sonar Systems					
Air-Deployed Sonar Systems					
Basic Research Underwater					
Underwater Acoustic Communication Systems					
Underwater Scanning Systems					
Other National Security Systems (Specify)					
Other (specify)					

Comments:

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Section 5.b **Calibration: Current Calibration/Testing Facilities - Lake/Ocean Facilities**

Instruction: If your company/organization does not operate Lake/Ocean calibration/testing facilities, then select "None" in the box at right and proceed to **Section 5.d.**

A. Please provide information on the capabilities of all **lake and/or ocean facilities** managed by your company/organization. Respond to all cells.

	Facility Name	Street Address	City	State/Province	Country	Physical Dimensions *(Meters)*			Usable Frequency Range					
						Usable Length	Usable Width	Usable Depth	<100Hz	100-500Hz	500-2500Hz	2500Hz - 10KHz	10-50KHz	>50KHz
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														
9.														
10.														

Comments:

B. For each lake and/or ocean facility described above, identify: 1) the type of facility, 2) the facility's operating status, 3) number of technical support staff assigned to the facility, 4) its suitability for sensor testing/calibration, 5) its suitability for full-scale testing, 6) the principal challenge affecting the facility's continued operation, and 7) the critical and/or planned physical updates needed to maintain the viability of the facility. Respond to all cells.

	Name of Facility	Type of Facility	Status of Facility Infrastructure	Number of Technical Support Staff Assigned to Facility	Appropriate for Individual Sensor Testing/ Calibration?	Appropriate for Full-Scale System Testing/ Calibration?	Principal Challenge to Maintaining this Facility *(Select one)*	Planned Physical Upgrades *(Do not list cost estimates)*
1.	0							
2.	0							
3.	0							
4.	0							
5.	0							
6.	0							
7.	0							
8.	0							
9.	0							
10.	0							

Comments:

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Section 5.c **Calibration: Capacity Utilization Rates for Lake/Ocean Facilities**

Instruction: If your company/organization does not operate **lake/ocean** calibration/testing facilities, then select "None" in the box at right and proceed to **Section 5.d.**

A. State the number of 8-hour production shifts your company/organization normally operates per day at its U.S. and Non-U.S. Facilities:

U.S. Facilities	
Non-U.S. Facilities	

B. State your company's/organization's capacity utilization rate at each of its **lake/ocean calibration facilities** for 2009-2012.

	Name of Facility	2009	2010	2011	2012 Estimated
1.	0				
2.	0				
3.	0				
4.	0				
5.	0				
6.	0				
7.	0				
8.	0				
9.	0				
10.	0				

C. State the **maximum** number of sensor and/or system calibrations possible per month in 2012 at each **lake/ocean calibration facility**, assuming one 8-hour shift per day and five-day a week operation.

	Name of Facility	Max Individual Sensor Calibrations Per Month	Max Individual System Calibrations Per Month
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
9.	0		
10.	0		

D. Estimate the average number of sensor or system calibrations performed per month at each **lake/ocean calibration facility** in 2012.

	Name of Facility	Individual Sensor Calibrations Per Month	Actual Individual System Calibrations Per Month
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
9.	0		
10.	0		

E. Indicate whether each of your **lake/ocean calibration facilities** will be operating through 2015. If "No," explain below.

	Name of Facility	Yes/No	If "No", select primary reason.
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
9.	0		
10.	0		

Comments:

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Section 5.d **Calibration: Current Calibration/Testing Facilities - Environmentally Controlled Facilities**

Instruction: If your company/organization does not operate Environmentally Controlled calibration/testing facilities, then select "None" in the box at right and proceed to **Section 5.f.**

A. Please provide information on the capabilities of all **environmentally controlled facilities** managed by your company/organization. Respond to all cells.

	Facility Name	Street Address	City	State/Province	Country	Physical Dimensions *(Meters)*			Usable Frequency Ranges					
						Usable Length	Usable Width	Usable Depth	<100Hz	100-500Hz	500-2500Hz	2500Hz - 10KHz	10-50Khz	>50KHz
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														
9.														
10.														

	Facility Name	Environmental Factors Controlled at this Facility - [Select All That Apply]							
		Attenuation	Bulk Modulus	Density	Ambient Pressure	Shear Speed	Sound Speed	Temperature	Other (specify in boxes below)
1.	0								
2.	0								
3.	0								
4.	0								
5.	0								
6.	0								
7.	0								
8.	0								
9.	0								
10.	0								

Comments:

B. For each **environmentally controlled facility** described above, identify: 1) facility name 2) the facility's operating status, 3) number of technical support staff assigned to the facility, 4) its suitability for sensor testing/calibration, 5) its suitability for full-scale testing, 6) the principal challenge affecting the facility's continued operation, and 7) the critical and/or planned physical updates needed to maintain the viability of the facility. Respond to all cells.

	Name of Facility	Status of Facility Infrastructure	Number of Technical Support Staff Assigned to Facility	Appropriate for Individual Sensor Testing/Calibration?	Appropriate for Full-Scale System Testing/Calibration?	Principal Challenge to Maintaining this Facility *(Select one)*	Planned Physical Upgrades *(Do not list cost estimates)*
1.	0						
2.	0						
3.	0						
4.	0						
5.	0						
6.	0						
7.	0						
8.	0						
9.	0						
10.	0						

Comments:

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Section 5.e **Calibration: Capacity Utilization Rates for Environmentally Controlled Facilities**

Instruction: If your company/organization does not operate e**nvironmentally controlled** calibration/testing facilities, then select "None" in the box at right and proceed to **Section 5.f.**

A. State the number of 8-hour production shifts your company/organization normally operates per day at its U.S. and Non-U.S. Facilities:

U.S. Facilities	
Non-U.S. Facilities	

B. State your company's/organization's capacity utilization rates for its **environmentally controlled** calibration facilities for years 2009-2012.

	Name of Facility	2009	2010	2011	2012 Estimated
1.	0				
2.	0				
3.	0				
4.	0				
5.	0				
6.	0				
7.	0				
8.	0				
9.	0				
10.	0				

C. State the maximum number of sensor and/or system calibrations possible per month at each **environmentally controlled** calibration facility in 2012, assuming one 8-hour shift per day and five-day a week operation.

	Name of Facility	Max Individual Sensor Calibrations Per Month	Max Individual System Calibrations Per Month
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
9.	0		
10.	0		

D. Estimate the average number of individual sensor and/or system calibrations performed per month at each **environmentally controlled** calibration facilities in 2012.

	Name of Facility	Average Number of Sensor Calibrations Per Month	Average Number of System Calibrations Per Month
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
9.	0		
10.	0		

E. Indicate whether each of your **environmentally controlled calibration facilities** will be operating through 2015. If "No," explain below.

	Name of Facility	Yes/No	If "No", select primary reason.
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
9.	0		
10.	0		

Comments:

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Section 5.f **Calibration: Calibration/Testing of Underwater Acoustic Transducer Products - Receivers**

A. Specify your company's/organization's capabilities to calibrate and/or test underwater acoustic transducers in accordance with each technical specification listed below. For every technical specification, indicate whether your company/organization plans to maintain or alter its capability through 2015. Respond to all cells.

Technical Specifications for Receiver Calibration	Mode of Calibration*			Retention of Capability Through 2015?
	Physics-Based Calibration	U.S.G. Certified Standard	Other (Specify in Comments)	
Free Field Voltage Sensitivity (FFVS) Primary Calibration Methods				
Conventional / Free Field Reciprocity (Bobber 2.3.1)				
Two Transducer Reciprocity (Bobber 2.3.2)				
Self Reciprocity (Bobber 2.3.3)				
Cylindrical Wave Reciprocity (Bobber 2.3.4)				
Plane Wave Reciprocity (Bobber 2.3.5)				
Tube Reciprocity - Propagating Wave (Bobber 2.3.6)				
Coupler Reciprocity (Bobber 2.3.7)				
Transfer Coupler Reciprocity (Zalesak)				
Two Projector Null Method (Bobber 2.4)				
Free Field Voltage Sensitivity (FFVS) Secondary Calibration Methods				
Comparison Calibrations				
Free Field Comparison Calibration (Bobber 2.2.1)				
Standard Projector Calibration (Bobber 2.2.2)				
Small Tank Calibration (Bobber 2.2.3)				
Impedance Method Calibrations				
Compliance Controlled (Bobber 2.5.1)				
Inertia Controlled (Bobber 2.5.2)				
Static (Low Frequency) Calibration Methods				
Dunking Machine (Bobber 2.6.3)				
Golendov Calibrator (Bobber 2.6.3)				
Pressure Gradient / Particle Velocity Measurements				
Free Field Calibration (Bobber 2.10)				
Standing Wave Calibration				
Rigid Walled tube (Bobber 2.10)				
Compliant/Slow Wave Tube (Bastyr, Lauchle and McConnell)				
Electrical Impedance / Admittance				
Efficiency				
Direct Method (Bobber 2.14.1)				
Impedance Method (Bobber 2.14.2)				
Dynamic Range - Hydrophone (Bobber 2.15)				
Linearity - Projector and Receiver (Bobber 2.15)				
Equivalent Noise Pressure (Bobber 2.16.2)				
Directivity Patterns				
Far Field				
Near Field				
Uniform Radiator				
Non-uniform Radiator				
Beam Width				
Minor Lobe Level				
Directivity Factor / Index				
Parameter Ranges				
Frequency range and resolution				
Temperature range				
Pressure range				
Angular resolution for beam patterns				
Nominal uncertainty				

B. State the degree of measurement accuracy that your company/organization is capable of achieving in its calibration and/or testing of underwater acoustic transducers.

	Degree of Accuracy
Magnetic Orientation	
Inertial Orientation (Gravitational)	

*Physics-based calibration from first principles on devices using an approved method. Comparative measurements from/ to the device to those taken simultaneously from a device certified by the U.S. Navy or other U.S. Government entity.

Comments:

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Section 5.g **Calibration: Calibration/Testing of Underwater Acoustic Transducer Products - Projectors**

Specify your company's/organization's capabilities to calibrate and/or test underwater acoustic transducers in accordance with each technical specification listed below. For every technical specification, indicate whether your company/organization plans to maintain or alter its capability through 2015.

	Technical Specifications for Projector Calibration	Mode of Calibration*			Retention of Capability Through 2015?
		Physics-Based Calibration	U.S.G. Certified Standard	Other (Specify in Comments)	
A.	Transmit Voltage Response				
	Transmit Current Response				
	Source Level Maximum				
	Efficiency				
	Direct Method (Bobber 2.14.1)				
	Impedance Method (Bobber 2.14.2)				
	Linearity (Bobber 2.15)				
	Electrical Impedance / Admittance				
	Directivity Patterns				
	Far Field				
	Near Field				
	Uniform Radiator				
	Non-uniform Radiator				
	Beam Width				
	Minor Lobe Level				
	Directivity Factor / Index				
	Parameter Ranges				
	Frequency range and resolution				
	Temperature range				
	Pressure range				
	Angular resolution for beam patterns				
	Nominal uncertainty				

			Degree of Accuracy
B.	State the degree of measurement accuracy that your company/organization is capable of achieving in its calibration and/or testing of underwater acoustic transducers.	Magnetic Orientation	
		Inertial Orientation (Gravitational)	

*Physics-based calibration from first principles on devices using an approved method. Comparative measurements from/to the device to those taken simultaneously from a device certified by the U.S. Navy or other U.S. Government entity.

Comments:	

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Section 5.h **Calibration: Capability to Calibrate Specific Underwater Acoustic Transducers and Transducer Arrays**

Identify your company's/organization's capability to calibrate and/or test each of the acoustic transducer and transducer arrays listed in accordance with technical specifications contained in the footnote* below.
For each device/system, state whether your company/organization plans to maintain or alter its capability through 2015. Respond to all cells.

	Acoustic Underwater Devices	Testing/Calibration Capability by Type of Application							Prospect for Retention of Calibration/Testing Capability Through 2015?	For organizations reporting that their capabilities will decline by 2015, identify the primary cause for this change.
		Military	Geophysical	Oceanographic	Hydrographic Survey	Object Detection	Array Shape	Other (Specify in comment box)		
	Acoustic Receivers									
	Reference Standard Hydrophones (Primary Calibration)									
	Hydrophones (Secondary Calibration)									
	Hydrophone Arrays									
	Line Array									
	Planar Array									
	Cylindrical Array									
	Spherical Array									
	Other Array									
	Acoustic Vector Field Sensors									
	Acoustic particle displacement									
	Acoustic particle velocity									
	Acoustic particle acceleration									
	Pressure gradient sensor									
A.	Seismic Accelerometer Sensor									
	Seismic Velocity / Geophone Sensor									
	Vector Field Array									
	Line Array									
	Planar Array									
	Other Array									
	Hybrid Sensors (e.g. ocean bottom seismometer with hydrophone)									
	Acoustic Projectors									
	Piezoelectric Ceramic Projectors									
	Flextensional Projector									
	Slotted Cylinder Projector									
	Moving Coil Projector									
	Impulsive Sources									
	Air Gun									
	Combustive Sound Source									
	Projector Arrays									
	Line Array / Seismic streamer									
	Planar Array									
	Cylindrical Array									
	Spherical Array									
	Other Array (specify)									

*Physics-based calibration from first principles on devices using an approved method. Comparative measurements from/to the device to those taken simultaneously from a device certified by the U.S. Navy or other U.S. Government entity.

Comments:

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Section 6	Acoustic Transducer Component/Product Competitiveness	
A.	Describe the actions your company/organization has taken in the last five years to improve its competitiveness.	
B.	Describe the actions your company/organization plans to take over the next five years to improve its competitiveness.	
C.	Is your company/organization aware of the Navy's Sonar Transducer Reliability Improvement Program (STRIP) investments?	
	Does your company/organization hold any of the STRIP program documentation, or otherwise have access to that documentation?	
D.	What changes to U.S. Government policies and/or regulations would increase your company's/organization's competitiveness? Explain below.	
Comments:		

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Section 7.a **Financial Performance**

Report the **identified line items** from your company's/organization's financial statement for years 2009-2012.

Note: Business Unit/Division financials are preferred.
Note: Calendar year data is preferred.

Indicate whether the reported income statement and balance sheet select line items are for your Corporate/Whole Company, or Business Unit/Division financials:	
Reporting Schedule:	

Income Statement *(Only identified line items)*		Record in $ Thousands, e.g., $12,000.00 = survey input $12			
		2009	2010	2011	2012-Estimated Full Year
A.	Net Sales (and other revenue)				
B.	Cost of Goods Sold				
C.	Total Operating Income (or Loss)				
D.	Earnings Before Interest and Taxes				
E.	Net Income				

Balance Sheet *(Only Identified Line Items)*		Record in $ Thousands, e.g., $12,000.00 = survey input $12			
		2009	2010	2011	2012-Estimated Full Year
A.	Cash				
B.	Inventories				
C.	Total Current Assets				
D.	Total Assets				
E.	Total Current Liabilities				
F.	Total Liabilities				
G.	Retained Earnings				
H.	Total Owner's Equity				

Comments:	

Use the space below to qualify with narrative any anomalies, transactions, or non-recurring events reflected in your financial statement line items, e.g., reporting restatement, merger and acquisition, Chapter 11, SEC investigation, etc.

A.	2009	
B.	2010	
C.	2011	
D.	2012	

Comments:	

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Section 7.b **Financial Performance**

For 2011-2012, report 1) Total Company/Organization Net Sales (and other revenue), 2) Total Underwater Transducer-Related Sales - All Customers, and requested category percentages, and 3) Total Underwater Transducer sales attributable to U.S. Department of Defense activities and requested category percentages.

		Note: Record in $ Thousands, e.g., $12,000.00 = survey input $12	**2011**	**2012 Estimated Full Year**
A.		Total Company/Organization Net Sales (and other revenue) - $	$ -	$ -
B.	1.	Total Underwater Transducer-Related Sales - All Customers - $		
	2.	Piezoelectric Materials (as a percent of Line B-1)		
	3.	Underwater Transducer Components (as a percent of Line B-1)		
	4.	Underwater Acoustic Transducer Products (as a percent of Line B-1)		
C.	1.	Total U.S. Department of Defense-Related Sales (direct and indirect) - $		
	2.	Piezoelectric Materials (as a percent of Line C-1)		
	3.	Underwater Transducer Components (as a percent of Line C-1)		
	4.	Underwater Acoustic Transducer Products (as a percent of Line C-1)		
		Comments:		

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Section 8 **Research and Development**

State your company's/organization's: 1) total (internal and external funded) research and development (R&D) dollar **expenditures**, 2) the **type of R&D performed** by percent allocation, 3) the percentage of total R&D expenditures **relating exclusively to underwater transduction business lines,** and 4) your company's/organization's **R&D funding sources** by percent of total R&D dollars. Respond to all cells.

Note: If your company's/organization's annual Total R&D Expenditures and Total R&D Funding Sources do not match, explain the discrepancy in the space provided.
Note: Calendar year data is preferred.

Source of R&D Data:	
R&D Reporting Schedule:	

		R&D Expenditures	Record $ in Thousands, e.g., $12,000.00 = survey input of $12			
			2009	2010	2011	2012 Estimated
A.	1.	Total R&D Expenditures				
	2.	Basic Research (as a percent of Line 1)				
	3.	Applied Research (as a percent of Line 1)				
	4.	Product/Process Development (as a percent of Line 1)				
	5.	Total (must equal 100% of Line 1)	0%	0%	0%	0%
	6.	R&D Expenditures exclusively for Underwater Transducer business (as a percent of Line 1)				

		R&D Funding Sources	Record $ in Thousands, e.g., $12,000.00 = survey input of $12			
			2009	2010	2011	2012 Estimated
B.	1.	Total R&D Funding Sources				
	2.	Internal/Self-Funded/IRAD (as a percent of Line 1)				
	3.a	Total Federal Government (as a percent of Line 1)				
	3.b	Federal funding from SBIR/STTR program (as a percent of Line 3.a)				
	4.	Total State and Local Government (as a percent of Line 1)				
	5.	Universities - Public and Private (as a percent of Line 1)				
	6.	U.S. industry, venture capital, non-profit (as a percent of Line 1)				
	7.	Non-U.S. investors (as a percent of Line 1)				
	8.	Other (specify)				
	9.	Total (must equal 100% of Line 1)	0%	0%	0%	0%

Comments:	

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Section 9.a **Workforce Profile/Employment**

For years 2009-2012, report by occupational category the number of **annual, full-time equivalent (FTE) employees** engaged in **underwater transducer** activities. Respond to all cells.

Note: Employment data should cover only the business units/organizations engaged in underwater transducer activities (e.g., program management, marketing, design, engineering, manufacturing, and research and development). Do not double count personnel with cross-operational roles.
Note: Calendar year data is preferred.

Source of Operational Data:	
Annual Reporting Schedule	

A.

	Professional Occupations	2009 Underwater Transducers	2010 Underwater Transducers	2011 Underwater Transducers	2012 Underwater Transducers	2012 Current % U.S. Citizens
1.	Administrative Staff					
2.	Production Managers/Supervisors/Executives					
3.	Research and Development (R&D) Staff					
4.	Production Line Workers, Support Technicians					
5.	Quality Control, Test Operations					
6.	Sales and Marketing					
7.	Facility Operations, Maintenance					
8.	IT/Network Engineers					
9.	Other (specify)					
10.	Other (specify)					
	Total in U.S. Operations >>	0	0	0	0	

Note: *Total in U.S. Operations* should comprise all preceding labor categories. If not, please indicate why in the comment box below.

Comments :

B. For years 2009-2012, report the number of annual, full-time equivalent (FTE) employees, by occupational category, engaged in underwater transducer activities in **U.S. locations** and **Non-U.S. locations**. Respond to all cells.

Annual Staffing Levels By Location	2009 U.S.	2009 Non-U.S.	2010 U.S.	2010 Non-U.S.	2011 U.S.	2011 Non-U.S.	2012 U.S.	2012 Non-U.S.
Number of full-time equivalent (FTE) staff engaged in Underwater Transducer systems								
Number of FTE Scientists and Engineers engaged in Underwater Transducer systems								

Comments:

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Section 9.b **Workforce Profile/Employment (cont.)**

State the 1) number of years of **work experience of your scientific/technical staff** have in underwater transducers and underwater sonar; and 2) the percentage that are U.S. citizens.
Note: Double counting is permitted for this section. Respond to all cells.

	Personnel Experienced in Specific Design and Process Areas	Applicable Working Experience							
		> 20 Years		10 - 20 Years		5 - 10 Years		< 5 Years	
		# of Employees	% U.S. Citizens	# of Employees	% U.S. Citizens	# of Employees	% U.S. Citizens	# of Employees	% U.S. Citizens
A.	**Total technical personnel**								
	Fields supporting underwater acoustic transduction								
	Fields supporting underwater sonar systems								
	Piezoceramic formulation and process control								
	Piezocrystal formulation and process control								
	Application of material/element design to systems that primarily operate below 1 kHz								
	Application of material/element design to systems that primarily operate between 1 kHz - 10 kHz								
	Application of material/element design to systems that primarily operate between 10 kHz - 100 kHz								
	Application of material/element design to systems that primarily operate above 100 kHz								
	Electro-dynamic actuators and force drivers								
	Bonding of materials								
	Potting, encapsulation, or filling (under vacuum) of transducers								
	Creating cost-effective, in-process testing capabilities								

Comments:	

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Section 9.c **Workforce Profile/Employment (cont.)**

A. Report your experience hiring and retaining skilled personnel for your underwater transducer/sensor related business. Respond to all cells.

Training	Availability	Retention	Training	Availability	Retention
Electroacoustic Engineer			Electrical Technician (Associates or equivalent)		
Physicist (BS) with Acoustics Experience			Mechanical Technician (Associates or equivalent)		
Physicist (MS) with Acoustics Experience			Test Engineer		
Physicist (PhD) with Acoustics Experience			Test Technician		
Electrical Engineer (BS) with Acoustics Experience.			Undergraduate Research Interns		
Electrical Engineer (MS) with Acoustics Experience			Graduate Research Interns		
Electrical Engineer (PhD/PE) with Acoustics Experience			Mathematics		
Mechanical Engineer (BS) with Acoustics Experience			Computer Science		
Mechanical Engineer (MS) with Acoustics Experience			Machinist		
Mechanical Engineer (PhD/PE) with Acoustics Experience			Other (Specify in Comment Box)		
Comment:					

B. Identify your company's/organization's critical staff skills and competencies, i.e., expertise that is critical to your organization's long-term competitiveness related to its underwater acoustic transducers, acoustic sensors, and/or sonar systems business.

1.
2.
3.
4.

C. Identify (in descending order) the five universities from which the highest number of your technical staff received their terminal degrees.

1.
2.
3.
4.
5.

	Technical Training	Bachelors Degree	Masters Degree	Ph.D./PE
D. Provide the distribution (%) of your technical staff's highest education levels.				
Provide the percentage of your technical staff that are U.S. Citizens.				

		Yes/No	Highest Degree Level
E.	Does your company/organization have a piezoelectric ceramist on staff? If "Yes," indicate the highest level of academic degree of these individuals.		
F.	Does your company/organization have a piezoelectric materials formulator on staff? If "Yes," indicate the highest level of academic degree of these individuals.		

G.	What percentage of your technical staff are expected to retire (or leave their jobs) within the next five years?	
H.	What percentage of your technical staff do you expect to have to replace over the next five years?	
I.	What percentage of your technical staff are expected to pursue higher education over the next five years?	
J.	What percentage of your technical staff were hired with the necessary basic skills from previous education?	
K.	What are the primary skills that have to be taught on-the-job?	
	Comments:	

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Section 10	Certification
The undersigned certifies that the information herein supplied in response to this questionnaire is complete and correct to the best of his/her knowledge. It is a criminal offense to willfully make a false statement or representation to any department or agency of the United States Government as to any matter within its jurisdiction (18 U.S.C.A. 1001 (1984 & SUPP. 1197))	
Company/Organization Name	
Company's/Organization's Internet Address	
Name of Authorizing Official	
Title of Authorizing Official	
E-mail Address	
Phone Number and Extension	
Date Certified	
If POC is different from the above named, include below:	
Point of Contact Name	
Title of Point of Contact	
E-mail Address	
Phone Number and Extension	
Would you like a free copy of the final report?	
In the box below, please provide any additional comments or any other information you wish to include regarding this assessment.	
How many hours did it take to complete this survey?	

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