Exhibit R-2, **RDT&E Budget Item Justification:** PB 2011 Defense Logistics Agency	**DATE:** February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603720S: *Microelectronics Technology Development and Support (DMEA)*

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	36.392	70.597	26.878	0.000	26.878	27.400	27.838	28.456	29.086	Continuing	Continuing
1: *Technology Development*	0.000	26.310	26.878	0.000	26.878	27.400	27.838	28.456	29.086	Continuing	Continuing
2: *Other Congressional Adds (OCAs)*	36.392	44.287	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Defense Microelectronics Activity (DMEA) provides a vital service as the joint Department of Defense (DoD) Center for microelectronics acquisition, adaptive operations and support - advancing future microelectronics research, development, technologies and applications to achieve the Department's strategic and national security objectives. An important part of the DMEA mission is to research current and emerging microelectronics issues with a focus on warfighters' needs. To this end, DMEA is integrally involved in the development of capabilities and resultant products based on technologies whose feasibility has been demonstrated but which have yet to be applied to real-world and military applications.

DMEA resolves microelectronics technology issues in weapon systems by quickly developing and executing appropriate solutions to not only keep a system operational but elevate it to the next level of sophistication or to meet new threats. DMEA provides critical microelectronics design and fabrication skills to ensure that the DoD is provided with systems capable of ensuring technological superiority over potential adversaries. DMEA provides critical, quick turn solutions for DoD, intelligence, special operations, cyber and combat missions as well as microelectronic parts that are unobtainable in the commercial market. DMEA's knowledge of varying military requirements across a broad and diverse range of combatant environments and missions—along with its unique technical perspective—allows it to develop, manage and implement novel microelectronic solutions to enhance mission capability. DMEA can then utilize these cutting-edge technology capabilities and products in the solutions it develops for its military clientele. After many years of performing analogous efforts, the technical experience, mission knowledge, and practical judgment that are gained from preceding efforts are often incorporated into subsequent technology maturation projects.

Microelectronics technology is clearly a vital and essential technology for all operations within the DoD. Yet, as critical as this technology is to DoD operations, the defense microelectronics market share is now less than 0.1% because the use of microelectronics has exploded in the commercial world. This commercial pressure is driving the semiconductor industry to supersede successive generations of microelectronics technologies with new technologies every 18 months or sooner. Due to intense business pressures, the semiconductor industry does not respond to the DoD's particular needs of ultra-low volumes, extended availability timeframes, or substantial security concerns. This has caused many commercial semiconductor facilities to close their doors or move off-shore to unsecure locations. Such intense commercial pressures make it impossible to assure that the current DoD suppliers will be available to satisfy the future DoD requirements. Therefore, DMEA has established a unique-in-the-world flexible integrated circuit manufacturing capability that provides microelectronics design, development, and manufacturing

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support on demand. DMEA produces limited quantities of components to meet the DoD's unique weapon system needs for a trusted, assured, and secure supply of microelectronics. This unique capability is essential to all major weapon systems, combat operations, and support needs. As such, DMEA serves the DoD, other US Agencies, industry and Allied nations.

B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	32.480	26.310	0.000	0.000	0.000
Current President's Budget	36.392	70.597	26.878	0.000	26.878
Total Adjustments	3.912	44.287	26.878	0.000	26.878
• Congressional General Reductions		-0.233			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds		44.520			
• Congressional Directed Transfers		0.000			
• Reprogrammings	3.912	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• FY 2011 Other Program Changes	0.000	0.000	26.878	0.000	26.878

Congressional Add Details ($ in Millions, and Includes General Reductions)

	FY 2009	FY 2010
Project: 2: *Other Congressional Adds (OCAs)*		
Congressional Add: *3-D Electronics and Power*	2.394	4.775
Congressional Add: *Agile Joint Tactical Radio System (JTRS) Integrated Circuits*	1.595	0.000
Congressional Add: *C-Scout Container Security System*	2.394	0.000
Congressional Add: *Carbon Nanotube Thin Film Devices to Portable Power*	1.595	1.592
Congressional Add: *Defense Command Integration Center*	0.878	0.000
Congressional Add: *Electronics and Materials for Flexible Sensors and Transponders (EMFST)*	3.191	4.775
Congressional Add: *Feature Size Migration at DMEA Advanced Reconfigurable Manufacturing of Semiconductors (ARMS) Foundry*	1.995	2.387
Congressional Add: *High Performance Tunable Materials*	2.393	3.581

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Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2009**	**FY 2010**
Congressional Add: *Scalable Topside Array Radar Demonstrator*	0.798	0.000
Congressional Add: *Semiconductor Photomask Technology Infrastructure Initiative*	2.393	1.592
Congressional Add: *Smart Bomb Millimeter Wave Radar Guidance System*	1.995	2.308
Congressional Add: *Sprintonics Memory Storage Technology*	2.393	2.785
Congressional Add: *Superlattice Nanotechnology*	1.995	0.000
Congressional Add: *Tunable Micro Radio for Military Systems*	4.787	5.570
Congressional Add: *X-Band/W-Band Solid State Power Amplifier*	1.596	0.995
Congressional Add: *UAV Situational Awareness Systems*	1.000	0.000
Congressional Add: *Indium-Based Nitride Devices for Advances Integrated Systems*	3.000	0.000
Congressional Add: *AESSA Technology Insertion Program*	0.000	2.387
Congressional Add: *End to End Semi Fab Alpha Tool*	0.000	1.592
Congressional Add: *Heterogeneous Gallium Nitride/Silcon Microcircuit Technology*	0.000	1.592
Congressional Add: *Superconducting Quantum Information Technology*	0.000	0.796
Congressional Add: *Shipping Container Security System Field Evaluation*	0.000	3.581
Congressional Add: *Vehicle and Dismount Exploitation Radar (VADER)*	0.000	3.979
Congressional Add Subtotals for Project: 2	36.392	44.287
Congressional Add Totals for all Projects	36.392	44.287

Change Summary Explanation

The increase to the FY 2010-2011 Reseach, Development, Test and Evaluation (RDT&E) budget for PE0603720S is not due to a new start. It is the result of transferring the DMEA funding from Operation and Maintenance (O&M) and Procurement (PDW) appropriations to the RDT&E budget commensurate with the organization's transfer from Deputy Under Secretary of Defense Logistics & Material Readiness (DUSD(L&MR)) to Director, Defense Research & Engineering (DDR&E). The DMEA investment requirement (formerly PDW budget) is to procure new, replacement, and upgraded tools used for Engineering Analysis, Prototype Design, Verification and Integration, and Wafer Post Processing. DMEA expenses (formerly O&M budget) are for civilian labor (160 full time equivalent (FTE) in FY 2010), travel, training, communications, utilities, services, supplies, maintenance, etc.

FY 2009 Economic Assumptions: $.088M

FY 2009 Added Projects: Indium Based Nitrate Technology: $3.000M and UAV Situational Awareness System: $1.000M

FY 2010 Economic Assumptions: $.214M

FY 2010 Federally Funded Research and Development Center Reduction: $.019M

Exhibit R-2A, **RDT&E Project Justification:** PB 2011 Defense Logistics Agency			**DATE:** February 2010
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COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**FY 2011 Base Estimate**	**FY 2011 OCO Estimate**	**FY 2011 Total Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
1: *Technology Development*	0.000	26.310	26.878	0.000	26.878	27.400	27.838	28.456	29.086	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Microelectronics Technology Development and Support funds are necessary to design, develop, and demonstrate microelectronics concepts, technologies and applications to extend the life of weapon systems and solve operational problems (e.g., reliability, maintainability, performance, and assured supply). This includes researching current and emerging microelectronics issues with a focus on warfighters' needs and providing for the development and long-term support structure necessary to ensure rapid prototyping, insertion, and support of microelectronics technologies into fielded systems, particularly as the technologies advance. DMEA maintains critical microelectronics design and fabrication skills to ensure that the DoD is provided with systems capable of ensuring technological superiority over potential adversaries. These funds provide an in-house technical staff of skilled and experienced microelectronics personnel working in state-of-the-practice facilities providing technical and application engineering support for the implementation of advanced microelectronics research technologies from reverse engineering through design, fabrication, test, assembly, integration and installation. DMEA provides an in-house capability to support these strategically important microelectronics technologies within the DoD with distinctive resources to meet DoD's requirements across the entire spectrum of technology development, acquisition, and long-term support. This includes producing components to meet the DoD's ultra-low volume, extended availability timeframe, needs for a trusted, assured, and secure supply of microelectronics. DMEA's capabilities make it a key resource in the intelligent and rapid application of advanced technologies to add needed performance enhancements in response to the newest asymmetric threats and to modernize aging weapon systems.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	**FY 2010**	**FY 2011 Base**	**FY 2011 OCO**	**FY 2011 Total**
Technology Development Accomplishments/Plans *FY 2009 Accomplishments:* Through projects and programs DMEA resources will achieve a cost savings/avoidance of over $450 million this year. DMEA will achieve over 90% of established program cost, schedule, and technical goals; maintain or exceed a program value responsibility ratio of $10 million per engineer; meet or exceed project requirements for quick reaction intelligence operations. Meet Trusted Assurance Program's accreditation timeframe goals.	0.000	26.310	26.878	0.000	26.878

Exhibit R-2A, RDT&E Project Justification: PB 2011 Defense Logistics Agency		**DATE:** February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: The DMEA will continue to design, develop, and demonstrate microelectronics concepts, advanced technologies, and applications to solve operational problems. DMEA will apply advanced technologies to add performance enhancements in response to the newest asymmetric threats and to modernize ageing weapon systems. The DMEA will accredit trusted sources and the Advanced Reconfigurable Manufacturing of Semiconductors (ARMS) foundry will provide a contingency means to ensure DoD can acquire critical trusted integrated circuits in a variety of process technologies and geometry node-sizes. *FY 2011 Base Plans:* The DMEA will continue to design, develop, and demonstrate microelectronics concepts, advanced technologies, and applications to solve operational problems. DMEA will apply advanced technologies to add performance enhancements in response to the newest asymmetric threats and to modernize ageing weapon systems. The DMEA will accredit trusted sources and the ARMS foundry will provide a contingency means to ensure DoD can acquire critical trusted integrated circuits in a variety of process technologies and geometry node-sizes.					
Accomplishments/Planned Programs Subtotals	0.000	26.310	26.878	0.000	26.878

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
2: *Other Congressional Adds (OCAs)*	36.392	44.287	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

An important part of the mission of the Defense Microelectronics Activity (DMEA) is to research current and emerging microelectronics issues with a focus on warfighters' needs. To this end, DMEA is integrally involved in the development of capabilities and resultant products based on technologies whose feasibility has been demonstrated but which have yet to be applied to real-world and military applications. DMEA's knowledge of varying military requirements across a broad and diverse range of combatant environments and missions-along with its unique technical perspective-allow it to develop, manage and implement novel microelectronic solutions to enhance mission capability. DMEA can then utilize these cutting-edge technology capabilities and products in the solutions it develops for its military clientele. After many years of performing analogous efforts, the technical experience, mission knowledge, and practical judgment that are gained from preceding efforts are often incorporated into subsequent technology maturation projects. In agreement with this mission, the following Congressionally directed programs are opportunities that have sufficient potential to merit development by DMEA.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: 3-D Electronics and Power *FY 2009 Accomplishments:* The leap in the integration of devices is addressed by three-dimensional (3D) technology. Conventional electronics is based on two-dimensional (2D) planar processes, but this is becoming prohibitively expensive as well as a barrier to performance. By stacking devices and interconnecting them in a 3-D arrangement, a huge leap in functional density is possible. 3-D integration is a cornerstone of the coming revolution in electronics. 3-D electronics requires the development of a number of enabling technologies in order to realize broad adoption over a sustained period – of the order of 5-10 years. Critical enablers to fulfilling the vision of high density 3-D technology are new materials for electrical interconnects electromagnetic shielding and heat removal. New packaging	2.394	4.775

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
technologies are required to address 3-D electronics. The required fundamental technologies include etching and filling of through-wafer vias and bonding of chips and wafers with high interconnect density in a variety of configurations. Requirements are being developed in conjunction with the preliminary results from a FY 2008 RDT&E program, 3D Electronics, which is currently being executed and will be completed in the 2nd quarter of FY 2010. *FY 2010 Plans:* Complete the requirements development and award of the effort. Start on execution of requirements, including technology development in four areas: 3-D integration of optical and digital technologies; materials development for thermal management; materials development for 3-D wiring; and utilization of new interconnects and devices based on graphene.		
Congressional Add: Agile Joint Tactical Radio System (JTRS) Integrated Circuits *FY 2009 Accomplishments:* Complex wireless systems like the JTRS combine the need for system flexibility, high data throughput, and high security in a miniature, portable and power efficient package. The dramatic progress in radio frequency integrated circuits has enabled monolithic integration of many of the active components and miniaturization. The passive components such as filters, resonators, and antenna multiplexers have remained problematic. Advanced packaging and miniaturization of surface acoustic wave (SAW) and film bulk acoustic resonator (FBAR) filters has made it practical to include multiple front end configurations and selection by radio frequency (RF) switching. However, performance is limited by the insertion loss and cross talk of the switches. Micro electro mechanical system (MEMS) devices have shown some promise for high isolation, but speed and reliability remain issues. A tunable or switchable resonator would provide a single device capable of covering multiple bands, thus eliminating the need for multiple systems and enable entirely new architectures for wireless systems.	1.595	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Proof of concept resonators that function from 1 to 3 GHz (JTRS Mobile Handset frequencies) have been designed and demonstration devices have been developed. Areas for improvement have been identified and upgrades initiated. Also, acoustic reflector substrates that are thermally compatible with barium strontium titanate (BST) thin films have been developed. FY 2010 Plans: Finish resonator improvements, investigate reliability characteristics of the resonator circuits, and start the development of a thin film, low loss tangent metal organic chemical vapor deposition (MOCVD) BST growth process.		
Congressional Add: C-Scout Container Security System *FY 2009 Accomplishments:* The feasibility of a trace detection system using microcantilever sensors to measure the concentrations of unlawful or hazardous materials in shipping containers has been demonstrated. This system is applicable for use not only in various types of shipping containers but also in handheld security devices and fixed asset applications such as airports and high profile buildings. The system was tested on its ability to measure trace concentrations of explosives, toxic chemicals, and biological agents such as those that might be used in a terrorist attack. The technology exceeded expectations in all test cases. Terrorist threat agents were detected at trace levels despite the use of less than optimal sensors. The system is easily adaptable to detect additional threat agents. Furthermore, prototype tests demonstrated the system's tolerance for common contaminants. Interface and communication with the Marine Asset Tagging and Tracking System (MATTS) was also demonstrated. MATTS is an important interface for future Department of Homeland Security (DHS) applications as it is used for transmission of test results in maritime shipping applications. The complete system includes a sensor array, electronics, power supply and air handling. The cost of the system in volume production would be a few hundred dollars. The goal of this effort is to develop a next-generation iteration of the C-Scout trace chemical detection system suitable for applications in International Organization for Standardization (ISO) shipping containers, reduce the system footprint, build prototypes and perform field testing.	2.394	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Requirements are being developed in conjunction with the results from a FY 2008 RDT&E program, Self-Sensing Array Container Pre-Screening Sensor System, which was completed on 30-Jun-09. FY 2010 Plans: Accomplish advances in material science technology of carbon nanotube manufacturing and develop techniques for the preparation of thin film CSLs and integrate them into GDEs that are necessary for deployment in portable fuel cells. Modify single-walled carbon nanotube (SWNTs) with Platinum (Pt) nanoparticles and demonstrate the preparation of large area thin film CSLs and integrate them into GDEs.		
Congressional Add: Carbon Nanotube Thin Film Devices to Portable Power *FY 2009 Accomplishments:* Due to environmental concerns and the need to find alternatives to petroleum-based energy sources, there has been a resurgence of interest in fuel cells (FCs). It is now anticipated that hydrogen-based fuel cells will find application in the automobile industry and perhaps as sources of auxiliary power in residences and industrial buildings. The main drawback to this type of fuel cell is the lack of portability due to the need to safely store the hydrogen fuel which requires high pressures or low temperatures. There is a pressing need to develop portable sources of power where the use of batteries is impractical. Emergency response teams, the military, mobile satellite communications and remote surveillance operations are vital services which are in dire need of portable power beyond that which can be supplied by batteries. A promising approach involves the use of reformed methanol (RM) as a fuel and this has allowed the development of portable fuel cells. Methanol is a liquid at room temperature, and it is much easier to handle, package and store than hydrogen, making it a more practical fuel source. A reformed methanol fuel cell can combine the practical advantages of methanol fuel packaging, storage and delivery with the energy advantages of hydrogen, and allows for a smaller and lighter weight power source for portable electronic devices. Direct methanol fuel cell (DMFC) that utilizes methanol directly as the fuel without a reformer is an attractive option for portable power sources. However, this fuel cell offers lower power output due to various technical	1.595	1.592

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
limitations. Development of reliable and cost effective membrane electrode assembly (MEA) for portable applications requires nanoscale engineering of gas diffusion electrode (GDE) and catalyst support layer (CSL). Requirements are being developed in conjunction with the preliminary results from a FY 2008 RDT&E program, Carbon Nanotube Thin Film Near Infrared Detector, which will be completed during the 4th quarter of FY 2010. *FY 2010 Plans:* Accomplish advances in material science technology of carbon nanotube manufacturing and develop techniques for the preparation of thin film CSLs and integrate them into GDEs that are necessary for deployment in portable fuel cells. Modify single-walled carbon nanotube (SWNTs) with Platinum (Pt) nanoparticles and demonstrate the preparation of large area thin film CSLs and integrate them into GDEs.		
Congressional Add: Defense Command Integration Center *FY 2009 Accomplishments:* This effort is the third phase of a series of tasks to develop a Regional Defense Command Integration Center (RDCIC) (the Eisenhower Center for Homeland Security Studies) in Topeka, Kansas. The previous efforts involved analysis of the capabilities of available DoD equipment, processes and microelectronics systems for their ability to enhance the emergency response system and the development of the architectures and systems of the center. Further enhancements were then developed to meet the evolving challenges of disaster management and distributed mission operations at the center, including the application of advanced microelectronics technologies, techniques, architectures and software, and the evaluation of leveraging Command Post of the Future (CPOF) technologies for a highly inter-connected mobile emergency-response force. Now, there is an urgent need for the center to have a mobile command vehicle with remote Geographic Information System (GIS) and Public Affairs Officer (PAO) communications capabilities. Also required is the capability	0.878	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
to rapidly deploy two critical capabilities to support an incident commander at the scene of a local or regional disaster, event, or attack. Finally, an upgrade is needed to the technologies used for information sharing between The Adjutant General's (TAG) Regional Defense Command Integration Center, the Kansas Intelligence Fusion Center (KIFC), the Kansas Emergency Operations Center, and other TAG assets. Began development of requirements, design and development of a mobile incident command capability with communications and GIS capabilities to aid command and control and situational awareness for emergency responders. FY 2010 Plans: Finish the efforts started in FY 2009 and identify technologies and concepts for information sharing between the RDCIC Eisenhower Center and other key emergency nodes in Kansas.		
Congressional Add: Electronics and Materials for Flexible Sensors and Transponders (EMFST) *FY 2009 Accomplishments:* Flexible electronics is a technology area that has potential to stimulate many new applications for electronic systems ranging from sophisticated military products to consumer electronics. Flexible circuits have been used for many years in numerous applications to aid its miniaturization of electronic systems and assembly in unique form factors. Typically the flexible substrate will provide interconnects between two rigid circuit boards in which the electronic components are populated. These applications utilize standard surface mount technology to pick and place components on the printed circuit boards. A new generation of flexible electronics, however, holds promise for electronic systems that are able to conform to the shape of objects to which they are affixed or embedded. In its ultimate form, electronic circuits will be completely written on the substrates through a printed electronics method.	3.191	4.775

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	**FY 2010**
A Statement of Objectives has been developed in conjunction with the preliminary results from a FY 2008 RDT&E program, Flexible Sensor and Transponders, which will be completed in the 4th quarter of FY 2009. *FY 2010 Plans:* Investigate advanced manufacturing technologies suitable for low-cost flexible sensor applications. Develop methods for transfer of integrated circuit die directly from a wafer to a substrate. Investigate and develop proof of concept elements of roll to roll assembly processes to demonstrate feasibility for sensors on flexible substrates. Develop system level implementations of sensor arrays and passive transducer based Radio Frequency Identification Device (RFID) sensors. Develop and evaluate technology for energy harvesting, processing and communications functions.		
Congressional Add: Feature Size Migration at DMEA Advanced Reconfigurable Manufacturing of Semiconductors (ARMS) Foundry *FY 2009 Accomplishments:* This project is required to ensure that ARMS fabrication technology is able to handle the increased functional density of components on microchips that commercial manufacturers are continuing to develop and install in each new product that they produce, and to ensure that the foundry is able to convert from one process to another in a short period of time with a high yield of acceptable microcircuits during the first manufacturing run after process changeover. The ability to switch from one process to another is becoming more important as DMEA acquires an increasing number of processes to support the more complex integrated circuits used in each new weapon system. DMEA has established a comprehensive growth path for increasing functional density of its existing digital, analog and mixed signal processes. This feature size migration project will allow manufacturing runs to produce integrated circuits that are fabricated with upwards of five million individual devices on a single silicon chip, increasing their reliability, maintainability and performance. Using new processes to produce replacements for obsolete integrated circuits will also allow performance improvements to be made at no added cost. This project will also develop procedures for improving the first pass yield	1.995	2.387

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
of microcircuits based on newly acquired processes, and improving the repeatability of process runs for chips manufactured from archived processes so that there will not be a lag in achieving acceptable quality of parts produced when flexing from one process to another. A study was performed to provide a migratory path for the current ARMS foundry to technology nodes less than 0.25um and identify processes and/or toolings for multi-layer interconnect development activities at different technology nodes. A poly etching capability at nodes less than 0.25micro millimeter (um) has been developed. The poly etching capability accepts 150milimeter (mm) wafers but is has a conversion kit that can make the same tool capable of accepting 200mm wafers. The capability to perform die inspection and digitally capture submicron images for analysis was also acquired. Laboratory and foundry equipment was also transferred to DMEA from the former National Security Agency (NSA) foundry. *FY 2010 Plans:* To be determined.		
Congressional Add: High Performance Tunable Materials *FY 2009 Accomplishments:* The realization of high performance tunable films will radically improve the tuning range and lower the loss of multi-octave tunable circuits for the pre-selectors of software defined radios and create the truly wideband, multi-mode radios long sought for direct communications across a variety of applications. Combining existing tunable material expertise with combinatorial development expertise and materials knowledge, a highly factored experimental program can quickly and reliably investigate thousands of material combinations to expose the optimum materials for tunable applications which are often overlooked by cruder experimental approaches. The key material performance areas that need to be addressed include a tuning range of 6:1 or better, a loss tangent below 0.003, and reliability greater than 100,000 hours at 125C (Centigrade).	2.393	3.581

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
A Statement of Objectives has been developed, and it has been solicited on a Broad Agency Announcement where multiple bidders have come forward with proposals. *FY 2010 Plans:* Investigate high-throughput combinatorial methodologies for rapid discovery, screening, and optimization of advanced tunable materials. Perform research with a goal of developing materials with enhanced tunability, lower RF losses, and greater reliability. Develop an approach for migrate current tunable material processing to a silicon wafer substrate.		
Congressional Add: Scalable Topside Array Radar Demonstrator *FY 2009 Accomplishments:* The Navy's existing surface ship radar systems are primarily monolithic in function, requiring replacing or extensively upgrading radar systems for newly defined threats. Recent innovations in DOD airborne radar development promise lower size, weight, and cost and are adaptable modular designs that can be quickly and inexpensively scaled to meet the Navy's shipboard needs. The Navy needs an assessment of elements of applicable technology and support refinements necessary to reduce the cost/risk of next generation surface ship radar systems. Such an effort would directly support the Navy's plan for an aggressive radar competition to help reduce the cost of next generation platforms such as the Next Generation (CG(X)) cruiser. Conducted studies and analysis on high power amplifier (HPA) monolithic microwave integrated circuits (MMICs), transmit/receive (T/R) modules, receiver multi chip modules (MCM), and beam steering control modules (BSCM) for improvements in next generation radar system performance. Developed a prioritized list of candidate components for development and fabrication to validate the analyses. FY 2010 Plans: Build and test the selected candidate components to validate the findings of the analyses.	0.798	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	**FY 2010**
Congressional Add: Semiconductor Photomask Technology Infrastructure Initiative *FY 2009 Accomplishments:* Semiconductor Photomask Technology Development otherwise known as the Advanced Domestic Mask Inspection Tools and Technology (ADMITT) program are accelerating the development of state-of-the-art mask making tools and also the formation of a domestic mask blank source for future applications in the below 45 nanometer regime. Specific accomplishments include development of beta prototype inspection hardware necessary to evaluate the optical quality of a mask and documented reticle inspection technology candidates that may meet 22nanometer (nm) and 16nm wafer node sizes. An additional (non-mask) inspection need has emerged – the qualification of the patterns written by e-beam pattern generators directly on semiconductor wafers – abbreviated as MLL (Mask Less Lithography). This technology is currently being investigated and was included in the ADMITT investigation tasks. Extend further the capabilities of the 6XX generation inspection tools to meet the needs for advanced 193nm immersion masks and Extreme Ultraviolet Lithography (EUVL) pilot-production masks (13.5nm). Complete System Requirements Document (SRD) for all the hardware and software to inspect immersion masks. *FY 2010 Plans:* Set all system level parameters for masking techniques required using EUVL and Nano-Imprint Lithography (NIL) node geometries. This effort will begin to define all the requirements for producing equipment to manufacture masks that will produce die with geometries of less than 22nm.	2.393	1.592
Congressional Add: Smart Bomb Millimeter Wave Radar Guidance System	1.995	2.308

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: Military tactical units require an all-weather, miniature, targeting Planned Position Indication (PPI), synthetic aperture radar (SAR) to target smart bombs to a target area in day, night and adverse weather conditions. Fuses currently exist in a dual mode system, using laser and infrared (IR) guidance, but there is a need for target preset in terms of latitude and longitude. This enhanced, third type of guidance may be implemented using a radar solution. This approach will enhance defense of the United States and Overseas Contingency Operation missions by leveraging existing bombs and targeting assets. The use of smart bombs for all missions, using the radar targeting capability will greatly reduce collateral damage and ensure that critical targets are neutralized. Requirements have been developed. The Small Business Administration approved DMEA's acquisition plan and authorized DMEA to negotiate directly with Global Technical Systems (GTS), Inc. *FY 2010 Plans:* Design, develop, integrate, test and demonstrate a Smart Bomb Microwave Radar Targeting System.		
Congressional Add: Sprintonics Memory Storage Technology *FY 2009 Accomplishments:* The control and understanding of materials at the nanoscale holds vast potential for the transformation of current information, communications and medical technologies. The twin demands of structural and functional perfection at the nanoscale—with integration into systems of increasing complexity—mandates alternative materials and technological solutions. This can be achieved through the control of charge, spin and light in nanoscale architectures to create a new set of electronic, photonic, spintronic and mechanical devices and systems. Such transformations hold profound, long-ranging impact for the nation's defense technologies. A strategic alliance that couples the strengths of an integrated and comprehensive University-based research program with commercial and national defense industries is vital to fostering this knowledge in a domestic environment. Key efforts that	2.393	2.785

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
require extensive research in this area are 1.) the demonstration of the advantages of forthcoming spintronic technologies and advanced electronics interconnect technologies through the incorporation of Magnetic Random Access Memory (MRAM) technology, and 2.) the development of electrically accessible arrays—from promising candidate nanomaterial structures—that can be integrated into Complementary Metal Oxide Semiconductors(CMOS) circuitry. Requirements are being developed in conjunction with the results from ongoing FY 2007 and FY 2008 RDT&E programs of the same name. *FY 2010 Plans:* Complete the requirements development and award of the effort. Start on execution of requirements including the demonstration of a practical nanomagnetic logic system, which will be superior to conventional technologies, via focused ion beam (FIB)-based rapid prototyping and state-of- the-art spinstand testing, and the investigation of applications of carbon materials in spintronic devices.		
Congressional Add: Superlattice Nanotechnology *FY 2009 Accomplishments:* Recent developments in superlattice nanotechnology have shown that extraordinary advances in power, frequency, heat consumption, radiation shielding, and reliability can be achieved in military electronics. The superlattice technology is expected to facilitate the development of a large silicon carbide (SiC) epitaxial substrate with processes comparable in cost to standard silicon wafers. This cost reduction will impact the use of SiC devices in military applications such as high power switches for power distribution (free electron lasers, high power radars, electromagnetic gun, electromagnetic launchers, solid state lasers, and commercial), high power radio frequency transistors, light emitting diodes, and radiation hard electronics. During earlier phases of this program, processes for the fabrication of SiC films on silicon substrates were demonstrated and samples were successfully fabricated and characterized.	1.995	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Films of SiC have been grown. Employed molecular beam epitaxy (MBE) to grow high quality aluminum nitride (AlN) films on sapphire that are of sufficient quality to permit the subsequent MBE growth of high quality SiC films on AlN on sapphire. Employed atomic layer deposition (ALD) growth techniques to grow SiC on (111) Si. FY 2010 Plans: Employ Metal Oxide Chemical Vapor Deposition (MOCVD) growth techniques to grow epitaxial AlN on (111) Si. Analyze the SiC films produced via MBE, ALD, and MOCVD growth to include structure, structural quality, strain, surface smoothness, crystallographic purity, chemical purity, doping levels, carrier transport properties, and effective energy gap.		
Congressional Add: Tunable Micro Radio for Military Systems *FY 2009 Accomplishments:* Government advanced radio programs have suffered significant delays as more and more capabilities have been designed into government systems. Radios are currently in 85% of military systems and will continue to be a core element of future systems. As radio requirements continue to increase, the number of components needed in the radio frequency (RF) section of the radio (known as the front-end) has grown dramatically and has become complex and difficult to integrate. This is because RF integration technology has not evolved the same pace as digital technology. As a result, the front-end is increasingly becoming the bottleneck in realizing advanced radio solutions. A tunable RF system that behaves as an “RF Microprocessor” in that a single module can manage multiple radio requirements on a multi-band and multi-mode basis is needed urgently. A Statement of Objectives has been developed, and it has been solicited on a Broad Agency Announcement from which a promising proposal has been submitted. *FY 2010 Plans:* Investigate packaging technology for integrated RF systems with a focus on reduced size and weight. Propose RF design and simulation tools to aid the design process. Investigate and develop	4.787	5.570

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
a system-level approach to design modern radios for mobile applications with a focus on reduced component cost, size, and weight reduction while increasing system performance. Develop and simulate proof of concept integrated circuit designs for individual RF technology blocks. Develop thermal and mechanical stress models for integrated RF system packaging to evaluate predictive reliability performance for various packaging concepts under consideration.		
Congressional Add: X-Band/W-Band Solid State Power Amplifier *FY 2009 Accomplishments:* Specific and timely radar tactical images are required to meet the challenge of highly asymmetrical threats on a global basis in support of the DoD Mission and in assisting in the addressing terrorism. Critical search, target identification, and forward looking imaging at low altitudes and on landing in adverse weather and day/night conditions is required for force protection and situation awareness, and during ingress and egress operations. The reliability and availability of systems critical to tactical warfare is necessary for the success of missions and conserving lives. The use of Traveling Wave Tubes (TWT) in radar systems has been long standing and has a relatively short Mean Time Between Failure (MTBF). The use of semiconductors has increased the reliability, availability, and MTBF of systems, over the use of vacuum tubes. The military has a great need for a solid state Power Amplifiers for both X-band radars and W-band radars. These power amplifiers must be high powered, small in size, lightweight, and have a very high MTBF. In order to achieve these goals, the extensive use of microelectronic technology is paramount. Solid state chips and surface mount devices must be integrated in order to reduce the size and weight. Requirements have been developed. The Small Business Administration approved DMEA's acquisition plan and authorized DMEA to negotiate directly with Global Technical Systems (GTS), Inc. *FY 2010 Plans:* Design, develop and test a solid state power amplifier at X-Band/W-Band to replace the currently used TWT, to provide a high Mean Time Before Replacement.	1.596	0.995

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: UAV Situational Awareness Systems *FY 2009 Accomplishments:* The DoD has a need to integrate an Unmanned Aerial Vehicle (UAV) Situational Awareness System, to improve integration and Joint Services collaboration supporting unmanned systems, as well as achieve greater interoperability between system controls, communications, data products, and data links on unmanned systems. The UAV Situational Awareness System will provide the awareness of the UAV's flight environment to the UAV in-flight controller, which is an extension of the Automatic Pilots that are commonly used aboard human piloted aircraft. In the human piloted aircraft, the pilot or aviator provides the situational awareness function. For a UAV flying autonomously, an artificial awareness system is needed to replace the pilot. In order to achieve these goals in a UAV, the extensive use of microelectronic techniques is paramount in order to reduce the size and weight. Commercial-Off-The-Shelf (COTS) sensor technology and computational systems would be utilized to the greatest extent possible but the system design will require some custom hardware and software. The system will be tested in a manned aircraft, for proof of concept. Requirements have been researched, developed, and definitized. FY 2010 Plans: Develop a system that will fuse data from sensor systems such as radar, infrared (IR), and optical sensors, with global positioning system (GPS) maps and global information, in near real-time. Create a capability for three dimensional location of targets and obstacles to result in a database that is available to provide inputs to the flight control director.	1.000	0.000
Congressional Add: Indium-Based Nitride Devices for Advances Integrated Systems *FY 2009 Accomplishments:* Indium-based Nitride devices promise higher power and greater efficiency than current technologies. They have the potential for insertion into a wide and diverse range of military applications including	3.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
radar, communications, electronic warfare, non-lethal active denial systems, and high frequency space-based systems and advanced optical systems. With rare exceptions, all advanced United States (US) military systems are looking for higher levels of component integration to achieve cost benefits as well as performance gains. Indium-based Nitride devices can continue to extend the performance advantages available to US military radio frequency (RF) systems that are looking for more performance than conventional Gallium Arsenide (GaAs) technologies can deliver. To date, the Gallium Nitride (GaN) based family of devices has been limited without the inclusion of Indium Gallium Nitride (InGaN) and Indium Aluminum Nitride (InAlN) to maximize both radio frequency (RF) and electro-optic (EO) device performance. However, for these materials to be widely adopted their efficiency will have to be improved and their costs significantly reduced. Although higher performance is key to many systems, it must often come with an ever increasing level of integration. Maximum cost benefits are achieved through highly integrated circuits when part counts are reduced and assembly labor & test time are minimized. This is best evidenced by the progression witnessed in commercial electronics. To this end, the development of advanced nitride based semiconductors must take into account a highly integrated end state. Requirements have been developed. The effort was solicited for fair opportunity on the Advanced Domestic mask inspection tools and technology (ATSP3) Indefinite Delivery Indefinite Quantity (IDIQ) contract vehicle. A proposal is currently being evaluated. FY 2010 Plans: Develop the material and device technologies required for future RF and electro-optical systems. Develop performance characteristic improvements for advanced Indium-based Nitride materials and devices and use them to demonstrate devices and highly integrated circuits designed for a wide range of military applications, including many conventional and innovative device structures.		
Congressional Add: AESSA Technology Insertion Program	0.000	2.387

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: To be determined.		
Congressional Add: End to End Semi Fab Alpha Tool *FY 2010 Plans:* To be determined.	0.000	1.592
Congressional Add: Heterogeneous Gallium Nitride/Silcon Microcircuit Technology *FY 2010 Plans:* To be determined.	0.000	1.592
Congressional Add: Superconducting Quantum Information Technology *FY 2010 Plans:* To be determined.	0.000	0.796
Congressional Add: Shipping Container Security System Field Evaluation *FY 2010 Plans:* To be determined.	0.000	3.581
Congressional Add: Vehicle and Dismount Exploitation Radar (VADER) *FY 2010 Plans:* To be determined.	0.000	3.979

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Adds Subtotals	36.392	44.287

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A