

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2004

BUDGET ACTIVITY

7 - Operational system development

PE NUMBER AND TITLE

0708045A - End Item Industrial Preparedness Activities

COST (In Thousands)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	79066	85853	67236	76945	80149	82119	84013	Continuing	Continuing
E25 MFG SCIENCE & TECH	58602	65313	67236	76945	80149	82119	84013	Continuing	Continuing
E27 RELIABILITY, MAINTAINABILITY & SUSTAINABILITY(RMS)	7849	0	0	0	0	0	0	0	49928
EA1 VENTURE CAPITAL	12615	0	0	0	0	0	0	0	25000
EA2 MANTECH INITIATIVES (CA)	0	20540	0	0	0	0	0	0	20558

A. Mission Description and Budget Item Justification: The goal of this program element (PE) is to improve readiness and reduce Total Ownership Cost for the Army through new manufacturing technologies and enhancements/improvements to future systems. The technologies introduced through this PE support the Army transition to the Future Combat Systems (FCS) and Future Force. This program element comprises four projects: E25 Manufacturing Technology (ManTech), E27 Reliability, Maintainability and Supportability (RM&S), E1A Venture Capital, and E2A ManTech Initiatives CA. The objective of the Army ManTech program is to provide essential manufacturing technologies that will enable affordable production and sustainment of future weapons systems. Objectives include development of advanced manufacturing processes, equipment and systems; enhancement in quality while achieving reduction in cost of Army materiel; and transferring improved manufacturing technologies to the industrial base. The ManTech program assists the Army in meeting its FCS and Future Force timetable and goals by reducing manufacturing risks and costs in the transition of new technologies into weapons systems. Projects selected for funding under this program have the potential for high payoff across the spectrum of Army weapon systems and in particular FCS as well as significant impact on national manufacturing issues and the U.S. industrial base. The major thrust of this PE is to reduce the manufacturing cost and risk of FCS technologies. Army ManTech projects are aligned into major investment areas to support Army Transformation to FCS and the Future Force. These major investment areas are Aviation Systems, Fire Support Systems, Armor, Sensors, Electronics/Power Systems, Munitions and Flexible Display Initiative. The RM&S program, which is focused on cost reduction of legacy systems, does not support these major investments and terminates after FY2003 and funds are reapplied to the ManTech effort. The Venture Capital initiative is an opportunity provided by Congress to engage small innovative companies that normally do not do business with the Army. The ManTech Initiatives CA program consists of ManTech efforts mandated by the Congress.

The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP).

The PE contains no duplication with any effort within the Military Departments.

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<u>B. Program Change Summary</u>	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2004)	74728	65981	67706
Current Budget (FY 2005 PB)	79066	85853	67236
Total Adjustments	4338	19872	-470
Congressional program reductions		-737	
Congressional rescissions			
Congressional increases		20750	
Reprogrammings	4338	-141	
SBIR/STTR Transfer			
Adjustments to Budget Years			-470

Significant Change Explanation.

FY04 - Ten FY04 Congressional Adds totaling \$20750 were added to this PE.

FY04 Congressional Adds with no R-2A:

(\$2018) Lean Munitions, Project EA2: The Lean Munitions Congressional add is to demonstrate in three phases, the prototype functionality for model-driven, standards-based, web-enabled business process, along with advanced toolsets for more timely and effective creation, distribution and management of munitions. No additional funding is required to complete this project.

(\$961) Conformal and Advanced Optics Manufacturing Technology, Project EA2: The purpose of this one year Congressional add will introduce new technology in the development of complex conformal and advanced optical elements for advanced DoD optical systems and weapon platforms by using superfine deterministic micro grinding and jet magnetorheological finishing. No additional funding is required to complete this project.

(\$961) Industrial Preparedness Manufacturing Science and technology, Project EA2: The purpose of this one year Congressional add is to validate dual-band focal plane array system readiness and demonstrate long-term reliability. No additional funding is required to complete this project.

(\$1153) Microwave Wastewater treatment System, Project EA2. The purpose of this one year Congressional add is to improve Force Provider System logistics through advanced treatment reduction and filtration methods for waste products. No additional funding is required to complete this project.

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(\$962) 21st Century High Tech, Legacy Parts Reinvention, Project EA2: The purpose of this one year Congressional add is to mature the processes to develop three dimensional (3D) computer assisted modeling/computer assisted design (CAM/CAD) models to define a virtual part to replace obsolete structural parts. No additional funding is required to complete this project.

(\$1442) 21st Century High Tech, Legacy Parts Reinvention -- Watervliet, Project EA2: The purpose of this one year Congressional add is to mature the processes to develop three dimensional (3D) computer assisted modeling/computer assisted design (CAM/CAD) models to define a virtual part to replace obsolete structural parts. No additional funding is required to complete this project.

(\$5767) Femtosecond Laser, Project EA2: The purpose of this one year Congressional add is to mature specification for first generation micro machine tool for fuel injectors to improve diesel engine efficiency. No additional funding is required to complete this project.

(\$3267) National Center for Defense Manufacturing and Machining, Project EA2: The purpose of this one year Congressional add is to develop, mature and deploy to industry advanced processes in manufacturing and machining related to advanced material development. No additional funding is required to complete this project.

(\$2451) Reactive Atom Plasma (RAP) Processing, Project EA2: The purpose of this one year Congressional add is to mature the technology for a new form of polishing at the micron/nano level to achieve unprecedented finishes. No additional funding is required to complete this project.

(\$961) Bipolar Wafer-Cell NiMH Battery for Army Vehicles, Project EA2: The purpose of this one year Congressional add is to continue development of larger batteries used in vehicles for the silent watch program. No additional funding is required to complete this project.

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PROJECT

E25

COST (In Thousands)	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	Cost to	Total Cost
	Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Complete	
E25 MFG SCIENCE & TECH	58602	65313	67236	76945	80149	82119	84013	Continuing	Continuing

A. Mission Description and Budget Item Justification: The major thrust of the Army Manufacturing Technology (ManTech) program is to reduce manufacturing cost and risk of FCS technologies. This project provides essential manufacturing technologies that will enable the affordable production and sustainment of future weapon systems including FCS and Future Force. ManTech also enables the affordable transition of new technologies as enhancements to current systems. Objectives include development of advanced manufacturing processes, equipment and systems; enhancement in quality while achieving reduction in cost of Army materiel; and transferring improved manufacturing technologies to the industrial base. The ManTech program assists the Army in meeting its FCS and Future Force timelines and goals by reducing manufacturing risks and costs in the transition of new technologies into weapons systems. Projects selected for funding under this program have the potential for high payoff across the spectrum of Army weapon systems as well as significant impact on national manufacturing issues and the U.S. industrial base. Other factors considered for project selection include cost share with both industry and the program managers as well as return on investment. Major programs are identified as Manufacturing Technology Objectives (MTOs). Army ManTech projects are aligned into major investment areas to support Army Transformation to FCS and the Future Force. These major investment areas are Aviation Systems, Fire Support Systems, Armor, Sensors, Electronics/Power Systems, Munitions and Flexible Display Initiative. The ManTech program is a critical enabler of affordable Transformation Programs that support the Critical Operational Goals (COGs) of Project and Sustain U.S. Forces (PSUSF), Deny Enemy Sanctuary (DES), Conduct Information Operations (CIO), and Leverage Information Technology (LIT). These Transformation Programs also directly support the Joint Operating Concepts (JOCs) of Major Combat Operations (MCO), Strategic Defense (SD), Homeland Security (HLS), and Stability Operations (SO).

The cited work is consistent with the Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP).

This project contains no duplication with any effort within the Military Departments.

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Accomplishments/Planned Program

Aviation Systems – In FY03, the Power Transfer Systems Manufacturing Demonstrations (MD) demonstrated increased durability on CH-47 gears and transitioned technology to the program manager for implementation; the Knowledge and Process Tools for Manufacturing of Affordable Composites MTO demonstrated and documented reduction in fabrication labor and weight of AH-64 and advanced rotary wing platforms, and thick section composite structures and matured advanced design and manufacturing concepts for airframe integration within FCS; the Low Cost Light Weight Structures MTO conducted tests on critical joints and ballistic panels to reduce manufacturing risk of new technologies being considered for current rotorcraft fuselage structures; and the Affordable Drive Train Housings MTO conducted material and process selection for housings. The planned program for FY04 and FY05 will construct tooling and complete the manufacturing process plan for CH-47 and UH-60 helicopter fuselage sections and demonstrate fabrication using soft tooling, new resin injection techniques and preforms to reduce O&S costs; and conduct material and process selection for housings that reduce weight, increase performance, and demonstrate rapid affordable manufacturing processes for composite housings to reduce the number of AH-64 housings lost and UH-60 housing unit weight. Supports the Project and Sustain U.S. Forces (PSUSF) Critical Operational Goal.

FY 2003

6495

FY 2004

5831

FY 2005

1687

Fire Support Systems – In FY03, the Uniform Cannon Tube Reshaping MTO conducted proof tests and demonstrated a fully automated cannon tube reshaping machine at Watervliet Arsenal; the Large Caliber Cannon Life Extension MTO completed construction of a 120mm large caliber cylindrical magnetron sputtering process for depositing refractory metal tantalum onto the bore surfaces of large caliber cannon barrels. The planned program for FY04 and FY05 will deliver the Shop Floor Cannon Tube Reshaping System, and Centerline and Erosion Measurement System to improve firing accuracy; mature forensic evaluation of full-length barrels, and complete post-firing of 120mm Abrams barrels and transition barrels for production and increase gun barrel wear resistance for the 120mm and 155mm cannon. Supports the PSUSF Critical Operational Goal.

5000

1500

0

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BUDGET ACTIVITY 7 - Operational system development		PE NUMBER AND TITLE 0708045A - End Item Industrial Preparedness Activities		PROJECT E25
Accomplishments/Planned Program (continued)		FY 2003	FY 2004	FY 2005
<p>Armor – In FY03, Improved Manufacturing Methods of Titanium in Ultra-Lightweight Armament and Ground Vehicle Systems MTO developed and demonstrated advanced welding and single melt processing of titanium which has enabled this material to be a replacement to high cost aerospace-grade titanium; the Knowledge and Process Tools for Manufacturing of Affordable Composite Structures (Ground Vehicles) MTO matured low cost composite tooling, implemented lay-up techniques with robotic equipment and demonstrated potential cost savings for several thick section composite parts; and the Low Cost Affordable ManTech for FCS Structural and Appliqué Armor MTO baseline armor material processes. The planned program for FY04 and FY05, will optimize titanium single melt process, test and apply robotic welding to XM777 lightweight howitzer and FCS components and transfer processes to contractor locations to reduce cost and weight; develop and mature manufacturing processes to enable affordable transition of armor material required for FCS ground vehicles to provide protection from ballistic threat, enhance vehicle running loads and contribute to weight reduction. The Durable Gun Barrel and Armaments MTO begins in FY04 and will demonstrate advanced lightweight large caliber manufacturing processes and medium caliber gun barrel coatings to enable lethality and enhanced weapon life; in FY05 this project will develop profiles and construct demonstration articles utilizing advanced steel alloys, composite barrel overwrap and thin wall cladding to meet requirements of FCS gun barrels. Supports the PSUSF Critical Operational Goal.</p>		5922	10268	13330
<p>Sensors – In FY03, the Military Lasers MTO baseline existing laser diode manufacturing processes and improved base material growth and processing to enable lightweight, reliable solid state laser systems; the Dual Band Focal Plane Array(FPA) MTO began optimization of manufacturing processes to include material growth, small pixel fabrication and read-out integrated circuits; Uncooled Focal Plane Array MTO began packaging improvement design, wafer level testing and bolometer fabrication to improve producibility and reduce cost of high resolution uncooled Infrared (IR) sensors. The planned program for FY04 and FY05 will increase laser diode power from 2 watts to 4 watts for Objective Individual Combat Weapon laser and improve epitaxial growth and other fabrication processes; increase wafer fabrication to 25 cm2, increase detector growth by 15% and process yield by 25% for dual band focal plane arrays; increase yield by 15%, reduce unit man-hours by 156 and reduce cycle time by (2) weeks to increase yield, performance, production cycle time, and reliability for uncooled focal plane arrays. Supports the PSUSF and Deny Enemy Sanctuary (DES) Critical Operational Goals.</p>		15722	21994	20949

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Accomplishments/Planned Program (continued)

Electronic/Power Systems – In FY03, the Silicon Carbide Switches MTO documented baseline processes, and began improved base material yield and fabrication processes to enable affordable, high power density power converters which are necessary for electronic guns and electromagnetic armor. Power Storage Systems MTOs (Power Storage Manufacturing, Very High Power Batteries and Energy Storage Manufacturing, High Energy Density Capacitors) are scheduled to begin in FY04. The planned program for FY04-FY05, will mature manufacturing processes in the area of silicon carbide production technology; provide manufacturing technology processes to reduce risk and cost associated with electronically scanned array (ESA) phase array shifting switches; and will address advanced power storage technologies and model manufacturing processes with a focus on batteries and capacitors for FCS robotics and sensors. The Flexible Assembly for Software Defined Radios MTO begins in FY05 and will provide chip scale packaging and aggressive power management design reducing volume/size and weight by 85% for FCS manned, Unmanned, and Soldier Systems Communications. Supports PSUSF and DES Critical Operational Goals.

FY 2003

2087

FY 2004

11222

FY 2005

16196

Munitions– In FY03, the Low Cost, High G, Micro-Electro-Mechanical Systems (MEMS) Inertial Measurement Units (IMU) developed improved process flow, automated equipment, and improved control software for first generation IMUs. The planned program for FY04 and FY05 will evaluate equipment and software concerns and complete processes improvements and testing for second generation IMUs. The Micro-Electro-Mechanical Systems (MEMS) Safe and Arm (S&A) MTO begins in FY04 and will use micro-injection molding, hot embossing, and loading technologies to provide a low cost medium-caliber fusing solution for XM29 (OICW) and XM307 (OCSW) combat weapons, and in FY05 will improve MEMS S&A fabrication, demonstrate loading processes and fire from the XM29 platform. Supports PSUSF and DES Critical Operational Goals.

9088

10642

12074

Flexible Display Initiative – This project begins in FY04 and is supported by science and technology in PE 62705. This technology will develop and demonstrate, light, low powered, rugged, miniature flexible displays for FCS and soldier systems. This project will address the affordability and manufacturing yield issues required to transition this technology to soldier systems. Efforts will focus on the design and manufacturing concepts for complex transparent conductive and emissive material, manufacturing processes, fabrication, assembly, quality control, and manufacturing yield. Supports PSUSF, Conduct Information Operations (CIO0, and Leveraging Information Technology (LIT) Critical Operational Goals.

0

2000

3000

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Accomplishments/Planned Program (continued)	FY 2003	FY 2004	FY 2005
Rechargeable Bipolar Wafer Cell NiMH Battery for SINCGARS Congressional add included nickel and hydride electrodes, separator, single cell testing, bipolar packing, ten cell stack, battery fabrication and testing, and improving performance at low temperatures and higher rates of discharge. In FY 03 the program matured processes for larger batteries used in vehicles for the silent watch program. No additional funding is required to complete this project.	940	0	0
Industrial Applications of Femtosecond Laser Technology Congressional add matured specification for first generation micro machine tool for fuel injectors to improve diesel engine efficiency. No additional funding is required to complete this project.	3948	0	0
Continuous Manufacturing for Metal Matrix Composites Congressional add produced and evaluated improved strength mortar tubes and artillery shells, conducted projectile firing, and demonstrated a metal matrix composites tape manufacturing line. No additional funding is required to complete this project.	423	0	0
Modular Extendable Rigid Wall Shelter (MERWS) Congressional add addressed manufacturing and design issues to reduce shelter costs associated with panel construction, leveling jacks and roof trusses. No additional funding is required to complete this project.	4559	0	0
Reactive Atom Plasma Processing Congressional add matured the technology for a new form of polishing at the micron/nano level to achieve unprecedented finishes. No additional funding is required to complete this project.	2068	0	0
21st Century High Technology for Legacy Parts Reinvention Congressional add matured the processes to develop 3D CAM/CAD models to define a virtual part to replace obsolete structural parts. It leveraged computer numerical control manufacturing (material removal) and sintering (material addition) to produce first article parts for testing and production. No additional funding is required to complete this project.	940	0	0
National Center for Defense Manufacturing and Machining Congressional add developed and matured advanced processes in manufacturing and machining related to advanced material development. No additional funding is required to complete this project.	1410	0	0
Small Business Innovative Research/Small Business Technology Transfer Programs	0	1856	0
Totals	58602	65313	67236

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<p><u>B. Other Program Funding Summary:</u> Not applicable for this item.</p> <p><u>C. Acquisition Strategy:</u> Not applicable for this item.</p>		