

# UNCLASSIFIED

FY 2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET  
Exhibit R-2

DATE: Feb 2004

BA: 07            PROGRAM ELEMENT: 0708011N  
PROGRAM ELEMENT TITLE: Industrial Preparedness

COST: (Dollars in Thousands)

Project Number & Title	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
<b>Total PE</b>	71,704	64,270	56,565	57,790	57,984	59,277	60,629
1050 MANUFACTURING TECH	67,401	53,985	56,565	57,790	57,984	59,277	60,629
2674 MANUFACTURING TECHNOLOGY	4,303	10,285	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.

**PROGRAM CHANGE SUMMARY:**

	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
FY 2004-2005 President's Budget Submission	73,320	54,593	56,810
Cong. Rescissions/Adjustments/Undist.Reductions	0	-723	0
Congressional Actions	0	10,400	0
Misc. Adjustments	149	0	-245
SBIR Assessment	-1,765	0	0
FY 2005 President's Budget Submission	71,704	64,270	56,565

**PROGRAM CHANGE SUMMARY EXPLANATION:**

Technical: Not applicable.

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Schedule: Not applicable.

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BA: 07 PROGRAM ELEMENT: 0708011N PROGRAM ELEMENT TITLE: Industrial Preparedness  
PROJECT NUMBER: 1050 PROJECT TITLE: MANUFACTURING TECH

COST: (Dollars in Thousands)

Project & Title	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
1050 MANUFACTURING TECH	67,401	53,985	56,565	57,790	57,984	59,277	60,629

**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 achieving affordability in the acquisition of weapons systems by inserting manufacturing process solutions early into the design phase to reduce lifecycle costs, improve schedules, and ensure quality.

**B. ACCOMPLISHMENTS/PLANNED PROGRAM:**

	FY 2003	FY 2004	FY 2005
<b>Metals Processing and Fabrication</b>	19,000	19,000	19,000

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.

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## **FY 2003 Accomplishments:**

- High Strength Marine Grade Fasteners Extended Development: Resulted in cost avoidance of \$1.1 million per Sea Wolf and Virginia Class sub.
- Advanced Thermal Battery Production: Reduced battery manufacturing costs resulting in cost avoidance of \$29 million for the Air Deployable Low Frequency Projector (ADLFP) and AN/SSQ-62E sonobuoy programs.
- Distortion and Accuracy Control: Improved dimensional accuracy of thermal cut plates to reduce ship fabrication and assembly costs by 30% for the DD(X) program.
- Single-Melt Process for Reduced-Cost Aluminum Alloys for LW-155 Howitzer: Developed new process which will become industry standard for producing low cost titanium ingots to be used on the M777 Howitzer, ingot cost reduced by 27%.
- Propulsor Affordability Initiative: Improved manufacturing technologies to reduce cycle time by 6 - 12 months and cost by over \$3M for the Virginia class sub.
- Automated Paint Application Containment and Treatment System Process Development: New paint application and containment system results in cost avoidance estimated to be \$2 million per year by reducing paint acquisition costs, reducing dry dock time and complying with environmental guidelines.
- Titanium Welding: Improved erosion and corrosion resistance of titanium pipes on LPD 17, extending their life resulting in large cost savings due to reduced maintenance and support costs.
- Weld Fume Manufacturing: Reduced hazardous weld fumes for Navy personnel fabricating the DDG, CVN, SSN sub, LPD-17, and F-14, F/A-18.
- Enhanced Processing for High Strength Steel Castings and Forgings for Naval Components (CVN): Reduced weight and improved performance of castings and forgings used on subs and ships.
- Concept Exploration for CVN 21 Metalworking Technology: Identified issues related to metalworking.
- Modeling and Simulation for Carrier Construction Planning and Sequencing: Developed pilot assembly process model and simulation.
- Laser Welded Lightweight Structure Panel Fabrication for CVN 21: Fabricated laser welded NAVTRUSS panels for analysis.

## **FY 2004 Plans:**

- Propulsor Affordability Initiative: Continue Single-Melt Process for Reduced-Cost Aluminum Alloys for LW-155 Howitzer. Continue High Strength Marine Grade Fasteners Extended Development. Continue Advanced Thermal Battery Production. Continue Distortion and Accuracy Control program. Continue Automated Paint Application Containment and Treatment System Process Development.
- Laser Welded Lightweight Structure Panel Fabrication for CVN 21: Deliver Navy approved process for fabrication.

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- Availability of SubMergable Arc Weld (SMAW) Electrode (Mil-10718-M) Required for Ballistic Performance Requirements: Manufacture and test initial electrodes.
- Modeling and Simulation for Carrier Construction Planning and Sequencing: Demonstrate the simulated construction of major ship modules for CVN 21.
- Issues Associated with the Fabrication of Titanium Components: Select 5 candidate applications for evaluation.
- Manufacturing Process Development for Elimination of Weld Distortion of CVN 21 Heavy Plate Erection Units: Develop a weld-sequence plan to minimize weld distortion for prototype assemblies.
- Development of Cost Effective, Low-Manganese Flux Core Welding Electrode for Joining High Strength Steels: Manufacture test lots of modified flux covered welding wire.
- High Strength and Toughness Naval Steels for Ballistic Protection: Determine optimal welding parameters.

## **FY 2005 Plans:**

- Propulsor Affordability Initiative: Continue Single-Melt Process for Reduced-Cost Aluminum Alloys for LW-155 Howitzer. Continue High Strength Marine Grade Fasteners Extended Development. Continue Advanced Thermal Battery Production. Continue Distortion and Accuracy Control program.
- Laser Welded Lightweight Structure Panel Fabrication for CVN 21: Weld and process validation.
- Availability of SMAW Electrode (Mil-10718-M) Required for Ballistic Performance Requirements: Develop recommendations on improving electrode manufacturing process.
- Modeling and Simulation for Carrier Construction Planning and Sequencing: Demonstrate the simulated construction of major ship modules for CVN 21.
- Issues Associated with the Fabrication of Titanium Components: Develop process for manufacture and joining of titanium structures to bimetallic transition joints.
- Manufacturing Process Development for Elimination of Weld Distortion of CVN 21 Heavy Plate Erection Units: Complete the construction of a prototype.
- Development of Cost Effective, Low-Manganese Flux Core Welding Electrode for Joining High Strength Steels: Verification of new wire.
- High Strength and Toughness Naval Steels for Ballistic Protection: Determine optimal welding parameters.

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	FY 2003	FY 2004	FY 2005
<b>Other (Repair Tech, Program Initiatives)</b>	26,901	13,485	16,065

The "Other" activity includes repair technology and those manufacturing efforts that are competed and executed by the Navy's Centers of Excellence, including DD-X, LPD-17, Unmanned Combat Air Vehicle-Navy, Shipbuilding Initiative, Wide Band Gap Initiatives, and technical engineering support.

**FY 2003 Accomplishments:**

- Initiated second year of the Navy International Cooperative Program for Shipbuilding Process Simulation and Advanced Composites Research. Initiated Phase 2 Wide Band Gap Materials Technology project based on the industry data from Phase 1. Continued Composites Affordability Initiative Phase II - Integrated and Bonded Structures Validation. Completed Pathways for Continuous Improvement program for the Standoff Land Attack Missile - Expanded Response (SLAM-ER) program. Continued Supply Chain Integration for Newport News Shipbuilding. Assessed transition path for MicroElectroMechanical Systems for Inertial Measurement Units (MEMS IMU) for go-no-go decision. Provided technical engineering support for the Manufacturing Technology (ManTech) program.
- Initiated Virtual Training in Welding in support of Program Executive Officer (PEO) Subs. Initiated Phase 2 of the Collarless Construction for DD(X). Completed Computer Numerically Controlled (CNC) Thermal Plate Forming in support of DD(X). Completed Amphibious Assault Vehicle (AAV) Enhanced Applique Armor Kit Product Improvement. Completed evaluation and repair of Lightweight Armored Vehicle (LAV) Armor. Completed heavy equipment repair. Completed Steering Block Repair. Completed Low Cost, Reliable Packaging and Integration of Miniaturized Explosive Components, and, Low Cost, Improved Quality CL-20 Material, Co Layered Propellant Manufacturing. Initiated Phase 2 for Dimensional and Accuracy Control. Initiated Phase 2 Large Marine Composite-to-Steel Adhesive Joints.

**FY 2004 Plans:**

- Continue to develop Manufacturing Process Improvements supporting DD(X), CVN-21, and LPD-17.
- Conduct a Pathways for Continuous Improvement program aboard the USS George Washington and USS Harry S. Truman. Develop comprehensive study in Supply Chain Integration for selected acquisition program. Close-out MEMS IMU, and publish industry-government guidelines. Provide technical engineering support for the ManTech program.

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## **FY 2005 Plans:**

- Continue to pursue Manufacturing Process Improvements supporting DD(X), CVN-21, and LPD-17. Establish manufacturing development teams and initiate projects in support of the Littoral Combat Ship. Provide technical engineering support for the ManTech program.

	FY 2003	FY 2004	FY 2005
<b>Electronics Processing and Fabrication</b>	10,000	10,000	10,000

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 to repair and maintenance facilities such as depots and logistics centers, with a strong emphasis on process maturation.

## **FY 2003 Accomplishments:**

- LINK-16 Low Cost Terminal: SPAWAR Program Officer established as stakeholder. Developed insertion path into Multifunctional Information Distribution System Land Vehicle Track 1 (MIDS LVT1) effective in FY05.
- Monolithic Miniature Integrated Circuit (MMIC) Flip Chip Attach Production Processing: Transitioned from prototype to high speed commercial manufacturing line.
- Teaching Factory Outreach, Rapid Response: Received ISO9001-2000 certification, demonstration factory supported the transition of MicroElectroMechanical Systems Inertial Measurement Unit (MEMS IMU), Radio Frequency (RF) devices for data links and solid state power switching Thyristors for DD(X).
- Infrared Focal Plane Array Manufacturing: Manufacturing process improved, cost metrics indicate costs goals will be met.
- Affordable Diode Array Manufacturing: Updated quality and testing procedures, fabricated submodule test station, and performed accelerated life-cycle testing of 10 "before" tiles.
- Fiber Optic Electrical Splice: Several improvements to the fabrication process to improve strength, and reduce manufacturing time per sensor.

## **FY 2004 Plans:**

- LINK-16 Low Cost Terminal: Test vehicles to be identified, evaluated, verified, and conclusions drawn with follow-on.
- MMIC Flip Chip Attach Production Processing: Reliability testing for bump process. Complete 2nd source transition. Deliver MMIC flip chip devices to F/A-18.

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- Teaching Factory Outreach, Rapid Response: Direct weapon support of AEGIS Radar, MIDS LVT-1, Joint Tactical Radio System (JTRS), F/A-18, and the Army's Future Combat System. Support transition of manufacturing technology of PRC-112 radio, the BB5590 battery for the USMC Single Channel Ground and Airborne Radio System (SINCGARS) radio, and the US Navy SEAL Delivery Vehicle.
- Infrared Focal Plane Array Manufacturing: Demonstration runs and final report to be completed.
- New efforts in Wide Band Gap Materials that support ship platforms.

## **FY 2005 Plans:**

- LINK-16 Low Cost Terminal: Delivery of 3 new Power Amplifiers.
- Complete MMIC Flip Chip Attach Production Processing.
- Teaching Factory Outreach. Continue Rapid Response. Continue support of Multi-Function-Fuze (MFF), Extended Range Guided Munition (ERGM), and Small Diameter Bomb (SDB).
- Manufacturing process improvement work for the new EA-18G.

	FY 2003	FY 2004	FY 2005
<b>Composites Processing and Fabrication</b>	6,000	6,000	6,000

The primary technical goal of the Composites Processing and Fabrication activity is to maximize weapon system effectiveness through the increased utilization of composite materials and structures by reducing acquisition as well as life cycle costs, improving reliability and demonstrating performance improvements. This will be achieved through the development and maturation of affordable, robust manufacturing and assembly processes for composite structures.

## **FY 2003 Accomplishments:**

- Composite Pressure Vessel Fabrication: Developed high burst strength vessels competitive with conventional metal containers used in tactical missiles, cost avoidance of \$37.5 million.
- Automation of Z-Fiber for Complex Shape: Reduced touch labor which results in cost avoidance of \$8,600 per F/A-18E/F and improves quality of Z-Pin Fiber insertion.
- Teaching Factory Outreach: Developed "Introduction to Composites and Composite Repair" courseware.
- Manufacturing Technology for Silicon Carbide Flaps and Seals: Optimized manufacturing process to result in cost avoidance of over \$5 million for 520 F414 engines.
- Propulsion Shaft Composite Surface Treatment: Developed a coating system that increases service life of ship propulsion shafts from seven to 15 years and results in estimated cost avoidance of \$24 million every five year period.

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## **FY 2004 Plans:**

- Composite Pressure Vessel Fabrication: Target implementation into Rolling Airframe Missile Pre-Planned Product Improvement program.
- Automation of Z-Fiber for Complex Shape: Target implementation into F/A-18E/F.
- Rapid Response initiatives supporting critical fleet manufacturing problems: Improve Manufacturing Technology for Silicon Carbide Flaps and Seals. Develop Propulsion Shaft Composite Surface Treatment.
- Expeditionary Fighting Vehicle (EFV) Troop Ramp: Develop SURMAX armor system to reduce weight by 25% and reduce the cost of door assemblies on 1000 Expeditionary Fighting Vehicles (formerly Advanced Amphibious Assault Vehicle (AAAV)).
- Systems Design & Manufacturing Demonstrations: Develop composites processing for carrier-compatible Joint - Unmanned Combat Aerial System (J-UCAS).

## **FY 2005 Plans:**

- Manufacturing Technology for Silicon Carbide Flaps and Seals: Develop propulsion shaft composite surface treatment.
- Systems Design & Manufacturing Demonstrations: Develop composites processing for carrier compatible J-UCAS.
- Develop new manufacturing processes supporting F/A-18 and the new EA-18G.
- Continue Rapid Response initiatives supporting critical fleet manufacturing problems.

	FY 2003	FY 2004	FY 2005
<b>Advanced Manufacturing Enterprise</b>	5,500	5,500	5,500

American Manufacturing Enterprise (AME) 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; 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. AME efforts create improvements to cost and cycle time for weapon system development, production, and repair.

## **FY 2003 Accomplishments:**

- Continued the following efforts: 5 Best Manufacturing Practices Surveys, Port Security Homeland Security efforts, Shipbuilding and Simulation Based Design, Occupational Safety and Health Administration (OSHA)

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Compliance Management System, Development of High Strength Corrosion Resistant Aluminum Alloys for Maritime Applications, and continuous improvements in Drydock Management.

- Continued the Maritime Environmental Information Center. Continued Ship Propeller Thrust and Torque Measurement. Continued Fiber-Bragg Optical Damage Control System. Continued Quality Assurance of Reliability Data in the 3-M Database of the U.S. Navy. Completed the Ships Works Robotic Laboratory. Continued Light Distance and Ranging Technology for Shipyards. Initiated Modeling of Residual Stress in Steel Plates.
- Initiated manufacturing technology process change portfolios for DD(X), CVX, and LPD-17.

## **FY 2004 Plans:**

- Conduct 6 Best Manufacturing Practices Surveys. Complete Shipbuilding and Simulation Based Design.
- Complete the following efforts: OSHA Compliance Management System, Development of High Strength Corrosion Resistant Aluminum Alloys for Maritime Applications, and continuous improvements in Drydock Management.

## **FY 2005 Plans:**

- Conduct 8 Best Manufacturing Practices Surveys. Complete Shipbuilding and Simulation Based Design.
- Continue manufacturing technology process changes for the DD(X), CVN, and LPD-17.

## **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.

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.

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PROJECT NUMBER: Various PROJECT TITLE: Congressional Plus-Ups

## CONGRESSIONAL PLUS-UPS:

2674	FY 2003	FY 2004
MANUFACTURING TECHNOLOGY	4,303	10,285

FY 2003: Funding was used to initiate three Transformational Technology Initiatives: Technology refresh in support of the Joint Strike Fighter program, Special Delivery Vehicle (SDV) Storage Battery in support of the Navy Seals, and Tin Whisker Mitigation. Also funded were two technology solution manufacturing efforts: Salinity Cell in support of CVN-21, and Long-Life Non-Skid Surfaces on Carriers. These projects were kicked-off, transition insertion paths identified, and program plans developed. Technical engineering work is being conducted in accordance with the prescribed SOWs.

FY 2004: Funding will be 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). Initiate a study with the FNC community to look at enabling capabilities that are similar to the ManTech platforms, and select a candidate technology for ManTech affordability/transition work. Initiate a program to improve energy density to increase battery lifetime in operational (especially dismantled) units.