ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2006

BUDGET ACTIVITY	PE NUMBER AND TITLE
3 - Advanced technology development	**0603772A - Advanced Tactical Computer Science and Sensor Tech**

	COST (In Thousands)	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	51699	44991	64604	65657	32015	30156	32480
101	TACTICAL AUTOMATION	15104	12623	13639	17399	17436	15795	18006
1AA	Tactical Computer Science Demonstrations (CA)	6614	6013	0	0	0	0	0
1AB	SENSOR DEMONSTRATIONS (CA)	13509	4633	0	0	0	0	0
243	SENSORS & SIGNALS PROC	16472	21722	50965	48258	14579	14361	14474

A. Mission Description and Budget Item Justification: This Program Element (PE) supports information dominance for the Army's Future Force, and where feasible to enhance the Current Force capabilities. To gain and maintain battlefield dominance, the Warfighter needs to understand, decide and act more rapidly than his adversaries. Project 101, Tactical Automation, matures and demonstrates technologies that will allow forces to more effectively collect, transfer and display digital information around the battlefield. It provides architectures and technologies to enable Command and Control (C2) during rapid, mobile, dispersed operations. It demonstrates technologies necessary for integrated battlefield situational awareness (SA), force synchronization, split-based, and On-the-Move (OTM) C2 operations. Project 243, Sensors & Signal Processing, matures signal processing and fusion technologies for Army sensors; matures and demonstrates ground based radar systems to track and identify enemy forces and personnel; matures and demonstrates multi-sensor control and correlation for improving reconnaissance, surveillance and target acquisition. Projects 1AA and 1AB fund Congressional special interest efforts.

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 PE contains no duplication with any effort within the Military Departments and is fully coordinated with PE 0602270A (EW Technology), PE 0602782A (Command, Control, Communications Technology), and PE 0603008A (Electronic Warfare Advanced Technology), PE 0602120 (Sensors and Electronic Survivability), PE 0603270A (EW Technology), Work in this PE is performed by the Army Research, Development and Engineering Command, Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth, NJ.

B. Program Change Summary	FY 2005	FY 2006	FY 2007
Previous President's Budget (FY 2006)	46313	42475	49279
Current BES/President's Budget (FY 2007)	51699	44991	64604
Total Adjustments	5386	2516	15325
Congressional Program Reductions		-7823	
Congressional Rescissions		-461	
Congressional Increases		10800	
Reprogrammings	5386		
SBIR/STTR Transfer			
Adjustments to Budget Years			15325

FY 05 increase of $5.386 million attributed to reprogramming of Congressional Add for Mvmnt Program for Simulation Based Operation (+$4.698 million after adjustment for Congressional Undistributed Reductions) for proper execution and below threshold reprogramming of + $.710 million for Joint Force Protection Advanced Concept Technology Demonstration
FY 07 increase of $15.3 million attributed to Foliage Penetrating (FOPEN) Radar for Unmanned Aerial Vehicles (UAV).

Ten FY06 Congressional adds totaling $10800 were added to this PE.

FY06 Congressional adds with no R-2A (appropriated amount is shown):
($1300) Bi-Directional English-Iraqi Translation System for the Warfighter
($1700) Blast and Damage Assessment Risk Analysis and Mitigation Application (BADARAMA)
($1200) C4ISR Integrated Digital Environment Service Module (DESM)
($1000) Digital Array Radar Technology Development
($1000) Distributed, Scalable C2 Communication System
($1000) Hyperspectral Imaging and Synthetic Aperture Radar for UAVs
($600) MVMT Program for Simulation Based Operations
($1000) Net-Centric Multi-Sensor Enhancements and Support Operations
($1000) Phraserlator
($1000) X-Band Interferometric Radar Development

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2006

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced technology development	**0603772A - Advanced Tactical Computer Science and Sensor Tech**	**101**

COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
101 TACTICAL AUTOMATION	15104	12623	13639	17399	17436	15795	18006

A. Mission Description and Budget Item Justification: This project provides improved command and control architectures and technologies for Future Force, and where applicable for Current Force, information dominance. For the Army Future Force, the key change in battle command will be in the use of automated information technologies embedded throughout its units that enable it to use information as an element of combat power. This project supplies the tools to provide commanders at all echelons better and more timely information and allow them to command from anywhere on the battlefield, freed from their command posts and while on-the-move. This will allow Future Force commanders to understand, decide and act faster than their adversaries, resulting in increased OPTEMPO, improved force synchronization and reduced fratricide. This project matures advanced computer science and technology solutions addressing: digital transfer and display of horizontal battlefield situational awareness (SA) and a common view of the battlefield; synchronization of combined and joint force operations; and Command and Control (C2) On-the-Move (OTM). It matures key technologies in the following areas: automated decision support; advanced database design and distribution; dynamic digital display and manipulation; web-based architectures for intelligent software agents and mission execution monitoring; and mobile adaptive computing. Network Enabled Battle Command (NEBC) matures and demonstrates advanced C2 software services for the Current Force, the Brigade Combat Team (BCT) and echelons above brigade. Command and Control of Robotic Entities (C2ORE) matures and demonstrates software services optimized for unmanned air and ground robotic systems for the Future Combat Systems (FCS) BCT Battle Command System (BCS) and Current Force initiatives. Joint developer/warfighter experiments will be conducted in coordination with PM FCS BCT, FCS Lead System Integrator (LSI), TRADOC and RDECOM partners.

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 (CERDEC), Fort Monmouth, NJ.

Accomplishments/Planned Program	FY 2005	FY 2006	FY 2007
- Distributed Command and Control (C2) On-the-Move: In FY05, matured a distributed collaboration software environment for use in complex and urban terrain, and matured lightweight geospatial service-based mapping tools, coupled with mobile software agents for use in a mobile environment. In FY06, demonstrate a set of service-based decision support and C2 modeling and simulation tools for dismounted Future Force commanders to collaboratively plan coalition activities in highly mobile operations.	2471	1965	0
- Network Enabled Battle Command (NEBC): In FY05, matured, demonstrated and transitioned decision support software services for subscription and presentation of plans, tactical graphics, and unit task organizations to Project Manager, Ground Combat Command and Control (PM GCC2); matured, demonstrated and transitioned to PM GCC2 an Unexploded Ordinances (UXO) software injector providing Command and Control Personal Computer/Joint Tactical Common Operating Picture Workstation (C2PC/JTCW) planners the capability to query and display UXO geometry from the Advanced Field Artillery Tactical Data System. In FY06, mature and demonstrate technologies to support the interfacing and information exchange management between the BCT and echelons above brigade C2 software applications and Army, Joint, Coalition and National information systems; mature intelligent search/retrieval technology and blue force predictive analysis tools for execution assessment/adjustment decision support and demonstration at the C4ISR On the Move Experiment at Ft. Dix, NJ; deliver two software enhancements, updates and repairs a year to the Battle Command Battle Lab (BCBL) for experimentation. In FY07, will enhance technologies supporting interface and information exchange management for the BCT and	6300	5690	6129

echelons above brigade C2 software applications and Army, Joint, Coalition and National Information Systems; will demonstrate and transition information search and retrieval technology and execution decision support tools into Joint Command and Control/Joint Tactical Common Operating Picture Workstation architecture; will mature information and advanced decision models; will provide one software delivery to BCBL for experimentation.			
- Command & Control of Robotic Entities (C2ORE): In FY05, demonstrated prototype software to PM FCS BCT and FCS LSI; developed an interface to Force XXI Battle Command Brigade and Below (FBCB2) for sensor planning software and an interface to Textron's unattended ground sensor (UGS) ground control station for participation in the C4ISR On the Move Experiment (Fort Dix, NJ) and Air-Assault Expeditionary Force (AAEF) Experiment (Fort Benning, GA); completed requirements for initial software development and was selected as the sensor planner software for Joint Expeditionary Force Experiment (JEFX06); established integration laboratory and analysis environment; derived and transitioned sensor placement and planning algorithms to FCS LSI. In FY06, prepare for and participate in JEFX06, FCS Experiment 1.1 and Future Force Battle Command Integration Initiative demonstration; design tactical Battle Command services for UGSs and a scenario for experimentation with UAMBL. In FY07, will mature and demonstrate tactical Battle Command services for unmanned aerial vehicles (UAVs); will prepare for and participate in FCS BCT sponsored experiments and execute a live experiment with up to 3 UGSs, 3 unmanned ground vehicles, and 1 UAV; will analyze experimental data and to assess and provide software improvements to the tactical Battle Command services.	2623	3358	7330
- Joint Force Projection (JFP) Advanced Concept Technology Demonstration (ACTD): In FY05, developed technical framework for process driven Mission Capability Package (MCP); matured modeling and simulation support tools for MCP. In FY06, develop and demonstrate an initial Joint Reception, Staging, Onward Movement, and Integration (JRSOI) bridge tool to join strategic & theater deployment and distribution processes that provides Combatant Commanders with enhanced capabilities to analyze, plan, execute, and assess force projection at the strategic and operational levels; integrate JRSOI into MCP. In FY07, will mature the Force Projection MCP within the next generation Joint Command and Control (JC2) environment; will support JFP integration into USCENTCOM, USTRANSCOM, & JFCOM exercises; will finalize transition of JFP technologies to JC2.	710	1610	180
- Networked Sensors for the Future Force: In FY05, enhanced tools for Battle Command applications, designed and implemented an unmanned systems controller, and matured decision aids to support semi-automatic sensor mission planning and management; integrated and tested Battle Command and unmanned systems controller applications with unmanned aerial vehicles containing infrared and electro-optical sensors, unmanned ground vehicles containing Cost Effective Targeting System sensor, and unattended ground sensors containing embedded acoustic, seismic and infrared sensors; conducted experimentations to demonstrate Battle Command for networked sensors at Fort AP Hill, Aberdeen Proving Ground, Fort Knox and Fort Dix; participated in C4ISR experiments with multiple unmanned networked sensors and platforms.	3000	0	0
Total	15104	12623	13639

COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
243 SENSORS & SIGNALS PROC	16472	21722	50965	48258	14579	14361	14474

A. Mission Description and Budget Item Justification: This project provides improved ground based radar, sensor fusion and correlation technologies for Future Force information dominance. The Multi-Mission Radar (MMR) program will mature a Multi-mission HMMWV mounted radar technology to support air defense, counter-battery, and air traffic control missions within a single system to enhance Future Force mobility and agility. MMR will be self-contained to process target data, identify aircraft/unmanned aerial vehicles (UAVs), and classify artillery, mortar and rockets. All target data will be distributed to relevant units in the battlefield through network centric channels. The sensor fusion program will demonstrate cross-sensor control and data correlation (fusion) of a multi-function, integrated sensor payload. Sensor suite candidates may include moving-target-indicator (MTI)/synthetic aperture radar (SAR), Night Vision and Electronic Sensors Directorate (NVESD)'s electro-optical/infrared (EO/IR) and signals intelligence technologies. This sensor suite will demonstrate wide area reconnaissance, surveillance, and targeting capability in adverse. Synergistic operation of sensors with on-board sensor management and the correlation of data for an integrated operational picture will be matured with significant leveraging of signal processing achievements from industry, Defense Advanced Research Projects Agency (DARPA) and other services. The Suite of Sense Through the Wall Systems will mature techniques for detection of personnel and objects through multiple wall types.

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 (CERDEC), Fort Monmouth NJ.

Accomplishments/Planned Program	FY 2005	FY 2006	FY 2007
- Multi-Mission Radar (MMR): In FY05, matured, built, and demonstrated radar hardware and software for Counterfire Target Acquisition (CTA), Air Defense Surveillance (ADS), Air Traffic Control (ATC)and Active Defense Fire Control (ADFC) functions; conducted systems engineering test to verify hardware and software; conducted initial field tests against targets of opportunity. In FY06, perform system and subsystem test; perform 2 sets of radar CTA system tests against dedicated targets to validate performance; conduct system test demonstration of CTA, ADS, ATC and ADFC capabilities to user community; deliver prototype MMR system and prime item development specification suitable for moving into system development and demonstration phase in support of Future Force MMR development. In FY07, will complete integration and test of 360 Degree CTA capability, demonstrate integration with Extended-Light Weight Counter Mortar Radar, demonstrate cueing to external airborne sensor for mobile shooter location. The effort will culminate in demonstrations of a fully tested MMR system and prime item development specifications suitable for moving into a system development and demonstration phase.	6579	6100	3000
- Sensor Fusion: In FY05, conducted operational concept study for integration of multi-sensor payload; initiated mission management module design and maturation for cross-sensor control and data correlation; established a simulation effort to identify means of autonomous sensor management to capitalize on sensor synergies and identified commercial off-the-shelf/Government off-the-shelf sensors for the multi-sensor payload. In FY06, complete system hardware design and level 1 fusion algorithms/software for automated data correlation, sensor cross-cueing, and target tracking; select architecture, integrate SAR/MTI, EO/IR and SIGINT sensors and conduct limited testing in the Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) On-the-	6024	9766	14280

Move (OTM) experiment at Fort Dix. In FY07, will mature fusion architecture to include non-IMINT sensing systems such as COMINT, ELINT, Counter Mortar radar and blue-force data sources; will mature and demonstrate target patterns recognition software for automatic cross-cueing of sensors; will develop sensor performance analysis tools; will complete integration of sensors to address moving and stationary targets in open/sparse terrain and conduct testing in the C4ISR OTM experiment.			
- Suite of Sense Through the Wall (STTW) Systems for the Future Force: In FY05, integrated prototype STTW systems with emerging network communications architecture and demonstrate transmission of STTW data on a real time basis; evaluated data transmission, dissemination and software tools; provided STTW performance model for incorporation into Battle Lab and FFW operational modeling and simulation; evaluated technology advancements for use in personnel detection, concealed explosive detection and concealed weapons detection. In FY06, conduct lab and user testing of STTW prototypes; utilize experiments to characterize urban and complex terrain phenomenology; mature and demonstrate techniques for the detection of stationary personnel through light construction materials. In FY07, will mature and demonstrate integrated personnel detection/Concealed Weapon Detection (CWD)/Concealed Explosive Detection (CED) systems with greater standoff capability and increase probability of detection; will conduct lab testing of individual STTW sensors against multiple wall types; will develop techniques for detection of stationary personnel through multiple wall types and participate in C4ISR OTM experiment as well as FFW ATD with hand held STTW prototype.	3869	5856	6857
- Cueing Sensor: In FY07, mature and demonstrate focal plane arrays, algorithms, and processing. Perform live-fire test of prototype sensors and systems. Work on this effort is also being accomplished under PE/Project: 62120/H15; 62270/A442; 63270/K16.	0	0	1560
- Foliage Penetrating (FOPEN) Radar for Unmanned Aerial Vehicles (UAV): This effort matures and demonstrates a FOPEN radar capability to meet the size, weight and power requirements for a Class 4 UAV. In FY07, will leverage efforts from the FOPEN Advanced Concept Technology Demonstration (FY03-FY06 in Program Element (PE) 0603750D8Z, and PE/Project 0603762E/SGT-04) capability from manned aircraft to Class 4 UAV; will redesign a compact and modular radar waveform generator; will mature the existing design of the radar transmitter; will redesign the existing radar antenna for the desired pattern, gain, weight and affordability; will mature the design of the receiver; will design a new processor to replace the existing obsolete processor; will mature advanced radar processing algorithms to increase area coverage rates while reducing the volume of processed data; will port existing algorithms to a new processor; will address software and hardware integration issues due to the introduction of new modes to support increased altitude requirements; will mature and demonstrate hardware and software to add an onboard image processing capability for faster processing/exploitation timeline and reduced data volume; will perform subsystem testing in a laboratory environment.	0	0	25268
Total	16472	21722	50965