ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2005

BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
0602705A - ELECTRONICS AND ELECTRONIC DEVICES

COST (In Thousands)		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 Program Element (PE) Cost		76609	102768	39554	41536	43629	46862	47320	47728
EM4	ELECTRIC COMPONENT TECHNOLOGIES (CA)	7013	23008	0	0	0	0	0	0
EM6	HEATING AND COOLING TECHNOLOGIES (CA)	4383	3451	0	0	0	0	0	0
EM7	POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)	29160	36266	0	0	0	0	0	0
H11	BATTERY/IND POWER TECH	6913	11877	12167	12669	12108	12076	12180	12269
H17	FLEXIBLE DISPLAY CENTER	0	0	4965	5084	5047	5046	5094	5105
H94	ELEC & ELECTRONIC DEV	29140	28166	22422	23783	26474	29740	30046	30354

A. Mission Description and Budget Item Justification: This program element provides enabling capabilities for the Future Force and, where feasible, exploits opportunities to enhance Current Force capabilities by researching and investigating technologies in areas such as electronic components, power components, frequency control and timing devices, and display technologies. The objective of the program is provide technologies to perform precision deep fires against critical mobile and fixed targets, to provide exceptional all-weather, day or night, theater air defense against advanced enemy missiles and aircraft; and to provide enhanced communications and target acquisition for Future Combat Systems (FCS) and Future Force Warrior applications. Project H11 will provide future Soldiers and other Future Force platform applications low weight and volume, safe, reliable and cost effective power sources, reduced system power requirements, increased mission duration and reduced cost and logistics burden. Project H94 consists of research in the physical sciences essential to all land combat systems that contain any of the following component technologies: electronics, photonics, flexible displays, micro electromechanical systems, imaging laser radar (ladar), magnetic materials, ferroelectrics, microwave and millimeter-wave components, batteries, electromechanical systems (engine generator sets) and fuel cells. Project H17 supports research at the new Flexible Display Center to enhance battlefield situational awareness, increased vehicle mobility, survivability and lethatlity, while reducing acquisition and support costs. Supported capabilities include autonomous missile systems, advanced land combat vehicles, smart anti-tank munitions, electric weapons, secure jam-resistant communications, automatic target recognition (ATR), foliage-penetrating radar, and combat identification. It supports all of the science and technology thrust areas that employ electronic and portable power-source technology. Work in this PE is related to and fully coordinated with efforts in PE 0602120 (Sensors & Electronic Survivability), PE 0602782 (Command, Control, Communications Technology), PE 0602709 (Night Vision Technology), PE 0602783 (Computer and Software Technology), PE 0603008 (Command, Control, Communications Advanced Technology), and PE 0603772 (Advanced Tactical Computer Science and Sensor Technology). 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). Work is performed by th

e Army Research Laboratory and the Army Communications and Electronics Research Development and Engineering Center, Fort Monmouth NJ.

B. Program Change Summary	FY 2005	FY 2006	FY 2007
Previous President's Budget (FY 2005)	41236	45919	43609
Current Budget (FY 2006/2007 PB)	102768	39554	41536
Total Adjustments	61532	-6365	-2073
Net of Program/Database Changes			
Congressional Program Reductions	-1501		
Congressional Rescissions			
Congressional Increases	65430		
Reprogrammings			
SBIR/STTR Transfer	-2397		
Adjustments to Budget Years		-6365	-2073

Change Summary Explanation:
FY06 - Funds realigned ($6365K) to higher priority requirements.

Thirty Four FY05 Congressional Adds totaling $65430 were added to this PE.

FY05 Congressional adds with no R-2A:
Advanced High-Energy Rechargeable Lithium Air Battery, Project EM7 ($1918)
Advanced Power Component Technologies, Project EM7 ($959)
Advanced Simplified Hybrid Fuel Cell/LiON Battery Program for the Future Force Warrior, Project EM7 ($959)
Battery Returns in Error Advanced Vehicle Battery Management Program (Phase II), Project EM7 ($959)
CFx Electrochemical Systems for Safe Soldier Power, Project EM7 ($959)
Conformal Lithium Ion Polymer Belt Battery, Project EM7

($959)
Cylindrical Zinc Air Battery for Future Soldier Communications Systems, Project EM7 ($959)
Direct Diode Electro-Optical Source, Project EM4 ($5276)
Dry Polymer Electrolyte Development for Safe Soldier Power, Project EM7 ($3098)
E-Beam Reticle and Lithography Inspection, Project EM4 ($6137)
Flexible Display Initiative: High Performance Displays for Military Applications, Project EM4 ($5370)
Flexible Polymer Multilaminate Packaging, Project EM7 ($1918)
High Power Solid State Lasers, Project EM4 ($959)
Integrated Methanol Fuel Cell/Reformer, Project EM7 ($959)
JP-8 Soldier Fuel Cell, Project EM7 ($959)
Liquid Silicone Lithium Rechargeable Battery, Project EM7 ($1439)
Lithium Metal Air Battery, Project EM7 ($719)
Low Cost Power Generation Platforms and Electric Power Control Hybrid Vehicles, Project EM7 ($1630)
Metal Oxide Cathode – 1.5v Alkaline, Project EM7 ($1200)
Nanofluidic Electronic Sensor Technologies for Defense Applications, Project EM4 ($1438)
Novel Zinc Air Power Sources for Military Applications, Project EM7 ($959)
ONAMI Miniature Tactical Energy Systems Development, Project EM7 ($2397)
PEM Fuel Cell Quiet Tactical Generators, Project EM4 ($959)
Portable Reforming on the Battlefield, Project EM7 ($959)
Rapid Recharge, Lithium-ion Battery Pack, Project EM7 ($2493)
Rechargeable Cylindrical Cell System-Lithium Ion/Nickel Metal Hydride, Project EM7 ($1438)
Ring Extruder, Project EM4 ($2397)
Software Defined Radio Communications Interoperability Initiative, Project EM7
($1007) Soldier Fuel Cell System, Project EM7 ($1438)
Soldier Portable Fuel Cell Power, Project EM7 ($2350)
State of Charge Battery Life Indicator, Project EM7 ($1534)
Transcritical CO2 Environmental Control Unit, Project EM6 ($3452)
Universal Radio Frequency Identification (RFID) Monitoring Device, Project EM7 ($959)
Weapons of Mass Destruction Marking Set, Project EM7 ($1630)

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2005

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602705A - ELECTRONICS AND ELECTRONIC DEVICES**	**H11**

COST (In Thousands)		FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
H11	BATTERY/IND POWER TECH	6913	11877	12167	12669	12108	12076	12180	12269

A. Mission Description and Budget Item Justification: This project conducts applied research to identify, advance and enhance emerging power generation, energy storage, and power management technologies for the Future Force and, where feasible, exploits opportunities to enhance Current Force capabilities. This project researches advancements in electrochemistry, energy conversion, and signature suppression technologies, including those for primary batteries, rechargeable battery hybrids, fuel cells, power management, and components for electromechanical power generation. There is a critical need for ultra-lightweight man portable power, chargers, and power management for the dismounted soldiers. The Soldier Hybrid Power and Smart Chargers effort investigates high energy and high power density hybrid power source components including rapid recharging methods using smart chargers, fuel cell systems, and smart rechargeable batteries. It also investigates novel power management methods through low power design tools and software operating system dynamic power management. The Silent Mobile power effort funds research in power sources that are smaller and more fuel-efficient enabling tactical sustainability and survivability. Both efforts will provide future soldiers and other future force platform applications low weight and volume, safe, reliable, cost-effective power sources, reduced system power requirements, increased mission duration and reduced cost and logistics burdens.

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). Work in this project is performed by the Army Research, Development and Engineering Command, Communications-Electronics Research, Development, and Engineering Center, Fort Monmouth, NJ.

Accomplishments/Planned Program	FY 2004	FY 2005	FY 2006	FY 2007
- Soldier Hybrid Power and Smart Chargers: Develop and evaluate hybrid power sources, rapid battery chargers, and power management technologies in order to decrease soldier load, increase power capabilities, and decrease battery costs. In FY04, demonstrated a safe, 2 pound, 170 Wh/kg lithium-ion polymer rechargeable battery; and demonstrated power management approaches for soldier systems. In FY05, investigate system level stand-alone smart charger technology with 2-hour recharge capability for soldier batteries; investigate power management techniques to reduce operating system power draw for soldier systems by 50%. In FY06, will develop and evaluate logistic fueled small Stirling engine generator components for silent manportable (<10kg) power <500 W; will demonstrate a hybrid battery/liquid fuel power source. In FY07, will investigate system-level smart chargers integrated with a quiet power source for stand-alone charging.	4843	7613	7817	8168
- Silent Mobile Power: Investigate component and system level power technologies that will provide higher energy, reduced weight, quiet, more fuel and cost efficient power generation sources, including silent mobile power sources, and tactical power management systems. In FY04, evaluated 10-kilowatt proof-of-concept system components leading to quiet, smaller, and fuel-efficient generator. In FY05, develop components for a 2 kW fuel processing system operating on low-sulfur fuel (<50 parts per million sulfur). In FY06, will investigate fuel cell reformer components for 1-2 kilowatt system for scout vehicle silent watch; will investigate and mature logistic fueled Stirling engine generator components for silent mobile (for vehicle/trailer platforms) power >1kW; will evaluate integrated 2 kW fuel processing system operating on low-sulfur fuel. In FY07, will investigate system-level heat-driven cooling components for application to tactical co-generation systems; will evaluate components for 2 kW fuel processing system operating on high sulfur fuel (>300 parts per million sulfur).	2070	4264	4350	4501
Totals	6913	11877	12167	12669

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February 2005

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602705A - ELECTRONICS AND ELECTRONIC DEVICES**	**H17**

COST (In Thousands)		FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
H17	FLEXIBLE DISPLAY CENTER	0	0	4965	5084	5047	5046	5094	5105

A. Mission Description and Budget Item Justification: This project funds the new Flexible Display Center at Arizona State University. The objective of this project is to conduct applied research in advanced and novel electronic displays. This research supports thrusts aimed at enhanced battlefield situational awareness, increased vehicle mobility, survivability, and lethality, reduced acquisition cost, and reduced operations and support costs. Areas of investigation include: lightweight, low power and rugged flexible displays. 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). Work in this project is performed by the Army Research Laboratory (ARL). Note: This project was previously funded in PE 0602705A Project H94 and is a restructuring of ongoing research into a distinct project for visibility and management oversight.

Accomplishments/Planned Program	FY 2004	FY 2005	FY 2006	FY 2007
- In FY04 and FY05, this effort was funded in this PE under Project H94. The Army established a Flexible Display Center at Arizona State University to develop flexible display technology demonstrations for future vehicle and future Soldier applications. In FY06, will investigate 4" diagonal Active Matrix reflective displays from pilot line. In FY07, will investigate 4" diagonal Active Matrix emissive displays from pilot line. Management and applied research will be conducted by ARL in collaboration with Natick Soldier Center, the center, industry, and other university partners.	0	0	4965	5084
Totals	0	0	4965	5084

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February 2005

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602705A - ELECTRONICS AND ELECTRONIC DEVICES**	**H94**

COST (In Thousands)		FY 2004 Actual	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
H94	ELEC & ELECTRONIC DEV	29140	28166	22422	23783	26474	29740	30046	30354

A. Mission Description and Budget Item Justification: The objective of this project is to conduct applied research in electronics and electronic devices including opto-electronics to support advanced power and energy generation and storage, Command, Control, Communications, Computers (C4) and Intelligence, Surveillance and Reconnaissance (ISR) technologies for the Future Force. This research supports thrusts aimed at enhanced battlefield situational awareness, increased vehicle mobility, survivability, and lethality, reduced acquisition cost, and reduced operations and support costs.

Areas of investigation include: low noise clocks and oscillators; lasers and focal plane arrays for eye safe laser radar and standoff target acquisition sensors like forward-looking infrared (FLIR); micro-electromechanical systems (MEMS) for multi-function radio frequency (RF) applications as well as smart munitions; advanced RF modules to support radars and communications systems, high temperature high power inverter circuits for electric drives; prognostics and diagnostics to reduce logistics demands; micro-power generators, and advanced batteries, fuel reformers, and fuel cells for hybrid power sources for individual soldier and platform applications. The fabrication of novel structures on new electronic materials, such as langasite for oscillators or molecular beam epitaxy (MBE) of semiconductor superlattices and UV/IR vertical emitters, will be a key enabler for more affordable devices with new capabilities. These fabrication techniques require a more complete understanding of fundamental properties, growth techniques, and processing of new materials. These new materials and structures also require the development of new design and layout techniques, more sensitive and flexible test and analysis capabilities, and new means of packaging to protect the devices and promote control of heat and atmosphere while enabling transport of signals and power. These challenges can only be overcome with judicious application of a basic understanding of the physics and chemistry of the electronic and opto-electronic processes. In FY2004 and 2005, this project also funds the new Flexible Display Center at Arizona State University. In FY06, the Flexible Display effort was restructured to Project H17 for increased visibility and management oversight. These projects serve to enhance the survivability, lethality, and mobility of future Army platforms by enhancing their survivability electronics suite, increasing ranges, while decreasing time lines, for target acquisition sensors, and evolving more efficient, controllable power sources, and displays. 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). Work in this project is performed by the Army Research Laboratory (ARL).

Accomplishments/Planned Program	FY 2004	FY 2005	FY 2006	FY 2007
- Mature high performance antennas and RF front-end architectures to support multifunction radar systems; and design and evaluate electronically scanning antennas for multifunction RF applications. In FY04, assessed a very high efficiency Ka-band amplifier and control devices; and designed, fabricated, and evaluated multilayer Ka-band apertures for narrow elevation beam. In FY05, prototype small linear Ka antenna arrays, using ferroelectric and micro electro mechanical system (MEMS) phase shifter technology to assess feasibility of each concept in terms of loss and beam positioning speed. In FY06, will investigate approaches for integrating antennas in composite armor. In FY07, will design, fabricate and evaluate performance of armor integrated antennas.	3744	2984	956	990
- Investigate micro and nano technology for small low cost highly reliable RF MEMS switches, resonators and filters for multifunction RF applications; design highly stable low-noise oscillators with low-acceleration sensitivity by integrating photonic resonators and conventional microwave components to improve the capability of radar systems to detect slow moving targets; mature components and software for C4 technology; and perform research in advanced tactical software tools for mobile, ad hoc network access control, intrusion detection, and authentication techniques for the Future Force. In FY04, established reliability evaluation of 1st generation Aluminum Nitride (AlN) MEMS resonators; designed 2nd generation resonators for high frequency filter applications; and reduced in-band spurs in opto-electronic oscillator (OEO) with performance suitable for moving target indicator (MTI) sensors. In FY05, examine the performance of E-Beam lithography in patterning nanoscale RF structures for Future Force and future Soldier communications; and design and evaluate phase-locked cavity based stabilized local oscillator (STALO) with RF front ends. In FY06, will explore nano science and technology for smart nano materials; and will design and evaluate Ka-band low phase noise, temperature insensitive ceramic dialectic resonant oscillator (DRO) oscillator and compare with OEO. In FY07, will design, simulate, and fabricate discrete smart nano devices; and will evaluate stabilized oscillator dual mode crystals with low hysteresis temperature effects.	2403	2914	2870	2966

Accomplishments/Planned Program (continued)	FY 2004	FY 2005	FY 2006	FY 2007
- Research, design, and investigate new component materials, structures, devices, and EM issues of millimeter wave (mmW) components and active devices, such as vacuum electronic (VE) devices and millimeter wave integrated circuits (MMICs), to achieve higher output power, power-added-efficiency, linearity, and dynamic range for increased operation and detection range in future systems, unmanned aerial vehicle (UAV), Electronic Warfare (EW), radar, and soldier systems. In FY04, devised VE tubes for millimeter power modules (MMPMs); and assessed the performance of microwave/millimeter wave wide bandgap devices and circuits. In FY05, integrate VE tube with semiconductor amplifier and power supply in MMPMs and characterize; evaluate new components to support design of next generation mmW active apertures; and complete transmit/receive (T/R) module incorporating wide bandgap MMICs for synthetic aperture radar/moving target indicator (SAR/MTI) radar to support tactical unmanned aerial vehicles. In FY06, will fabricate and evaluate high power (60W) Q-band MMPM amplifier; and will investigate reliability of gallium nitride (GaN) devices under high temperature, fabricate 2nd generation devices, and implement packaging concepts with thermal modeling. In FY07, will characterize, analyze, and evaluate high power (80W) Ka-band MMPM; and will design and characterize GaN transmit/receive (T/R) and power amplifier modules.	1972	3087	2909	3004

Accomplishments/Planned Program (continued)	FY 2004	FY 2005	FY 2006	FY 2007
- Investigate eye-safe scannerless 3-D imaging laser radar (ladar) and multi-color passive infrared (IR) imaging focal plane arrays (FPAs) and cameras for both long-range reconnaissance and short-range unmanned ground and air vehicle applications. Investigate optical limiter designs with promising nonlinear materials in order to provide passive protection of Future Force electro-optic (EO) vision systems from damage from laser threat devices. In FY04, integrated eye-safe components, laser, and detector operating at 1.5 um into ladar breadboard; performed airborne evaluation of two-color passive IR camera for mine detection and collected passive IR signatures of targets and backgrounds to support the development of advanced dual-band passive IR sensors; and fabricated and characterized the nonlinear properties of phase change materials such as fast switches and sacrificial materials with application to passive protection of EO vision systems. In FY05, show an improved version of ladar breadboard, field test, and collect data to show functionality for target acquisition; using the newly constructed tandem test bed, characterize promising nonlinear optical materials in militarily relevant focusing configurations. In FY06, analyze passive IR target and background signatures and recommend design criteria to CERDEC for advanced IR dual-band passive sensors; ealuate and select a nonlinear limiting material with large bandwidth and high optical density. In FY07, design and evaluate obscured target detection through 3-D ladar imagery in simulated UAV and ground-to-ground scenarios and transition to CERDEC Mission Equipment Package for Class II UAV program; address issues associated with encapsulating the selected nonlinear material in a solid host, leading to development of a robust limiting device, which provides technologies to protect against damage at all laser wavelengths across the operating spectrum of the Future Force electro-optic vision systems.	3080	2709	3025	3041

Accomplishments/Planned Program (continued)	FY 2004	FY 2005	FY 2006	FY 2007
- Investigate molecular beam epitaxy (MBE) growth techniques for the growth of mercury cadmium telluride (HgCdTe) on Silicon substrates for both the mid and long wave IR spectral region to significantly decrease the cost and to allow the development of large area arrays. Also design and fabricate arrays for higher operating temperature. In FY04, midwave arrays were fabricated with equal performance compared to arrays grown on the standard cadmium telluride (CdTe) substrates. Also first Long Wave IR (LWIR) arrays were grown with promising results. In FY05, achieve growth of LWIR arrays with less than 2% defective pixels. In FY06, will fabricate large area arrays-up to 1000X1000 pixels for both MWIR and LWIR with a goal of less than 1% defective pixels; and will fabricate arrays with new detector design for higher operating temperature. In FY07, will continue the growth of high temperature arrays with the goal of achieving operating temperatures of 180 Kelvin for MWIR and 120 Kelvin for LWIR.	1295	2385	2048	2585

Accomplishments/Planned Program (continued)	FY 2004	FY 2005	FY 2006	FY 2007
- Investigate a broad base of extremely quick, accurate, and novel photonic architectures to enable detection of hazardous substances to enhance soldier survivability. Investigate novel new vertically emitting ultraviolet (UV) emitters offering packaging and cost advantages for environmental sensing and non-line-of-sight UV communications. Investigate new vertically emitting mid-wave Infrared (IR) and near-IR LEDs and lasers for IR scene simulation, opto-electronic (OE) sensors and OE flow/processing of sensor data. In FY04, characterized miniaturization of a sensor based on Photoacoustic spectroscopy and leveraged use of quantum cascade lasers technologies for detection of hazardous chemicals; fabricated and characterized mid-wave IR vertical-emitter LEDs for IR scene projection; and conducted UV vertical emission experiments on aluminum gallium nitride (AlGaN) heterostructures. In FY05, characterize the chemical sensing concept using a photoacoustic system on a MEMS platform; characterize antimony-based resonant-cavity vertical-emitting IR LED and laser structures; investigate AlGaN-heterostrucuture mirrors and cavities for UV vertical emitters. In FY06, will evaluate MEMS photoacoustic sensor performance for feasibility as a trace-level chemical sensor; and will design high-bandwidth vertical-cavity near-IR emitters hybridized with electronics for communications. In FY07, will explore possible chip-level technologies (Quantum / Interband Cascade Lasers, MEMS microphones and MEMS actuators) for incorporation into MEMS photoacoustic chemical sensing system; and will fabricate novel mid-wave IR and UV resonant-cavity vertical emitters hybridized with electronics for OE sensors and scene projection.	2161	2103	1424	1471
- Investigate, design and fabricate micro electro mechanical system (MEMS) based components to improve power generation for the dismounted soldier and micro-cooling technology for both the soldier and Future Force systems. In FY04, improved compressor blades were fabricated using 3D fabrication methods and a micro-cooling system was designed to provide 250 watts /centimeters2 (W/cm2) of cooling. In FY05, fabricate high-temperature high-speed 3D power MEMs devices; implement systems to reclaim energy from small engines, fabricate micro-cooling systems capable of 250 W/cm2; and implement methods for fuel/air delivery for small engines and fuel cells. In FY06, will design and fabricate reclaimed energy systems for small engines; will fabricate components to provide fuel/air control on small engines and fuel cells; and will design and fabricate cooling systems that provide 500 W/cm2. In FY07, will characterize a fuel delivery and injection system for MEMS fuel pumps delivering 200mil per min and atomization systems that deliver 10um droplet sizes of fuel.	2582	2500	4500	4500

Accomplishments/Planned Program (continued)	FY 2004	FY 2005	FY 2006	FY 2007
- Investigate and evaluate prognostics and diagnostics (P&D) algorithms; design, fabricate and evaluate micro-electro-mechanical systems (MEMS) and other sensors; and design, code, and evaluate database for the integration into decision systems to extend sensor rationalization and minimize downtime via condition-based maintenance. In FY04, designed and evaluated 1st wafer run of multi-level acceleration latch switches and showed combined MEMS and nanotechnology sensor concept models. In FY05, fabricate multi-level acceleration latch/reset switches for no power shock detection and monitoring; and conduct validating experiments on MEMS/nanotechnology sensors. In FY06, will investigate and evaluate advanced base-sensor suite, processor, and transceiver in distributed multi-node network. In FY07, will evaluate chemical and stress sensors for missile health monitoring.	2444	2815	2820	3294

Accomplishments/Planned Program (continued)	FY 2004	FY 2005	FY 2006	FY 2007
- Investigate and mature silicon carbide (SiC) power device and packaging technologies to enable high temperature and power density converters for motor drive applications for Future Force (FF). Investigate technology for advanced batteries, fuel reformers and fuel cells to be used in hybrid power sources for FF electromagnetic armor and smart munitions. In FY04, fabricated and validated a 10 kilowatt (kW) SiC based high-temperature converter for alternating current motor control and 50 kW high-temperature SiC diode power modules for direct current–direct current (DC-DC) conversion applications; formulated and evaluated new catalysts for efficient hydrocarbon reformation for fuel cells and evaluated new electrolyte and energetic cathode material for lithium-ion (Li-ion) batteries; and investigated technology for advanced batteries and fuel cells to be used in hybrid power sources for FF. In FY05, implement high-temperature controller and DC-DC isolation circuits for high-power converters; investigate high temperature power converters for 10 kW mobile power applications; provide technology for an advanced high-energy rechargeable battery with enhanced user safety and high temperature charge retention; explore sulfur-removal absorbents for fuel cells. In FY06, will investigate and evaluate high-temperature SiC power converters implemented with current-controlled devices for medium power hybrid-electric vehicle (HEV) power conversion applications; provide electrode/electrolyte materials technology for enhancing charge/discharge rate of advanced Li-ion batteries and solvents for removing sulfides in military fuel for fuel cells. In FY07, will mature current controlled SiC power components; investigate/evaluate high-temperature SiC converters implemented with voltage-controlled devices for low power HEV power conversion; and provide improved electrolyte for low temperature Li-ion batteries and sulfur-tolerant catalysts for logistic fuel processing for fuel cells.	2075	2028	1870	1932
- The Army established a Flexible Display Center at Arizona State University to develop flexible display technology demonstrations for future vehicle and future Soldier applications. In FY04, established the center and developed test structures for flexible display active matrix backplanes (AM) with electro-optic devices. In FY05, investigate 2.5” diagonal AM reflective displays from research line. In FY06, this effort will be restructured into PE 0602705A Project H17 for increased visibility and management oversight.	3617	4641	0	0
- Flat Panel Displays/Flexible Display Initiative: In FY04, the objective of this Congressional add was to improve the quality of equipment and materials available from U.S. suppliers for flat panel display technologies. The add identified and inserted improvements into manufacturing, pre-production and pilot facilities; and established standards and manufacturing benchmarks for the flat panel display industry. No additional funding is required to complete this project.	3767	0	0	0

Accomplishments/Planned Program (continued)	FY 2004	FY 2005	FY 2006	FY 2007
Totals	29140	28166	22422	23783