Exhibit R-2, PB 2010 Army RDT&E Budget Item Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research					R-1 ITEM NOMENCLATURE PE 0602782A Command, Control, Communications Technology					
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	42.004	41.218	24.833						Continuing	Continuing
H92: Communications Technology	13.845	14.427	14.777						Continuing	Continuing
TR9: C3 COMPONENT TECHNOLOGY (CA)	20.387	17.283	.000						Continuing	Continuing
779: Command, Control and Platform Electronics Tech	7.772	9.508	10.056						Continuing	Continuing

A. Mission Description and Budget Item Justification

Efforts in this program element (PE) research and develop communications technologies, command and control (C2), and electronics systems and subsystems that provide the Army with enhanced capabilities for secure, mobile, networked communications, assured information delivery, and presentation of information that enables decision-making. Commercial technologies are continuously investigated and leveraged where possible. This PE researches and develops technologies that; enable management of information across the tactical and strategic battle space; provide automated cognitive reasoning and decision making; and allow timely distribution, display, and use of C2 data on Army platforms (project 779). This PE also supports research in technologies which allow field commanders to communicate on-the-move to/from virtually any location, through a seamless, secure, self-organizing, self-healing, network (project H92). Project TR9 funds congressional special interest efforts.

Work in this PE is fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602783A (Computer and Software Technology), PE 0602874A (Advanced Concepts and Simulation), PE 0603008A (Electronic Warfare Advanced Technology), and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

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.

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B. Program Change Summary ($ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	36.955	24.014	24.519	
Current BES/President's Budget	42.004	41.218	24.833	
Total Adjustments	5.049	17.204	.314	
Congressional Program Reductions	.000	-.136		
Congressional Rescissions	.000	.000		
Total Congressional Increases	.000	17.340		
Total Reprogrammings	5.696	.000		
SBIR/STTR Transfer	-.647	.000		

Change Summary Explanation

FY08 funding increase was due to transfer of congressional interest items.
FY09 funding increase is due to congressional adds.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602782A Command, Control, Communications Technology					PROJECT NUMBER H92	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
H92: Communications Technology	13.845	14.427	14.777						Continuing	Continuing

A. Mission Description and Budget Item Justification

Efforts in this project investigate, develop and apply advanced communications and network technologies; the strategy is based on leveraging and adapting commercial technology to the maximum extent possible and focusing research efforts on emerging technology areas (e.g., mobile radio based infrastructures, information assurance, security in narrowband environments, multiband on-the-move (OTM) transmit and receive antennas, adaptive protocols, and low probability of interception/low probability of detection waveforms).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

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.

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Communications Planner for Operational and Simulation Effects with Realism (COMPOSER): This effort develops technologies to observe and predict the performance of wireless tactical networks at faster than real time: COMPOSER consists of the following software modules: communication effects simulator (CES), network visualizer (NV), spectrum manager, and architecture framework. In FY08, completed enhancements to CES; increased the integration of waveform models to CES; completed spectrum management capability; developed final version of COMPOSER for transition to the Coalition Joint Spectrum Management Planning Tool (CJSMPT) Joint Concept Technology Demonstrations. Work on this effort is also being accomplished under PE 0603008A/project TR1.	.289	.000	.000	
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.185	.000	
Wireless Information Assurance (IA): This effort investigates and develops technologies to protect wireless tactical networks against computer network attacks. In FY08, developed software (SW) based tactical automated intrusion detection and response components capable of detecting "zero day" or previously unseen cyber attacks on "red-side"(unencrypted) host internet protocol networks;	3.166	2.548	2.616	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
provided the capability to automatically respond and mitigate/recover from the malicious activity; validated the maturity and performance in a fully scaled mobile ad hoc emulation environment. In FY09, develop a suite of IA technologies to enable tactical battlefield information sharing across multiple security classification domains (i.e., TS/SCI to Unclassified), (technologies include cross domain boundary services with trusted labeling and data sanitization to enforce data release restrictions from higher to lower classified domains, smart pull information requests from higher domains, and trusted SW partitioning and kernel technology with controlled interface filtering to enforce push/pull of information across security domains for severely resourced constrained environments); develop and assess operating system agnostic malicious code detection technology to find vulnerabilities and software flaws via source code analysis and reverse engineering. In FY10, will investigate distributed key management concepts that allow mobile users to automatically affiliate, de-affiliate, and re-key the network to respond to a change or a compromise without requiring pre-placed keys; will evaluate SW cross domain security (CDS) services providing SW separation of kernel that protect and establish separation of classification levels; will investigate adaptive middleware and conduct lab testing. Work on this effort is also being accomplished under PE 0603008A/project TR1.				
Encryption Technologies: This effort is a Jointly funded effort with US Navy, Air Force, Marine Corps, to develop high speed, 4-channel, remotely manageable, programmable, embeddable crypto device. In FY08, completed development of the engineering development model (EDM) and delivered Non-Certified EDMs for start of Government Lab Evaluation/Test with a simulated host terminal; performed initial NSA Certification testing and implement design changes based on test results. In FY09, conduct lab evaluation; conduct the security certification process, and complete the program effort with Certified EDM delivery.	1.441	1.502	.000	
Network Designs: This effort investigates and develops technologies to design the next generation mobile ad hoc wireless networks. In FY08, evaluated the network design capability on a surrogate future force network; interfaced the network design algorithms with the simulation; characterized detailed end-to-end user performance metrics; and assessed the effectiveness of new networking technologies. In FY09, extend the basic design tool to include distributed reasoning/learning in a mobile Ad Hoc Network environment; develop a comprehensive representation of the internal operation and performance of network data dissemination mechanisms; improve the network traffic characterization model.	2.691	3.399	3.224	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY10, will enhance the basic design and perform evaluation on a number of typical military maneuver and network traffic scenarios.				
Antenna Technologies: This effort develops low cost, power efficient, directional antenna technologies for terrestrial and tactical satellite ground terminals to enable them to operate on the move over multiple frequency bands. In FY08, completed development of terrestrial directional antenna (TDA) technologies for mobile ground platforms (WIN-T) providing air interface for terrestrial directional networking and beam steering protocols; investigated hybrid scan and phased array antenna technologies for a low profile multi-beam OTM SATCOM antenna for use with military Ka band and commercial Ku band satellites. In FY09, develop and demonstrate multi-beam low profile electronically steered OTM SATCOM antenna components that functions in two frequency bands (Ka/Q); develop and demonstrate Ka and Q band high efficiency power amplifier; develop TDA C/Ku affordable directional antenna brassboard. In FY10, will develop TDA C/Ku directional antenna and integrate platform feed and evolutionary aperture design to reduce antenna profile and cost; will develop multi-beam low profile electronically steered Ka/Q band SATCOM OTM antenna components. Work on this effort is also being accomplished under PE 0603008A/project TR1.	4.486	6.793	4.170	
Radio Enabling Technologies and Nextgen Applications (RETNA): This effort develops technologies that enable the porting of radio waveforms onto software defined radios at reduced cost and complexity. In FY08, performed detailed assessment and evaluation of the hardware/software and porting of waveforms onto joint tactical radio system (JTRS) representative software defined radio (SDR) platforms; developed capability to reduce the complexity of porting software waveforms onto SDR hardware.	1.772	.000	.000	
Cognitive Networking: This effort develops technologies enabling wireless networks to sense network and spectrum conditions and automatically adapt for more efficient use. In FY10, will begin the design and development of cognitive network tools for mobile ad hoc networks that will take into consideration network connectivity, end-to-end user requirements (bandwidth), survivability and optimality (goodness of design), provide knowledge oriented representation of radio frequency (RF) connectivity, network operations/ behaviors, and effectiveness of learning/prediction techniques in dynamic environment. Work on this effort is also being accomplished under PE 0603008A/project TR1.	.000	.000	1.883	

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APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602782A Command, Control, Communications Technology	PROJECT NUMBER H92

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Dynamic Spectrum and Network Technologies: This effort develops and investigates technology for radios and network management systems to enable access to spectrum currently unavailable because of current spectrum management methods. In FY10, will investigate and develop software policy agents for integration into software defined radios to allow the radios to accept Dynamic Spectrum Access (DSA) from the network management system over the air, will adapt the DARPA Disruption Tolerant Networking (DTN) technology for military communications systems to improve reliability and transportability.	.000	.000	2.884	
Total	13.845	14.427	14.777	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602782A Command, Control, Communications Technology					PROJECT NUMBER TR9	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
TR9: C3 COMPONENT TECHNOLOGY (CA)	20.387	17.283	.000						Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for C3 Component Technology applied research.

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Innovative Wireless Technologies for Sensor Networks	.000	.678	.000	
Portable Flexible Communication Displays Devices	1.160	.000	.000	
Integrated Lightweight Electronics Shelter	1.352	.000	.000	
Lightweight Theater Transportable TOC	2.318	.000	.000	
C4ISR Integrated Digital Environment Service Model (IDESM)	1.932	.000	.000	
Dynamically Managed Data Dissemination	.966	1.163	.000	
Advanced 3-D Locator (A3DL) Technology	3.092	.000	.000	
Development of a High Performance Computing System Based on a Modem High Speed Switch Fabric	.966	.000	.000	
Intelligent Distributed Command & Control (IDC2)	1.933	2.325	.000	
Research of Advanced Communications Technologies for Enhncd Secure, Mobile, Networked Communications	.774	.000	.000	
Nanophotonic Devices	1.546	.000	.000	
Ruggedized Cylinders for Expandable Mobile Shelters	4.348	2.325	.000	
Tactical Booster for Mobile Network Centric Warfare	.000	1.550	.000	
Portable Non-Magnetic Compass/Positioning/Timing Device	.000	1.550	.000	
21st Century Command, Control, and Communications Technology	.000	.620	.000	
Automated Language and Cultural Analysis for National Security	.000	1.938	.000	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
On-the-Move Telescoping Mast	.000	2.325	.000	
Modular Universal TOC Packages for Vehicles and Shelters	.000	2.325	.000	
SBIR/STTR	.000	.484	.000	
Total	20.387	17.283	.000	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602782A Command, Control, Communications Technology					PROJECT NUMBER 779	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
779: Command, Control and Platform Electronics Tech	7.772	9.508	10.056						Continuing	Continuing

A. Mission Description and Budget Item Justification

Efforts in this project research technologies that enable commanders at all echelons to have better and more timely information and allows them to command from anywhere on the battlefield. Emphasis is on data management and automated analysis to provide course of action determination, mission planning and rehearsal, mission execution monitoring and re-planning, and precision positioning and navigation. This project researches technologies that support multi-modal man-machine interactive technology, battle space visualization, positioning and navigation in degraded environments, automated cognitive decision aids, real-time collaborative tactical planning tools, data transfer, distributed data bases, open system architectures, and integration concepts which contribute to more mobile operations.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

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.

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
C2 On-The-Move (OTM) Enabling Technologies: This effort investigates and develops technologies to improve the Warfighters ability to access, use, present and understand relevant battle command information. In FY08, partnered with the Space and Missile Defense Command (SMDC) to develop intelligent software agents that operate in space and strategic (e.g., Missile Defense) as well as terrestrial domains; design, develop, assess and transition software agents that can be user defined and interoperable for battle command, intelligence, surveillance, and reconnaissance , and logistic customers; provided extraction of unstructured and structured data (graphics, numeric) from free text and identified report info for further analyses (Smart Filtering Service); supported generation of warnings and alerts relevant to Commander's Critical Information Requirements (Alert and Warning Service). In FY09, investigate digital OPORD representations to enable software agent based services; research baseline human cognitive limits for understanding while performing C2 workflows; continue to work with SMDC to further the development of intelligent software agent services with the addition of automatic discovery which enables the software agents to reduce the need for user intervention by automatically searching and retrieving data from other software	4.890	7.720	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
agent services; apply automatic discovery intelligent software agent technology to help optimize data initialization and information management in all domains and transition intelligent software agent services to PEO C3T; evaluate machine language translation tools and parsing techniques for the purpose of text-to-text and speech-to-speech translation to provide enhanced collaboration among Joint coalition forces.				
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.067	.000	
Battle Space Awareness and Positioning: This effort investigates positioning, navigation and tracking sensor/integration technologies to provide position, velocity, and time information to support operational and training requirements, especially in hostile electro-magnetic interference and other radio frequency (RF) degraded/denied environments. In FY08, investigated advanced positioning/navigation (pos/nav) and attitude sensor technologies; conducted trade studies to determine applicability of advanced network algorithms and processes within the context of emerging brigade combat team (BCT) architectures; continued the design and assessment of performance improvements in micro electro mechanical system (MEMS) inertial measurement units for dismounted Soldier and tactical vehicle applications. In FY09, downselect the pos/nav sensor suite and develop integration techniques to incorporate radio network algorithm and processes to enable robust position information for enhanced situation awareness in global positioning system (GPS) denied, urban, and other complex environments. In FY10, will continue development of pos/nav and attitude sensors, especially those that exploit the synergy between communications and position such as RF ranging and network assisted GPS. Work on this effort is also being accomplished under PE 0603772A/project 101.	2.882	1.721	1.790	
C2 OTM Enabling Technologies (continued FY10): In FY10, will develop speech and optical character recognition translation services within a Service Oriented Architecture (SOA) framework to allow Coalition forces the benefit of communicating more efficiently and securely, while providing additional translation options; will develop text-to-text machine translation algorithms for low density languages to enable translation capabilities for languages currently not widely used, but are on the Defense Language Agency prioritized language list; will investigate unmanned ground vehicle/unmanned aerial system (UGV/UAS) platform behaviors and C2 info knowledge management of unmanned systems to provide capability to manage large numbers of air and ground robots over extended urban areas at scales beyond current robotic inventories; will develop benchmarks for decision-making and identify emerging patterns of interaction between individuals, intelligent agents, and teams of agents and	.000	.000	8.266	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
humans; based on approved scenarios, will develop work flow analyses to identify and assess cognitive processes in decision-making.				
Total	7.772	9.508	10.056	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.