

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)**February 2003****BUDGET ACTIVITY****7 - Operational system development****PE NUMBER AND TITLE****0708045A - End Item Industrial Preparedness Activities**

COST (In Thousands)	FY 2002 Actual	FY 2003 Estimate	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	98769	74728	65981	67706	77460	80628	82569	84457	0	710930
E25 MFG SCIENCE & TECH	61059	56859	65981	67706	77460	80628	82569	84457	0	636002
E27 RELIABILITY, MAINTAINABILITY & SUSTAINABILITY(RMS)	12710	17869	0	0	0	0	0	0	0	49928
EA1 VENTURE CAPITAL	25000	0	0	0	0	0	0	0	0	25000

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 Objective Force (OF). This program element comprises three projects: E25 Manufacturing Technology (ManTech), E27 Reliability, Maintainability and Supportability (RM&S) and EA1 Venture Capital. 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 OF 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 OF. These major investment areas are Aviation Systems, Fire Support Systems, Armor, Sensors, Electronics/Power Systems 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 Army Venture Capital (VC) initiative is an opportunity provided by Congress to engage small innovative companies that normally do not do business with the Army. The VC focus is on power and energy technology to support the soldier.

The work in this PE is consistent with the Army S&T Master Plan (ASTMP), the Army Modernization Plan and Project Reliance. The PE contains no duplication with any effort within the Military Departments.

No Defense Emergency Response Funds (DERF) were provided to the program.

This program supports the Objective Force transition path of the Transformation Campaign Plan.

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<u>B. Program Change Summary</u>	FY 2002	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2003)	77863	61025	69315	71104
Current Budget (FY 2004/2005 PB)	98769	74728	65981	67706
Total Adjustments	20906	13703	-3334	-3398
Congressional program reductions				
Congressional rescissions		-1055		
Congressional increases		17300		
Reprogrammings	23035	-433		
SBIR/STTR Transfer	-2129	-2109		
Adjustments to Budget Years			-3334	-3398

Change Summary Explanation:

FY03 (+\$17300) Congressional Adds totaling \$17300 (as noted below) added to this program element.

FY03 Congressional adds:

Industrial Short Pulse Laser Development/Femtosecond Laser, Project E25 (\$4200), Reactive Atom Plasma Processing, Project E25 (\$2200), 21st Century High Technology for Legacy Parts Reinvention, Project E25 (\$1000), Bipolar Wafer Cell NiMH Battery, Project E25 (\$1000), Continuous Manufacturing Process for Metal Matrix Composites, Project E25 (\$450), ManTech for Cylindrical Zinc Air Battery for Landwarrior System, Project E25 (\$2100), Modular Extendable Rigid Wall Shelter (MERWS) – Phase II, Project E25 (\$4850), and National Center for Defense Manufacturing and Machining, Project E25 (\$1500).

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COST (In Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
E25	MFG SCIENCE & TECH	61059	56859	65981	67706	77460	80628	82569	84457	0	636002
<p><u>A. Mission Description and Budget Item Justification:</u>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 OF. 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 OF 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). Short term programs are identified as Manufacturing Demonstrations (MDs). The cited work is consistent with the Army S&T Master Plan (ASTMP), the Army Modernization Plan and Project Reliance. The project contains no duplication with any effort within the Military Departments. Army ManTech projects are aligned into major investment areas to support Army Transformation to FCS and the Objective Force. These major investment areas are Aviation Systems, Fire Support Systems, Armor, Sensors, Electronics/Power Systems, and Flexible Display Initiative.</p> <p>No Defense Emergency Response Funds (DERF) were provided to the project.</p> <p>This project supports the Objective Force transition path of the Transformation Campaign Plan.</p>											

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<u>Accomplishments/Planned Program</u>		FY 2002	FY 2003	FY 2004	FY 2005
Aviation Systems –In FY02, the Power Transfer Systems Manufacturing MD demonstrated extended service life of tail rotor gearboxes. The Knowledge and Process Tools for Manufacturing of Affordable Composites MTO demonstrated reduction in fabrication labor of composite structures. The Low Cost Light Weight Structures MTO and the Affordable Drive Train Housings MTO begin in FY03. The program for FY03-FY05, will enhance the spiral bevel gear, improve the manufacturing process, and provide a reduction in drive weight ratio for rotary wing aircraft. It will also mature advanced design and manufacturing concepts for complex composite structures, reduce assembly labor, demonstrate composite prototypes, conduct structural tests, and implement airframe integration for FCS. This will reduce weight, increase performance, and demonstrate rapid affordable manufacturing processes for composite housings. The benefits will be a reduction of AH-64 housings lost and UH-60 and RAH-66 housing unit weight, demonstrate fabrication using soft tooling, new resin injection techniques and preforms, and provide cost reduction and O&S cost savings to the aviation fleet.		1197	4867	6082	2795
Fire Support Systems –In FY02, the Uniform Cannon Tube Reshaping MTO fabricated a fully automated cannon tube reshaping machine; the Low Cost, High-G, Micro-Electro-Mechanical Systems (MEMS) Inertial Measurement Units (IMU) project defined system processes to include modeling process flow, assembly, test and yield for first generation IMU; the Objective Individual Combat Weapon (OICW)/ Objective Crew Served Weapon (OCSW) MTO completed limited production of the OICW warhead and conducted preliminary evaluation of components to demonstrate guidance and control system cost reductions Army missiles; and the Large Caliber Cannon Life Extension MTO completed the design of large caliber cylindrical magnetron sputtering coatings for depositing refractory metal tantalum onto the bore surfaces of large caliber cannon barrels. The planned program for FY03-FY05 will deliver the Shop Floor Cannon Tube Reshaping System, and Centerline and Erosion Measurement System to improve firing accuracy; begin manufacturing and process control development for 2nd generation IMU and reduce IMU unit cost; 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.		16449	16708	8629	9020

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PROJECT

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E25

FY 2002

FY 2003

FY 2004

FY 2005

Armor – In FY02, Improved Manufacturing Methods of Titanium in Ultra-Lightweight Armament and Ground Vehicle Systems MTO demonstrated advanced welding and single melt processing of titanium on M240 machine gun and transferred robotic welding technology to an advanced combat vehicle manufacturer; and the Knowledge and Process Tools for Manufacturing of Affordable Composite Structures (Ground Vehicles) MTO demonstrated full integration of automation and sensor-based intelligent process control for composite ballistic hull and turret structures. The planned program for FY03-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; conduct alternative resins manufacturing trials to broaden commercial base and extend service temperatures of ballistic structures, incorporate FCS armor tile “encapsulation” into previously demonstrated processes, and mature depot level repair solutions; and will mature low cost composite tooling, implement lay-up techniques with robotic equipment and demonstrate potential cost savings for several parts. Low Cost Affordable ManTech for FCS Structural and Appliqué Armor MTO begins in FY03 and will develop and mature manufacturing processes to enable affordable transition of composites (organic and hybrid ceramic) materials required for FCS ground vehicles. These composites will provide protection from ballistic threat, enhance vehicle running loads and contribute to weight reduction.

3183

4157

$$\frac{12004}{5495}$$

1 2005
9407

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<u>Accomplishments/Planned Program (continued)</u>			<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
Sensors –In FY02, the IR Cooled and Uncooled Staring Sensors MTO increased performance for emerging weapons systems and accelerated the production of affordable monolithic uncooled focal plane arrays operating in the mid to long wave IR bands; and the Conformal Optics MTO integrated advanced optics processes within OICW fire control system to reduce weight and defined process tools for manufacturing of a new generation of missile window domes and mirrors for surveillance systems. The planned program for FY03-05 will address Military Lasers and the Dual Band Focal Plane Array (FPA). The Military Lasers MTO begins in FY03. This project will provide manufacturing processes for diode pumped lasers, which will reduce size and weight of laser systems and enable lightweight laser designators (3lb) for soldiers and Unmanned Aerial Vehicle (UAV) applications. In FY03, this project will determine the baseline for process yields, throughput, cycle times; increase 930 nm laser diodes from 2 watts to 4 watts/200 mm device for Objective Individual Combat Weapon laser. In FY04, it will improve Epitaxial growth to increase yield to 40%. In FY05, it will reduce cost of unmounted bars to \$1/peak watt and improve reliability for 60° C operation and military OPTEMPO cycles. The Dual Band FPA MTO begins in FY03. This project will provide manufacturing processes to produce affordable detector/dewar assemblies with cryogenic cooler providing digital video output to be integrated into higher assembly infrared sensors. In FY03, it will baseline the processes and defines Smart FPA features. In FY04, it will increase wafer fabrication to 35 cm2 and improve interconnects. In FY05, it will increase detector growth by 15% and process yield by 20%.			7430	13827	19130	18863
Electronic/Power Systems –Silicon Carbide Switches MTO, and 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. Efforts in Software Defined Radio Manufacturing and Micro-Electro Mechanical Systems (MEMS) Tenna Switch/Ferroelectric Switch Electronically Scanned Array (ESA) Manufacturing will be initiated in FY03. The planned program for FY04-FY05, will mature manufacturing technology processes related to software defined radios; mature manufacturing processes in the area of silicon carbide production technology; provide manufacturing technology processes to reduce risk and cost associated with 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.			0	0	24684	24676

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<u>Accomplishments/Planned Program (continued)</u>			<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
Flexible Display Initiative – This project begins in FY04 and is supported by science and technology in PE 62705. This technology will develop and deploy, 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.			0	0	1961	2945
ManTech for Munitions Totally Integrated Munitions Enterprise Congressional add demonstrated enterprise architecture for design and manufacture of munitions components to meet surge/replenishment needs. Goal: Mature manufacturing technologies essential to reducing the cost of munitions production, reducing product variability, and enabling production of emerging munitions such as those needed for FCS. No additional funding is required to complete this project.			11200	0	0	0
Totally Integrated Munitions Enterprise Congressional add demonstrated manufacturing processes for 155mm modular charge system that reduced costs and increased quality, demonstrated explosive formulations for next generation munitions applications, and demonstrated manufacture for composite cartridge cases for FCS applications, significantly improving reproducibility and lowering costs. Goal: Mature manufacturing technologies essential to the affordable production of conventional and precision munitions. No additional funding is required to complete this project.			7000	0	0	0
Laser Peening Technology for Aircraft and Ground Equipment Congressional add began standardization of data for laser shock peened materials and construction of a Laser Shock Peen Manufacturing Cell to increase component life and decrease maintenance cost of helicopters and ground vehicles. No additional funding is required to complete this project.			1000	0	0	0
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. FY 03 funding was added to the program for continuation of the development of larger batteries used in vehicles for the silent watch program. No additional funding is required to complete this project.			1000	1000	0	0
Industrial Applications of Femtosecond Laser Technology Congressional add to mature specification for first generation micro machine tool for fuel injectors to improve diesel engine efficiency. FY03 funding was added to continue the project. No additional funding is required to complete this project.			4200	4200	0	0
Force Provider Microwave Wastewater Treatment Congressional add to prepare for field scale prototype development and testing to demonstrate a new wastewater treatment system. No additional funding is required to complete this project.			1400	0	0	0

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<u>Accomplishments/Planned Program (continued)</u>		FY 2002	FY 2003	FY 2004	FY 2005	
ManTech Program for Cylindrical Zinc Batteries Congressional add had contract award in June 02. FY03 funding was added to continue the cell assembly stations, automated cell assembly, automated battery assembly, and quality control standards and testing. No additional funding is required to complete this project.		1800	2100	0	0	
Continuous Manufacturing for Metal Matrix Composites Congressional add to mature metal matrix composites tape manufacturing line to achieve improved strength of materials at reduced weight for advanced artillery shells and mortar tubes. FY03 funding was added to continue the project. No additional funding is required to complete this project.		2600	450	0	0	
Modular Extendable Rigid Wall Shelter (MERWS) Congressional add to address manufacturing issues of the shelter components and design issues to reduce shelter costs. FY03 funding was added to continue the project. No additional funding is required to complete this project.		2600	4850	0	0	
Reactive Atom Plasma Processing Congressional add matures 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.		0	2200	0	0	
21st Century High Technology for Legacy Parts Reinvention Congressional add matures the processes to develop 3D CAM/CAD models to define a virtual part to replace obsolete structural parts. It leverages 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.		0	1000	0	0	
National Center for Defense Manufacturing and Machining Congressional add will 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.		0	1500	0	0	
Totals		61059	56859	65981	67706	
 <u>B. Other Program Funding Summary:</u> Not applicable for this item.						
 <u>C. Acquisition Strategy:</u> Not applicable for this item.						