

UNCLASSIFIED

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 2000
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology
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COST <i>(In Thousands)</i>	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	22892	27612	21505	23775	22421	26000	25936	Continuing	Continuing
D247 Tactical C4 Technology Integration	11843	11321	12429	13838	12706	14793	14766	Continuing	Continuing
D257 Digital Battlefield Communications (DBC)	4773	4723	3813	4766	5446	6441	5938	Continuing	Continuing
D592 Space Applications Technology	2421	4702	5263	5171	4269	4766	5232	Continuing	Continuing
D596 Field Laser Radar Demo	0	6866	0	0	0	0	0	0	6866
D617 Global Broadcast System (GBS) Information Management	3855	0	0	0	0	0	0	0	3855

A. Mission Description and Budget Item Justification: This program element will develop and demonstrate Command, Control, Communications, and Computers (C4) technology to provide the soldier with distributed, mobile, secure, fully automated spread spectrum radio networks with integrated space technologies. Commercial communication technologies are continuously investigated and leveraged whenever possible. Multimedia inter-networked communications will be demonstrated while on-the-move (OTM) with commercial based standard gateway connectivity to both high-speed and legacy communication assets. The Multifunctional On-the-move Secure Adaptive Integrated Communications (MOSAIC) Advanced Technology Demonstration (ATD) will provide the communications technology foundation that will enable the emerging the Future Combat Systems (FCS) and Army 2010 concepts by demonstrating the ability for command posts to seamlessly and automatically support high volume, secure multimedia traffic over variable range and bandwidth transmissions while operating in a dispersed OTM fashion. The tactical Command and Control (C2) protect ATD will provide protection technologies for tactical internet C2 systems against modern network attacks. The space applications technology project will demonstrate novel applications of space assets for Army missions and support space technology integration. The Global Broadcast System (GBS) information management system developed a prototype for the First Digitized Division (FDD) network architecture. These projects develop technology to integrate communications systems and prototype products to enhance the survivability and efficiency of Army tactical C4 systems. This program also tests and evaluates net radio, common user, advanced antenna concepts, and distributed communications equipment and automated network management aids in conjunction with the Defense Advanced Research Projects Agency (DARPA) and the other Services. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance. Work in this program element is related to, and fully coordinated with, efforts in PE 0602782A (Command, Control and Communications Technology), PE 0203740A (Maneuver Control System), PE 0203726A (Advanced Field Artillery Tactical Data System), PE 0602783A (Computer and Software Technology), PE 0602702E (Tactical Technology), PE 0603772A (Advanced Tactical Computer Science and Sensor Technology), and PE 0603789F (C3I Technology Development) in accordance with the ongoing Reliance joint planning process.

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B. Program Change Summary	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (FY 2000/2001 PB)	23747	20883	21508
Appropriated Value	24109	27883	
Adjustments to Appropriated Value			
a. Congressional General Reductions	-362		
b. SBIR / STTR	-528		
c. Omnibus or Other Above Threshold Reductions		-103	
d. Below Threshold Reprogramming	-233		
e. Rescissions	-94	-168	
Adjustments to Budget Years Since (FY 2000/2001 PB)			-3
Current Budget Submit (FY 2001 PB)	22892	27612	21505

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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology				PROJECT D247		
COST (In Thousands)	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost	
D247 Tactical C4 Technology Integration	11843	11321	12429	13838	12706	14793	14766	Continuing	Continuing	
<p>Mission Description and Justification: This project develops computer and communications technology options using commercial standard hardware and software to support mission planning and battlefield decision making. This project includes the MOSAIC ATD with the development, adaptation, and integration of communications for mobile operations required for future command post operations. This technology also provides the communications capabilities required by the FCS. This project includes the Tactical C2 Protect (TC2P) ATD that provides protection technologies for tactical internet command and control information systems, components and data, against modern network attacks. This project also performs development of OTM ultra-high frequency (UHF), super high frequency (SHF), and extremely high frequency (EHF) satellite communications technology; interfaces mobile UHF satellite communications radios to combat net radio technology using commercial standard data packet protocols; and is developing technologies that are required for a complete future Joint Tactical Radio System (JTRS).</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 2988 – Developed and delivered Wideband Radio Network (WRN) products: wideband network radio (WNR), WRN testbed (WRNT), software development environment (SDE), and wideband (WB) waveform. – Tested and evaluated new JTRS WB waveforms and DARPA Global Mobile (GloMo) technology. • 5013 – Demonstrated integrated digital battlefield communications (DBC) ATD technologies in support of high-capacity OTM digitized communications and split-based operations. – Integrated and demonstrated enhanced commercial terrestrial Personal Communications System (PCS) capability in the Army’s warfighter information network proof of concept. – Demonstrated integrated phased array antenna to meet OTM radio access point communications requirements. – Demonstrated wideband high frequency communications technology, with access to the tactical internet, for transmitting maneuver and intelligence data from long range surveillance for units that are beyond-line-of-sight. • 3842 – Demonstrated unmanned aerial vehicle based battlefield paging. – Fully integrated and demonstrated end-to-end unmanned aerial vehicle based surrogate communication (SHF) satellite capability, including ground component. – Demonstrated a surrogate for UHF low earth orbit (LEO) Multiple Beyond-line-of-sight Communications (MUBLCOM) capability (leverages DARPA development). – Built and demonstrated airborne switching capability integrated with SHF surrogate satellite communication payload. <p>Total 11843</p>										
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology	PROJECT D247
<p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 4346 - Investigate and evaluate information protection technologies for the upper tactical internet with focus on network access protection, intrusion detection and host level protection. • 3575 - Integrate wideband power amplifier control signal interface within the WRNT. <ul style="list-style-type: none"> - Conduct a cosite performance test and evaluation of the UHF multiplexer. - Investigate and develop an extended frequency wideband power amplifier (EF-WBPA) (400-2000 Mhz). - Integrate laboratory testbed equipment within the WRNT. • 1740 - Conduct an initial review of existing and proposed (LEO/ medium earth orbit (MEO)) wideband commercial satellite communication (SATCOM) technologies and capabilities. Develop a fast recovery modem for EHF OTM narrowband communication. <ul style="list-style-type: none"> - Test JTRS multiband OTM antenna prototypes. - Develop modeling and simulation tools to evaluate performance of multiple antennas on multiple vehicles used in Tactical Operation Centers (TOCS). • 1381 - Develop, fabricate and test alternative technologies for phased array antennas with goal of cost reduction. • 279 - Small Business Innovation Research / Small Business Technology Transfer Programs <p>Total 11321</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 6693 -Investigate and evaluate information protection technologies for the upper tactical internet expanding the effort to address security management and malicious code detection and eradication. Integrate and test command and control protection solutions in a field environment. • 2891 - Integrate very high frequency (VHF)/ UHF radio frequency (RF) receiver/transmitter multiplexer into single box. <ul style="list-style-type: none"> - Conduct performance testing on the Wideband Power Amplifier (WBPA) (30-450MHz). - Conduct performance testing on the EF-WBPA. - Evaluate UHF multiplexer and WBPA prototypes through WRNT and field test. • 2845 - Develop a fast recovery modem for Ka Band LEO/MEO OTM wideband communication . <ul style="list-style-type: none"> - Exhibit capability of JTRS compatible OTM antenna, and begin development of expanded bandwidth OTM antenna (2 GHz). <p>Total 12429</p>		
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology				PROJECT D257		
COST (In Thousands)	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost	
D257 Digital Battlefield Communications (DBC)	4773	4723	3813	4766	5446	6441	5938	Continuing	Continuing	
<p>Mission Description and Justification: The objective of the MOSAIC ATD is to provide networked communications systems that support short range dispersed wireless elements (< 1 km), medium range dispersed wireless elements (< 10 km) and range extended dispersed wireless elements (> 10 km). Multiple wireless transmission facilities provide the user flexibility to traverse varied terrain over wide areas, which can improve system robustness and reduce vulnerability. The overall system will provide a scaleable capability that allows the user to have the best wireless communications system available based on current operating conditions. The selection of these multiple wireless systems will be automated to ease the burden on the operator. To provide this highly reliable mobile communications infrastructure, the communications assets will seamlessly assign user bandwidth as a function of range. In addition, automated reconfiguration of the routing protocols without operator intervention will occur. This program will use DARPA's Airborne Communications Node (ACN) communications payload to provide a networked, beyond line of sight, capability. Its inclusion allows command post elements to be dispersed in excess of 15 km to support split based operation associated with FCS operations. The ability to seamlessly and automatically support multimedia traffic over variable range and bandwidth transmission systems while the vehicles are in motion also will be demonstrated. Mobile elements will demonstrate minimally interrupted communications, which support, data, voice, real time multimedia and video teleconference (VTC) services. In order to show connectivity in this ATD, the communications system will dynamically operate over several different transmission systems including a wireless local area network (LAN), packet radio, wideband cellular radio, unmanned arial vehicles (UAV's), and satellites in a minimally interrupted manner. This Project is shared with PE0603006A D247.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 2730 – Demonstrated mobile radio access point. Integrated and demonstrated Digital Battlefield Communications (DBC) ATD radio access point with OTM high capacity trunk radio and phased array antenna capable of mobile operation. <ul style="list-style-type: none"> – Integrated OTM, high capacity, trunk radio and mobile phased array antenna into the radio access point. – Developed, evaluated and demonstrated dual band airborne communications relay antenna improvements to provide consistent gain across the coverage area for improved range extension communications. – Demonstrated a dual band airborne communications relay package capable of supporting 45-Mbps communications • 2043 – Integrated and demonstrated secure tactical PCS capability into the warfighter information proof of concept in support of the DBC ATD. <ul style="list-style-type: none"> – Inserted and evaluated digital battlefield communications technologies in the Joint Space-based Common Operational Picture Enhancement (JSCOPE) demonstration. – Integrated and demonstrated enhanced asynchronous transfer mode (ATM) features into the radio access point and the Army's warfighter information proof of concept. – Demonstrated Army application of satellite PCS technology to provide a highly mobile, handheld, worldwide communications capability. <p>Total 4773</p>										
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology	PROJECT D257
<p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 1964 - Develop a security architecture to consider MOSAIC security issues up front and generate solutions to improve performance and reduce costs. <ul style="list-style-type: none"> - Extend existing communications testbed into a ground mobile testbed to provide an environment to demonstrate the concepts of mobile, seamless communications between the mobile trunking backbone communications and to the subscriber, lower data rate users. - Develop capability to enhance communications services to mobile, wireless tactical user such as voice, data, video, e-mail, file transfer, web browsing, video conferencing, etc. • 2666 - Investigate and identify communications technologies to support distributed mobile wireless tactical operations centers. <ul style="list-style-type: none"> - Identify and mature key technologies developed under the DARPA Global Mobile (GloMo) program to support networked OTM communications. -Analyze and develop communications architecture for the FCS. • 93 - Small Business Innovation Research / Small Business Technology Transfer Programs <p>Total 4723</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 1568 - Integrate networking and link layer technologies for the future generation tactical internet into the ground mobile testbed. <ul style="list-style-type: none"> - Explore methods to achieve guaranteed quality of service associated with real-time, internet protocol based, multimedia communications over tactical asynchronous transfer mode backbone networks. - Enhance commercial personal communications technology currently being adapted to tactical applications to provide system elements that safeguard against inherent system vulnerabilities. - Leverage commercial wireless LAN technology to provide fast Ethernet connectivity for mobile and ad-hoc networks where wired networks are inappropriate for existing infrastructures. • 2245 - Integrate and demonstrate the matured DARPA GloMo program technology to support networked OTM communications. These technologies will be integrated into the ground mobile testbed. <ul style="list-style-type: none"> - Integrate, demonstrate and evaluate communications technologies to support distributed mobile wireless tactical operations centers and FCS in the ground mobile testbed. - Integrate enhanced communications services capability for mobile wireless tactical users into ground mobile testbed. - Integrate, evaluate and demonstrate key technologies developed under the DARPA ACN program for extended range networked communications with the ground mobile testbed. - Complete development of communications architecture for the FCS. <p>Total 3813</p>		
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology				PROJECT D592				
COST (In Thousands)				FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D592 Space Applications Technology				2421	4702	5263	5171	4269	4766	5232	Continuing	Continuing
<p>Mission Description and Justification: The objective of this project is to optimize Army utilization of space-based systems. The project involves: (a) space technology development and demonstrations for evaluating technology feasibility, determining Army utility, and refining requirements, and (b) space technology integration into battlefield operating systems. The project also addresses: defining Army requirements for space platforms; demonstrating advanced, compact space hardware; developing algorithms that optimally process space data; integrating satellite direct down link to ground systems; and providing an advanced technology base for the Army space exploitation demonstration program, the Tri-Service DoD space test program, and the exploitation of commercial space capabilities. The project focus is on space force enhancement (communications, intelligence, position/navigation, reconnaissance, surveillance, target acquisition, weather/terrain, missile warning) and space control (space surveillance) to improve warfighting capabilities and operations other than war.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 618 - Baselined overhead sensor configuration for unmanned air vehicle and space applications with initial demonstration of spectral data; upgraded sensor components for improved performance. • 1367 - Developed an air platform battlefield ordnance awareness infrared sensor design with onboard processing; developed signature collection and processing algorithms for technology demonstration. • 436 - Completed laser communications air to ground terminal technology demonstration and verified satellite to ground pointing and tracking software; transition to Space and Missile Defense Battle Lab to participate in Ballistic Missile Defense Organization (BMDO) funded laser communications space to ground demonstration for tactical internet evaluation. <p>Total 2421</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 1010 - Demonstrate a hyperspectral sensor in the 1-2.5, micron wavebands, and improved cueing and clutter rejection via polarization using ground test. - Initiate Long Wave Infrared (LWIR) Acousto-Optic Tuneable Filter (AOTF) development. • 3093 - Demonstrate battlefield ordnance awareness infrared sensor to detect artillery and rocket firings; develop identification, targeting, and simultaneous explosive ordnance events software; collect signature data in various tactical environments for technical requirements definition. • 485 - Develop radar phenomenology document and complete conceptual space surveillance technology design requirements. • 114 - Small Business Innovation Research / Small Business Technology Transfer Programs <p>Total 4702</p>												
Project D592				Page 7 of 10 Pages				Exhibit R-2A (PE 0603006A)				

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603006A Command, Control and Communications Advanced Technology	D592
FY 2001 Planned Program:		
•	1054 - Demonstrate on board spectral/polarization data processing, and hyperspectral spatial and temporal signature processing with sensor using airborne testing. Complete Long Wave Infrared (LWIR) Acousto-Optic Tuneable Filter (AOTF) development.	
•	3225 - Complete battlefield ordnance awareness infrared signature database development; demonstrate algorithms for near real-time processing of ordnance events; develop initial set of Army technical ordnance reporting requirements for integration in fire support and DOD space based infrared systems.	
•	984 - Complete space surveillance threat database development and evaluate radar algorithms for technology demonstration.	
Total	5263	
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology				PROJECT D596		
COST <i>(In Thousands)</i>	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost	
D596 Field Laser Radar Demo	0	6866	0	0	0	0	0	0	6866	
<p><u>Mission Description and Justification:</u> The objective of this one year Congressional special interest project (innovative sensor enhancement integration technology (ISEIT)) was for Space and Missile Defense Command to do a proof-of-principle (POP) demonstration to develop and validate a solid state infrared sensor system which collects and fuses non-collocated dissimilar sensor data in response to the operational needs of seven of the eight US Special Operations Command's (USSOCOM) SP6 flagship capabilities. These flagship capabilities are the USSOCOM link to supporting the mission needs statement and the operational concepts of joint vision 2010. This effort is a new start and is not related to previous efforts. This demonstration will include delivery of a prototype infrared sensor, fusion engine, and operational software.</p> <p>FY 1999 Accomplishments: Program not funded in FY 1999.</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 6682 - This one year congressional special interest effort will demonstrate a prototype infrared sensor and a prototype fusion engine with software. • 184 - Small Business Innovation Research / Small Business Technology Transfer Programs <p>Total 6866</p> <p>FY 2001 Planned Program: Program not funded in FY 2001.</p>										
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603006A Command, Control and Communications Advanced Technology				PROJECT D617		
COST (In Thousands)	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost	
D617 Global Broadcast System (GBS) Information Management	3855	0	0	0	0	0	0	0	3855	
<p><u>Mission Description and Justification:</u> The objective of this one year Congressional special interest project was to develop, install and evaluate an operational prototype global broadcast service/information management (IM) system for the Army first digitized division network architecture. This program specifically addresses joint service demonstrations coordinated through the joint directors of laboratories technology panel for C4, and provides key demonstrations of systems integration across the Army's battlefield functional areas. GBS/IM will provide efficient high data rate connectivity between many distributed information sources and warfighters who receive the broadcast directly on small, inexpensive user terminals. Broadcast data includes digitized imagery, logistics data, weather data, maps, operational orders (e.g., Air Tasking Order), and video.</p> <p>FY 1999 Accomplishments:</p> <ul style="list-style-type: none"> • 1355 - Completed evaluation of the DARPA Battlefield Awareness Data Dissemination (BADD) Phase 2 Advanced Concept Technology Demonstration (ACTD) Information Dissemination Management (IDM) application and unique architecture needs to apply emerging Army Battle Command System information technology. • 2500 - Completed demonstration of wide band, high-speed transmission of Map Files. • 2500 - Completed the development of a Tactical IDM (T-IDM) System Architecture that establishes T-IDM as a "User Owned and Operated System". • 2500 - Completed the development of a T-IDM Experimentation Plan and stand-up a Developmental Server in the CECOM Testbed and at the Ft Hood Central Test Facility. <p>Total 3855</p> <p>FY 2000 Planned Program: Program not funded in FY 2000.</p> <p>FY 2001 Planned Program: Program not funded in FY 2001.</p>										
Project D617			Page 10 of 10 Pages				Exhibit R-2A (PE 0603006A)			