FY 2006/2007 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: Feb 2005
Exhibit R-2

BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0708011N
PROGRAM ELEMENT TITLE: INDUSTRIAL PREPAREDNESS

COST: (Dollars in Thousands)

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total PE	62,791	59,775	57,753	58,001	60,210	61,650	62,973	64,323
R1050 MANUFACTURING TECHNOLOGY	52,786	56,047	57,753	58,001	60,210	61,650	62,973	64,323
R2674 NANO-IMPRINT/IMPROVE MANUFACTURER DEMO	10,005	3,728	0	0	0	0	0	0

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Manufacturing Technology (ManTech) program is intended to improve the productivity and responsiveness of the U.S. defense industrial base by funding the development of manufacturing technologies. The ManTech program, by providing seed funding for the development of moderate to high risk process and equipment technology, permits contractors to upgrade their manufacturing capabilities. Ultimately, the program aims to produce high-quality weapon systems with shorter lead times and reduced acquisition costs.

BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0708011N
PROGRAM ELEMENT TITLE: INDUSTRIAL PREPAREDNESS

PROGRAM CHANGE SUMMARY:

	FY 2004	FY 2005	FY 2006	FY 2007
FY 2005 President's Budget	64,270	56,565	57,790	57,984
Cong Rescissions/Adjustments/Undist. Reductions	0	-572	0	0
Congressional Action	0	3,800	0	0
Non-Pay Inflation Adjustments	-60	0	0	0
Program Adjustments	0	-18	-29	-30
Rate Adjustments	0	0	-8	47
SBIR Assessment	-1,419	0	0	0
FY 2006/2007 President's Budget	62,791	59,775	57,753	58,001

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.

Schedule: Not applicable.

BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0708011N PROGRAM ELEMENT TITLE: INDUSTRIAL PREPAREDNESS
PROJECT NUMBER: R1050 PROJECT TITLE: MANUFACTURING TECHNOLOGY

COST: (Dollars in Thousands)

Project Number & Title	FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
R1050 MANUFACTURING TECHNOLOGY	52,786	56,047	57,753	58,001	60,210	61,650	62,973	64,323

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Manufacturing Technology (ManTech) project is intended to improve the productivity and responsiveness of the U.S. defense industrial base by funding the development of manufacturing technologies. Major areas of endeavor both underway and planned include: advanced manufacturing technology for electronics assembly, laser metalworking, flexible computer manufacturing, composites, metal working, and welding technology. The ManTech project is being integrated into the Seapower 21 and Joint Warfare Operational Capability process and will utilize the results of these initiatives as appropriate in the program planning process. The ManTech project is aimed at assisting acquisition programs in meeting performance and affordability goals by inserting manufacturing process solutions early into the design phase.

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 2004	FY 2005	FY 2006	FY 2007
METALS PROCESSING AND FABRICATION	19,000	18,826	18,988	19,005

The objective of the Metals Processing and Fabrication activity is to develop affordable, robust manufacturing processes and capabilities for metals and special materials critical to defense weapon system applications. Major areas that support this objective include: processing methods, special materials, joining, and inspection and compliance. These efforts directly impact the cost and performance of future aircraft, rotorcraft, land combat vehicles, surface and subsurface naval platforms, space systems, artillery and ammunition, and defense industry manufacturing equipment. Near-term efforts are focused on the Integrated Systems Investment Strategy platforms: DD(X); CVN 21; and Joint-Unmanned Combat Air Systems (J-UCAS). Future concentration will include projects applicable to Littoral Combat Ship development, submarines, and the Joint Strike Fighter (JSF).

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FY 2004 Accomplishments:

- Continued Translational Friction Welding (TFW) of titanium engine blisks to improve affordability, readiness, and time-on wing for aircraft engines in support of F/A-18E/F and JSF programs.
- Continued development of high-productivity, cost-effective welding processes for large, thick-section, high-strength steel structures for enhanced survivability of DD(X) (Manufacturing Large Marine Structures).
- Continued Amphibious Assault Vehicle (AAV) Enhanced Appliqué Armor Kit (EAAK) Product Improvement for enhanced corrosion protection. Delivered sets were installed on units undergoing a six month deployment.
- Continued application of improved casting techniques to medium-size castings and transferred lessons learned to the Virginia-Class propulsor manufacturing process (Propulsor Affordability Initiative).
- Continued effort on ceramic coatings for corrosion protection in Allison 501 engines (Hot Section Corrosion Protection for 501-K34 Gas Turbine).
- Continued Modeling and Simulation for Carrier Construction Planning and Sequencing effort to support CVN 21.
- Continued rapid response and teaching factory activities.
- Completed process development of adhesive bonded Pi-joints to produce lighter, stronger, less expensive, and more damage tolerant primary aircraft structures for the JSF program (Aircraft Primary Structure Adhesive Bonding).
- Completed concept exploration for CVN 21 Metalworking Technology: conducted process development activities on thick section welding, hot/cold forming, Friction Stir Welding (FSW) on High Strength Lightweight Alloy (HSLA)-65 steels; initiated selection and design of Laser Corrugated (LASCOR) application; and developed process model for Hangar Bay Division Door (HBDD) fire scenarios.
- Completed concept exploration for J-UCAS effort by identifying key metalworking technology requirements for both Boeing and Northrop Grumman J-UCAS developmental unmanned air systems.
- Completed development of Single-Melt Process for Reduced-Cost Titanium Alloys for Marine Corps Lightweight 155MM Howitzers for potential cost avoidance of $5M/yr.
- Initiated evaluation of material properties of small-scale production heat of 10%Ni material for CVN 21 (High Strength and Toughness Naval Steels for Ballistic Protection (Ballistic 10%Ni Steel)).
- Initiated analysis with Naval Surface Warfare Center (NSWC) and Northrop Grumman Ship Systems (NGSS) of key components and substructures that can be converted to low-cost titanium for center of gravity and structural weight savings on CVN 21 (Issues Associated with the Fabrication of Titanium Components for CVN 21).
- Initiated development of a system to automate thermal plate forming of complex steel shapes to reduce the fabrication cost and improve the signature of the DD(X) (Automated Thermal Plate Forming).

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- Initiated development of optimal welding procedures to permit use of 10%Ni steel to reduce weight and cost of the CVN 21 aircraft carrier (Welding Development for 10%Ni Steel).
- Initiated development of cost effective joining processes for titanium structures and bimetallic transition joints to reduce weight and center of gravity of the CVN 21 (Fabrication of Titanium Components for CVN 21).
- Initiated Laser Welded Lightweight Panel Structure Fabrication and Application to CVN 21, developed inter-panel joint concepts and preliminary design concept to improve productivity. Investigated commercial sources for panels to ameliorate weight issues associated with design of the next generation carrier.
- Initiated development of preliminary designs and manufacturing concepts, identifying material changes and specific processes to be improved (Advanced Surface Ship Watertight Closures).
- Initiated development of two diameters of electrodes capable of meeting ballistic performance requirements in welded HSLA-100 and HY-100 steels for CVN 21 applications (Availability of Submergible Arc Weld (SMAW) Electrode (Mil-10718-M) Required for Ballistic Performance Requirements).
- Initiated Manufacturing Process Development for Elimination of Weld Distortion of CVN 21 heavy plate erection units.
- Initiated development of Cost-Effective, Low-Manganese Flux Core Welding Electrode for joining High-Strength Steels for CVN 21 applications.
- Initiated process improvements to DD(X) Program on surface hull treatment application processes to support critical design review schedule (DD(X) Advanced Bonding Methods for Steel Structures).

FY 2005 Plans:

- Continue all efforts of FY 2004 less those noted as completed above.
- Continue to pursue manufacturing process improvements supporting CVN 21 and J-UCAS. Establish manufacturing development teams and initiate projects in support of submarines (Advanced Metalworking Technology).
- Complete testing and validation of adhesive bonded joints to support critical design review and technical insertion to reduce radar cross section, weight, and life-cycle costs for DD(X) program (Large Marine Composite-to-Steel Adhesive Joints).
- Complete transition of high-productivity, cost-effective welding processes for large, thick-section, high-strength steel structures to shipyard production to enhance the survivability of DD(X) (Manufacturing Large Marine Structures).
- Complete development of optimal welding procedures for 10%Ni steel to reduce weight and cost of the CVN 21 aircraft carrier (Welding Development for 10%Ni Steel).

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- Complete manufacture and testing of 1/8 inch and 5/32-inch electrodes and revise procurement specification for CVN 21 (Availability of SMAW Electrode (Mil-10718-M) Required for Ballistic Performance Requirements).
- Complete development of cost-effective joining processes for titanium structures and bimetallic transition joints for application to CVN 21 aircraft carriers (Fabrication of Titanium Components for CVN 21).
- Complete effort on AAV EAAK effort by evaluating armor sets upon return from deployment and provide process details to Marine Corps (AAV EAAK Product Improvement).
- Complete Propulsor Affordability Initiative by pouring of a large, cored blade and section of hub and installing high speed machining capability at the Navy Foundry.
- Initiate J-UCAS Metallic Manufacturing Technology Transition effort to integrate with the Composites-J-UCAS Systems Design and Manufacturing Development (SDMD), Boeing St. Louis.
- Initiate extended metallurgical and manufacturing evaluation for 10%Ni steel implementation for use in the CVN 21 program.
- Initiate implementation of Steel Investment Castings effort to enhance reliability and decrease cost for the M777 Lightweight Howitzer.
- Initiate Turbine Inspection Techniques effort.
- Initiate Hybrid Laser Beam Welding effort.
- Initiate and complete Optimization of Virginia Class Submarine Facility Utilization effort.
- Initiate Erosion Resistant Coatings for Stage I Compressor Blisks effort.
- Initiate FSW effort for Littoral Combat Ship.
- Initiate J-UCAS Structural Welding effort.
- Initiate Weld Quality Improvement/Distortion Reduction effort for CVN 21 carriers.
- Initiate metalworking/joining manufacturing process improvements supporting CVN 21, J-UCAS, and Littoral Combat Ship.

FY 2006 Plans:

- Continue all efforts of FY 2005 less those noted as completed above.
- Complete Hot Section Corrosion Protection for 501-K34 Gas Turbine effort.
- Complete Modeling and Simulation for Carrier Construction Planning and Sequencing effort for CVN 21.
- Complete the Laser Welded Lightweight Panel Structure Fabrication and Application to CVN 21 effort.
- Complete DD(X) Collarless Construction effort.
- Complete Development of Cost-Effective, Low-Manganese Flux Core Welding Electrode for Joining High-Strength Steels effort with shipyard verification of trial production advanced weld wire.

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- Complete Improved Affordability of Titanium Parts for Marine Corps M777 Lightweight 155MM Howitzer effort by implementing flow formed titanium tubes into full rate production.
- Complete J-UCAS Structural Welding effort.
- Complete Weld Quality Improvement/Distortion Reduction effort for CVN 21 carriers.

FY 2007 Plans:

- Continue all efforts of FY 2006 less those noted as completed above.
- Continue metalworking/joining manufacturing process improvements supporting CVN 21, J-UCAS, and Littoral Combat Ship.
- Complete Manufacturing Process Development for Elimination of Weld Distortion of CVN 21 Heavy Plate Erection Units by construction of a superlift assembly.
- Complete Automated Thermal Plate effort by demonstrating a system for automated thermal plate forming of complex steel shapes to reduce fabrication cost and signature of the DD(X).
- Complete process improvements to DD(X) effort for surface hull treatment application processes to support critical design review schedule. (DD(X):Advanced Bonding Methods for Steel Structures.)
- Complete FSW effort for Littoral Combat Ship.
- Complete High Strength and Toughness Naval Steels for Ballistic Protection (Ballistic 10Ni Steel) effort.
- Complete the Laser Welded Lightweight Structure Panel Fabrication for CVN 21 (Application Development of LASCOR) effort: Design, fabrication, testing, and final application demonstration for various repair, stud attachment, and joining technologies.
- Complete specifications for the manufacture of an interior, watertight door for the CVN 21 (Advanced Surface Ship Watertight Closures).
- Complete Turbine Inspection Techniques effort.

	FY 2004	FY 2005	FY 2006	FY 2007
OTHER (REPAIR TECH, ENERGETICS, GULF COAST, AND TECHNICAL ENGINEERING SUPPORT)	10,200	9,413	8,994	9,003

The “Other” activity includes repair technology, energetics, and technical engineering support. Repair technology addresses repair, overhaul, and sustainment functions that emphasize remanufacturing processes and advancing technology. Energetics efforts concentrate on developing energetics solutions to ensure the availability of safe, affordable, and quality energetics products largely in support of Program Executive

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Office (PEO) Integrated Warfare Systems (IWS).

FY 2004 Accomplishments:

- Continued to provide technical engineering support for the ManTech program.
- Continued HAZMAT Analyzer effort to build and evaluate hand-held analyzer that can provide test results for determining presence of Poly-Chlorinated Biphenyl (PCB) contamination.
- Continued Helicopter Blade Refurbishment effort to develop worker-health and environmentally sensitive de-painting processes for helicopter main rotor blades.
- Continued Polycan Fabrication effort to develop a manufacturing process to reduce the cost and lead-time associated with polycan fabrication; demonstrated a proof of concept at Pearl Harbor Naval Shipyard that indicated a 50% labor savings, $17,000 per ship material savings and increased safety.
- Continued qualification of a laser cladding process to apply corrosion protection to Vertical Launch System tube areas; demonstrated alpha tool and identified two new alloys specifically designed for stagnant seawater applications. (Vertical Launch System Tube Repair)
- Continued demonstration of metals removal and wastewater solids recycling process. (Waste Water Solids Recycling)
- Continued work with ATK Thiokol Propulsion to scale-up and implement the alternative manufacturing process. (Alternative Manufacture of Energetic Material 1,3,5-triamino-2,4,6-trinitrobenzene (TATB))
- Continued development of a continuous co-extrusion process for the manufacture of co-layered propellants. (Co-Layered Propellant Manufacturing)
- Continued development and demonstration of integrated assembly and packaging techniques for miniature explosive train components contained in the Safety and Arming device of the Canistered Countermeasure Set, Anti-Torpedo. (Low Cost, Reliable Packaging & Integration of Miniaturized Explosive Components)
- Continued to develop an international standard of equipment boundaries and identifiers for collecting and exchanging performance data for shipbuilding.
- Continued developing a modeling and simulation-based framework for a shipyard Manufacturing Process Planning System to improve the effectiveness of shipyard production planning. Cost savings in excess of $22M are expected in the construction of the first two DD(X) hulls. (DD(X): Manufacturing Process Modeling and Fabrication)
- Completed development of a database of appliqué coating system adhesion to modeled substrates and to identified / developed improved removal methods for appliqué coating systems that reduce processing and maintenance resources without adversely affecting aircraft. (Aircraft Appliqué)

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- Completed development of Occupational Safety and Health Administration Compliance Management System for shipyards.
- Completed assessment of optimum process parameters and combinations of parameters that shipyards can use to minimize emissions and maximize productivity. (Environmentally-Friendly Abrasives)
- Initiated use of “Super Finishing Process” to salvage helicopter gears and reduce procurement and maintenance costs. Designed modifications for test stands to allow testing of CH-46 gears and defined an acceptance test plan for approval by NAVAIR. (CH-46 Gear Repair)
- Initiated development of a safer, repeatable, cost effective and environmentally sound alternative to live fire testing of M198, M777 and M1A1 recoil assemblies. (M198 Howitzer Mechanism Recoil Testing)
- Initiated evaluation of the time and resources required to implement Unique IDentifier (UID) at Navy and Marine Corps depot maintenance activities. (Unique Identifier Joint Implementation Assessment)
- Initiated project to identify technologies to reduce the time and costs of alignment and inspection procedures associated with the maintenance of submarines. (Alignments and Inspections)
- Initiated the creation of a methodology to track the Cost of Poor Quality system being used by Northrop Grumman Ship Systems. Eliminating poor quality can reduce cost by 25 – 30%. (Institutionalizing Corporate Initiatives: The Northrop Grumman Cost of Poor Quality System)
- Initiated development of a ship product design and development process that leverages Six Sigma program benefits. (Ship system Design for Six Sigma)
- Initiated project to define a Design for Six Sigma (DFSS) process that couples ship design and operation to the existing efforts in lean six sigma production processes. (Lean Six Sigma (for Shipbuilding))
- Initiated development of a predictive capability for analysis and design for avoidance of excessive high-speed catamaran cross-deck slamming. (Wet-Deck Slamming of High-Speed Catamarans)
- Initiated investigation into solutions for documenting, modeling, and standardizing assembly processes for interim products used in U.S. ship construction. (Improving Shipyard Assembly)
- Initiated development of a nonlinear dynamics based analysis approach for advanced hulls which can be used to supplement the current Navy simulation and model testing analysis approach. (Combined Seakeeping and Maneuvering Survival Analysis of Advanced Naval Hull Forms)
- Initiated Virginia-Class structural fabrication facility design effort to incorporate Product Centric manufacturing principles and robotic processes into self-sufficient and self-governing product lines. (Product Centric Facility Design)
- Initiated development of a man-portable Gas Metal Arc (GMA) welder for shipyard applications.
- Initiated evaluation of feasibility of welding High-Strength Low-Alloy (HSLA)-100 steel with reduced preheat, specifically for submerged arc welding of plates more than 1 5/8 inch thick and GMA welding of plates more than one inch thick.

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- Initiated wireless automated diagnostics / prognostics, monitoring diesel engines of mobile yard equipment, in coordination with the National Shipbuilding Research Program.
- Initiated predictive weld distortion in submarine structures.
- Initiated program to develop standards and processes for digital radiography of piping and plate welds supporting CVN 21 and Virginia-Class construction non-destructive testing. (Digital Radiography)
- Initiated effort to minimize distortion and resulting re-work and costs in Virginia-Class hull ring manufacturing. (Weld Distortion Prediction Initiative)

FY 2005 Plans:

- Continue all efforts of FY 2004 less those noted as completed above.
- Complete qualification of a laser cladding process to apply corrosion protection to Vertical Launch System tube areas. Complete and test the beta tool and conduct corrosion testing of new alloys. [Vertical Launch System Tube Repair]
- Complete demonstration of metals removal and wastewater solids recycling process. [Waste Water Solids Recycling]
- Complete evaluation of the time and resources required to implement UID at Navy and Marine Corps depot maintenance activities. [Unique Identifier Joint Implementation Assessment]
- Complete development of environmentally and worker-health sensitive de-painting processes for helicopter main rotor blades. [Helicopter Blade Refurbishment]
- Complete evaluation and testing of manufactured TATB. [Alternative Manufacture of Energetic Material (TATB)]
- Complete development of an international standard of equipment boundaries and identifiers for collecting and exchanging performance data for shipbuilding.
- Complete development of a modeling and simulation-based framework for a shipyard Manufacturing Process Planning System to improve the effectiveness of shipyard production planning. [DD(X): Manufacturing Process Modeling and Fabrication]
- Complete development of a nonlinear dynamics based analysis approach for advanced hulls which can be used to supplement the current Navy simulation and model testing analysis approach. [Combined Seakeeping and maneuvering Survival Analysis of Advanced Naval Hull Forms]
- Complete development and demonstration of a continuous co-extrusion process for the manufacture of co-layered propellants. [Co-Layered Propellant Manufacturing]
- Complete demonstration of integrated assembly and packaging techniques for miniature explosive train components contained in Safety and Arming (S&A) Devices and transition optimized processes to industry for

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implementation and production of the canistered countermeasure anti-torpedo. [Low Cost, Reliable Packaging & Integration of Miniaturized Explosive Components]
• Complete effort with Northrop Grumman Ship Systems to implement DFSS procedures. [Lean Six Sigma (for Shipbuilding)]
• Complete wireless automated diagnostics / prognostics project and implement on mobile diesel engines in shipyards.
• Initiate Repair Technology projects based on high priority depot needs.
• Initiate energetics efforts to support PEO(IWS) and other acquisition programs.
• Initiate shipbuilding efforts for Littoral Combat Ship, CVN 21, and others.
• Initiate development of new weld size and inspection criteria based on fitness for service. [Portable Weld Inspection Management System]
• Initiate development of a pre-production laser / GMA hybrid pipe welding system. [Laser / GMA Hybrid Pipe Welding System]
• Initiate development of a comprehensive technical training and data collection program for structural welders and fitters, applying elements of Best Practices Lean technologies.
• Initiate re-engineering internal supply chain / material delivery process.
• Initiate the development and implementation of transient thermal tensioning of thin steel ship panel structures at Northrop Grumman Ship Systems for use in the construction of LPD, DDG, LHD, and DD(X). [Thermal Tensioning of Thin Steel Ship Panel Structures]
• Initiate and complete Mid-Tier Shipyard Capability Assessment effort.

FY 2006 Plans:

• Continue all efforts of FY 2005 less those noted as completed above.
• Complete development of a manufacturing process to reduce the cost and lead-time associated with polycan fabrication. (Polycan Fabrication)
• Complete development of “Super Finishing Process” to salvage helicopter gears and reduce procurement and maintenance costs. (CH-46 Gear Repair)
• Complete building and evaluation of hand-held analyzer that can provide test results for determining presence of PCB contamination. (HAZMAT Analyzers)
• Complete development of a safer, repeatable, cost effective and environmentally sound alternative to live fire testing of M198, M777 and M1A1 recoil assemblies. (M198 Howitzer Mechanism Recoil Testing)
• Complete project to identify technologies to reduce the time and costs of alignment and inspection procedures associated with the maintenance of submarines. (Alignments and Inspections)

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- Complete the methodology to track the Cost of Poor Quality system being used by Northrop Grumman Ship Systems. (Institutionalizing Corporate Initiatives: The Northrop Grumman Cost of Poor Quality System)
- Complete development of a ship product design and development process that leverages Six Sigma program benefits. (Ship system Design for Six Sigma)
- Complete development of a predictive capability for analysis and design for avoidance of excessive high-speed catamaran cross-deck slamming. (Wet-Deck Slamming of High-Speed Catamarans)
- Complete investigation into solutions for documenting, modeling, and standardizing assembly processes for interim products used in U.S. ship construction. (Improving Shipyard Assembly)
- Complete Virginia-Class structural fabrication facility design effort to incorporate product centric manufacturing principles and robotic processes into self-sufficient and self-governing product lines. (Product Centric Facility Design)
- Complete development of a man-portable GMA welder for shipyard applications.
- Complete evaluation of feasibility of welding HSLA-100 steel with reduced preheat, specifically for submerged arc welding of plates more than 1 5/8 inch thick and GMA welding of plates more than one inch thick.
- Initiate/Continue Repair Technology projects based on high priority depot needs.
- Initiate/Continue energetics efforts to support Program Executive Office (PEO) for Integrated Warfare Systems (IWS) and other acquisition programs.
- Initiate/Continue shipbuilding efforts for Littoral Combat Ship, CVN 21, and others.

FY 2007 Plans:

- Continue all efforts of FY 2006 less those noted as completed above.
- Initiate/Continue Repair Technology projects based on high priority depot needs.
- Initiate/Continue energetics efforts to support PEO IWS and other acquisition programs.
- Initiate/Continue shipbuilding efforts for Littoral Combat Ship, CVN 21, and others.

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ELECTRONICS PROCESSING AND FABRICATION	10,000	9,908	9,994	10,003

Electronics Processing and Fabrication efforts develop and deploy affordable, robust manufacturing processes and capabilities for electronics critical to defense applications over their full life cycle. Efforts create new and improved manufacturing processes on the shop floor, as well as repairing and maintaining facilities such as depots and logistics centers, with a strong emphasis on process maturation. Near-term efforts are focused on the Integrated Systems Investment Strategy platforms: DD(X), CVN 21, and J-UCAS. Future

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concentration will include efforts applicable to the Littoral Combat Ship, EA-18G, and Joint Strike Fighter (JSF).

FY 2004 Accomplishments:

- Continued Teaching Factory Outreach, Rapid Response: Supported transition of Aegis SPY-1 Radar to lead-free materials, re-engineered and reduced cost of the SQQ-32 hull penetrating cable, and manufactured PRC-112 battery cases which were deployed to Iraq and Afghanistan.
- Continued MicroElectroMechanical Systems (MEMS) Affordability Program: Completed all cost reduction efforts on existing Vibrating Beam Accelerometers (VBA) design and attempted to achieve tolerance and yield goals with the VBA sensor. Performance targets that would meet Extended Range Guided Munition (ERGM) requirements were not achieved – refocused program to current ERGM Inertial Measurement Units (IMU) supplier.
- Continued Microwave Monolithic Integrated Circuit (MMIC) Flip Chip Attach Production Processing: Completed transfer of MMIC bumping process to production fabrication line that supports the APG-79 production. Developed relationship with two second source suppliers and have received bumped die from one of the suppliers.
- Completed Power Electronics Manufacturing for DD(X): Achieved significant cost savings on existing Power Control Modules (PCM) for DD(X) through improvements in manufacturing, packaging, and component selection. Savings are estimated at $1.5M per PCM.
- Completed Swimmer Deliver Vehicle (SDV) Energy Storage Improvement Program: Designed and developed two competing battery technologies for the SDV and delivered to Naval Surface Warfare Center (NSWC) CRANE for testing.
- Completed LINK-16 Low Cost Terminal effort on next generation Multifunction Information Distribution System (MIDS) Joint Tactical Radio System (JTRS) and Weapons Data Links.
- Completed Power Electronics Manufacturing for DD(X): Achieved significant cost savings on existing PCMs for DD(X) through improvements in manufacturing, packaging, and component selection.
- Continued Fiber Optic Interconnect Technology to develop an automated process to reduce touch labor hours and level of expertise required to terminate simple-mode fiber optic cables / harnesses on Navy platforms.
- Continued Navy Advanced Infrared Focal Plane Arrays effort to develop two color focal plane arrays.
- Continued Electro-Optics Rapid Response efforts such as fiber optic training and troubleshooting efforts to support integration of fiber into new and legacy aircraft and ships.
- Completed Fiber Optic Electrical Splice and implemented in Advanced Deployable System. Exceeded goals for cost reduction and increased strength and reduced manufacturing time per sensor.

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- Completed Fiber Optic Acquisition Training Rapid Response effort to develop curriculum and teach initial class to NAVAIR professionals.
- Completed MK48 Advanced Capability (ADCAP) Torpedo Fiber Optic Guidance Tether effort to verify integrity and functionality of fiber data link to torpedo.
- Completed Remote Source Lighting effort to reduce costs and improve performance and implemented on LPD 17.
- Initiated Fiber Optic Ultra-Thin Line Towed Array Rapid Response effort to determine applicability of ultra thin low cost acoustic arrays for use in littoral sensing.

FY 2005 Plans:

- Continue all efforts of FY04 less those noted as completed above.
- Complete Fiber Optic Ultra-Thin Line Towed Array effort for the Unmanned Surface Vehicle (USV) and other Navy towed array applications.
- Complete Fiber Optic Interconnect Technology effort.
- Initiate Lead-Free & Environmentally Safe Manufacturing to reduce the risk of implementing current environmentally safe components and materials.
- Initiate Hermetic Sealing of Transmit/Receive (T/R) Modules to provide significant improvement in affordability of T/R Modules for SPY-3 radar through use of more commercial packaging and manufacturing methods.
- Initiate Manufacturing & Packaging of Power Systems for PEO Carriers and PEO Ships: Develop packaging methodologies for transmission and storage of switching devices and subsystems for pulsed power systems.
- Initiate ALQ-99 Band 4 Jammer effort.
- Initiate DD(X) / CVN 21 Manufacturing of Opto-Electronic Sensors effort.
- Initiate F-18 / DD(X) MMIC Flip Chip Second Source validation and transfer effort.
- Initiate effort on Helmet Mounted Displays to reduce cost and improve durability of F/A-18 and Join Strike Fighter (JSF) helmet mounted visor.
- Initiate low cost, lightweight, multi-purpose Light Detection and Ranging (LIDAR) imaging systems for unmanned vehicles.
- Initiate effort on High Power Electronics with three vendors to facilitate implementation of silicon carbide into solid-state power systems for the Navy.
- Initiate Packaging Reconfigurable Antenna Solutions for Improved Mission Adaptability for the Littoral Combat Ship effort.

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FY 2006 Plans:

- Continue all efforts of FY05 less those noted as completed above.
- Initiate Silicon Carbide Reliability/Failure analysis effort.
- Initiate Electro-Optic Sensors effort.
- Initiate Fiber Optics effort for J-UCAS.
- Initiate advanced electronics and electro-optics efforts geared towards improvements for the Littoral Combat Ship, EA-18G, and JSF.

FY 2007 Plans:

- Continue all efforts of FY06 less those noted as completed above.
- Complete the Packaging Reconfigurable Antenna Solutions for Improved Mission Adaptability for the Littoral Combat Ship effort.
- Initiate advanced electronics and electro-optics efforts geared towards improvements for the Littoral Combat System, EA-18G, and JSF.

	FY 2004	FY 2005	FY 2006	FY 2007
COMPOSITES PROCESSING AND FABRICATION	6,000	5,945	5,996	6,002

The primary technical goal of the Composites Processing and Fabrication activity is improving weapon systems affordability, enhancing weapon system effectiveness and improving reliability/war-fighter readiness through the increased utilization of composite materials and structures. This is being achieved through the development and maturation of affordable, robust manufacturing and assembly processes that fully exploit the benefits of composite materials. Near-term efforts are focused on the Integrated Systems Investment Strategy platforms: DD(X), CVN 21, and Joint Unmanned Combat Air Systems (J-UCAS). Future concentration will also include efforts applicable to the Littoral Combat Ship and Joint Strike Fighter (JSF).

FY 2004 Accomplishments:

- Continued to develop/optimize processing for composite marine impellers (Composite Marine Impellers).
- Completed development of manufacturing technologies to improve reliability, reduce weight, and enhance cost competitiveness of pressure vessels used in the Rolling Airframe Missile Pre-Planned Product Improvement program (RAMP3I)(Composite Pressure Vessel).

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• Completed development of composite processing techniques for low-cost, structural armor system that reduced weight by 25%, part count by almost 90%, and cost of troop door assemblies on 1000 Expeditionary Fighting Vehicles (formerly Advanced Amphibious Assault Vehicle (AAAV))(Expeditionary Fighting Vehicle (EFV) Troop Ramp).
• Completed successful demonstration of integrated bleeding manufacturing process (IBMP) as a viable and cost-effective composite fabrication process for producing highly curved submarine cover plates (Composite Submarine Cover Plates).
• Completed identification of key J-UCAS aircraft structures requiring enhanced manufacturing affordability and initiated development of improved composite processing and assembly tasks (J-UCAS Concept Exploration).
• Initiated improvement of composites fabrication and assembly process to eliminate cracking of the Advanced Seal Delivery System (ASDS) stator system during operation, resulting in improved mission readiness and improved propulsion performance characteristics (ASDS Stator).
• Initiated effort to identify critical performance requirements and viable weight reduction opportunities for CVN 21 multi-functional composite ship structure. Follow-on phase was also initiated in FY04 (CVN 21 Weight Reduction).
• Initiated development of manufacturing processes to produce high temperature organic polymer radomes for the Phase III and IV Advanced Medium Range Air-to-Air Missile (AMRAAM) with required surface finish, tolerance control, quality control, and mounting methodology(Development of Manufacturing Processes to Produce High Temperature Capable Composite Radomes).

FY 2005 Plans:

• Continue all efforts of FY 2004 less those noted as completed above.
• Complete validation of materials and processes for integrated and bonded airframe primary structural applications for high performance aircraft (CAI Phase III - Integrated and Bonded Structures Validation).
• Complete engine qualification testing at General Electric Aircraft Engines and implement ManTech technology as baseline production process (Manufacturing Technology for Silicon Carbide Flaps and Seals).
• Complete qualification testing of improved stator for ASDS using Naval Sea Systems Command funds, install deliverable improved stator as baseline unit on Boat #1 and follow-on hulls, and transition technology to production vendor during manufacture of second improved stator (ASDS Stator).
• Complete investigation and refinement of low-cost composite manufacturing approaches for key vehicle areas identified under concept exploration phase (J-UCAS System Design and Manufacturing Demonstration Phase).
• Complete remaining DD63 article fabrication using automated insertion process and transition the

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technology into F/A-18E/F (Automation of Z-Fiber for Complex Shape).
• Complete validation testing at Naval Surface Warfare Center (NSWC) Philadelphia Detachment for new coating candidate systems for propulsion shaft coatings and initiate transition of technology to Northrop Grumman Ship Systems, Puget Sound Naval Shipyard, Portsmouth Naval Shipyard, and Norfolk Naval Shipyard (Propulsion Shaft Composite Surface Treatment).
• Complete effort with manufacture of two composite impellers to be used in pump loop qualification testing funded by Submarine Program Office PMS 450 (Composite Marine Impellers).
• Complete effort by transitioning generic, multi-functional composite panel processing techniques to the shipyard, with a focus on specific CVN 21 applications such as sponsons, multi-functional radar house, deck edge elevator doors, etc. (CVN 21 Weight Reduction)
• Complete development of manufacturing processes to produce high temperature organic polymer radomes for the Phase III and IV Advanced Medium Range Air-to-Air Missile (AMRAAM) (Development of Manufacturing Processes to Produce High Temperature Capable Composite Radomes).
• Initiate Phase 1 to develop advanced manufacturing techniques for alternate Joint Strike Fighter (JSF) Weapons Bay Door (WBD) design that employs integrated structure concepts to reduce both weight and cost (Weapons Bay Door).
• Initiate effort to demonstrate new “as-built” manufacturing variability simulation and analysis techniques along with corrosion/fatigue resistant components using an EA-18G aileron demonstration article for future production transition (Affordable Control Surfaces).
• Initiate development of low cost Vacuum Assisted Resin Transfer Mold (VARTM) process to produce Virginia-Class “Special Feature” parts that do not require significant post processing/machining and meet drawing and performance specifications (Composite Manufacturing Technology for “Special Feature”).

FY 2006 Plans:

• Continue all efforts of FY 2005 less those noted as completed above.
• Complete development efforts on Advanced Hawkeye satellite communications antenna and initiate application of technology to advanced antennas being developed by Program Executive Office (PEO) Integrated Warfare Systems (IWS) for CVN 21 application (Affordable Integrated Structural Apertures).
• Complete demonstration of advanced processing technology on full-scale EA-18G composite aileron and conduct verification testing on hardware (Affordable Control Surfaces).
• Complete the development of a low cost VARTM process to produce Virginia-Class “Special Feature” parts that do not require significant post processing/machining and meet drawing and performance specifications (Composite Manufacturing Technology for “Special Feature”).

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• Initiate projects in support of the Littoral Combat Ship and JSF and establish manufacturing development teams. Pursue manufacturing process improvements supporting CVN 21 and J-UCAS (Advanced Composites Manufacturing).

FY 2007 Plans:

• Continue all efforts of FY 2006 less those noted as completed above.
• Complete Full Scale Weapons Bay Door (WBD) Manufacturing Demonstration and Testing. (Weapons Bay Door)
• Initiate/Continue projects in support of the Littoral Combat Ship and JSF and establish manufacturing development teams. Continue to pursue manufacturing process improvements supporting CVN 21 and J-UCAS.

	FY 2004	FY 2005	FY 2006	FY 2007
CORPORATE INVESTMENTS	7,586	11,954	13,781	13,988

The Corporate Investments area (includes initiatives from the former Advanced Manufacturing Enterprise) is focused on accelerating defense industrial enterprise progress toward implementation of world-class industrial practices as well as advanced design and information systems that support weapon system development, production, and sustainment. Key emphasis areas include: 1) Benchmarking and accelerating the implementation of world-class industrial practices throughout the contractor base; 2) Demonstrating and validating advanced business practices and information technologies capable of streamlining management functions in all industrial base tiers; and 3) Leveraging information technologies in pursuit of tighter coupling of all defense industrial enterprise elements. Corporate Investment efforts create improvements to cost and cycle time for weapon system development, production, and repair.

FY 2004 Accomplishments:

• Continued Best Manufacturing Practices efforts in surveys, the Program Manager’s WorkStation, and Collaborative Work Environment.
• Continued Supply-Chain Practices for Affordable Navy Systems (SPANS) efforts in supply chain development and management technologies to improve the agility of the Navy manufacturing base and enhance the affordability of Navy weapon systems.
• Completed LPD 17 Lean-Pathways (LPW) Phase I effort with five Northrop Grumman Ship Systems (NGSS) suppliers for lead-time reductions, quality improvements, and integration of supplier integration efforts with the ships.

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- Completed Stand-off Land Attack Missile – Expanded Response LPW with nine suppliers, reducing missile delivery time from 75 weeks to 52 weeks at no increase in price.
- Completed Technology Refresh for Navy Information (TRENT) effort to identify a solution for optimizing technology refresh for Navy weapons systems by identifying a timely and cost-effective plan for each individual system based on anticipated parts obsolescence and technology road mapping.
- Completed Tin Whisker Mitigation effort to develop a method to recoat lead-free component finishes with tin-lead alloy to avoid the electrically conductive hair-like filaments that can cause electrical shorting failures and mechanical damage.
- Initiated LPW effort with DDG 51 Program Office and seven suppliers to improve deliveries, improve quality, and reduce cost.
- Initiated LPW engagements with two CVNs to introduce lean concepts and improve sortie rate.

FY 2005 Plans:

- Continue all efforts of FY04 less those noted as completed above.
- Complete SPANS effort in supply chain development and management technologies.
- Complete LPW effort with DDG 51 Program Office and seven suppliers.
- Complete LPW engagements with CVNs.
- Initiate and complete Aegis Ballistic Missile Defense (BDM) Weapons Control Systems (WCS) Computer Processors effort to aid in the integration of state-of-the-art, non-developmental item processors into the Aegis upgrade to meet deployment schedule.
- Initiate and complete effort to develop Navy Capability for Analytical Computing Engineering Trade Studies for a resident analytic computing center for the Navy to support Navy acquisition programs.
- Initiate and complete effort on Lean Six Sigma for Naval Air Systems Command (NAVAIR).

FY 2006 Plans:

- Continue all efforts of FY05 less those noted as completed above.
- Initiate efforts to continue to improve the Navy industrial base through above-the-factory-floor enhancements and supply chain processes/technology improvements for Navy weapon system acquisition programs such as the Littoral Combat System (LCS), CVN 21 carrier program, and others.

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PROGRAM ELEMENT: 0708011N PROGRAM ELEMENT TITLE: INDUSTRIAL PREPAREDNESS
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FY 2007 Plans:

- Continue all efforts of FY06 less those noted as completed above.
- Initiate efforts to continue to improve the Navy industrial base through above-the-factory-floor enhancements and supply chain processes/technologies improvements for Navy weapon system acquisition programs such as the Littoral Combat System (LCS), CVN 21 carrier program, and others.

C. OTHER PROGRAM FUNDING SUMMARY:
RELATED RDT&E:
Major Acquisition programs, such as: DD(X), LPD-17, V-22, EFV, F/A-18, and CVN-21.

NON-NAVY RELATED RDT&E:
PE 0708011F Industrial Preparedness
PE 0708045A End Item Industrial Preparedness Activities
PE 0708011S Manufacturing Technology

D. ACQUISITION STRATEGY:
Not applicable.

BUDGET ACTIVITY: 07
PROGRAM ELEMENT: 0708011N PROGRAM ELEMENT TITLE: INDUSTRIAL PREPAREDNESS
PROJECT NUMBER: Various PROJECT TITLE: Congressional Plus-Ups

CONGRESSIONAL PLUS-UPS:

R2674	FY 2004	FY 2005
IMPROVE MANUFACTURABILITY DEMO OF EXHAUST COMPONENTS FOR MILITARY AIRCRAFT	0	981

This purpose of this project is to improve manufacturability (and therefore reduce production costs) of silicon carbide – carbon composite (SiC-C) exhaust flaps and seals on the GE F414 engine for the F/A 18 E/F Super Hornet fighter jet, resulting in projected savings of more than $30M over the remaining life of the F414 production program.

R2674	FY 2004	FY 2005
MANUFACTURING TECHNOLOGY	10,005	0

Funding was used to support continuing efforts under the Manufacturing Technology (ManTech) Integrated Investment Strategy focusing on CVN 21 weight reduction initiatives, J-UCAS production vehicle, and composite-to-steel processes for DD(X). Initiated a study with the Future Naval Capabilities (FNC) community to look at enabling capabilities similar to ManTech platforms for selection of a candidate technology for ManTech affordability/transition work. Initiated a program to improve energy density to increase battery lifetime in operational (especially dismounted) units.

R2674	FY 2004	FY 2005
NANO-IMPRINT AT A MANUFACTURING SCALE	0	2,747

This project will develop the imprint lithography process issues relating to fluid delivery, imprinting and in-liquid alignment while keeping the constraints of interferometric mag-lev stages in mind. It will build on unique capabilities in the motion systems area that have been developed.