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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 1999
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603772A Advanced Tactical Computer Science and Sensor Technology
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COST (<i>In Thousands</i>)	FY1998 Actual	FY 1999 Estimate	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	17602	18257	22610	19111	22213	23694	26179	27557	Continuing	Continuing
D101 Tactical Automation	11101	12951	16108	13421	15941	16887	18845	19858	Continuing	Continuing
D243 Sensors and Signal Processing	3628	5306	6502	5690	6272	6807	7334	7699	Continuing	Continuing
D281 Ground Combat Identification Demonstrations	2873	0	0	0	0	0	0	0	0	25865

A. Mission Description and Justification: This program element supports projects that provide advanced computer science and technology solutions to command and control (C2), data correlation, tactical surveillance, and combat identification problems. Specifically, this program addresses technologies to provide integrated battlefield situation awareness (SA), synchronization of combined arms forces, synchronization of joint forces, C2 on the move, correlation of intelligence data from airborne and space based sensors, battlefield combat identification (CI), point of engagement identification (ID) approaches to reduce fratricide for ground forces, unmanned air vehicle surveillance, and hostile weapons location. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance. It is related to and fully coordinated with efforts in PE 0602783A (Computer and Software Technology), PE 0602782A (Command, Control and Communications Technology), PE 0603006A (Command, Control and Communications Advanced Technology), PE 0602709A (Night Vision Technology), PE 0603710A (Night Vision Advanced Technology), and PE 0602120A (Electronic Surveillance and Fuzing Technology) in accordance with the ongoing Reliance joint planning process.

B. Program Change Summary	FY 1998	FY 1999	FY 2000	FY 2001
Previous President's Budget (FY 1999 PB)	18886	18456	22411	21214
Appropriated Value	19970	18456		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-1084	-199		
b. SBIR / STTR	-439			
c. Omnibus or Other Above Threshold Reductions	-145			
d. Below Threshold Reprogramming	-700			
e. Rescissions				
Adjustments to Budget Years Since FY 1999 PB			+199	-2103
Current Budget Submit (FY 2000/2001 PB)	17602	18257	22610	19111

Change Summary Explanation: Funding: FY2001 funding (-2103) reprogrammed to support other high priority requirements.

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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603772A Advanced Tactical Computer Science and Sensor Technology				PROJECT D101		
COST (<i>In Thousands</i>)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D101 Tactical Automation	11101	12951	16108	13421	15941	16887	18845	19858	Continuing	Continuing

Mission Description and Justification: This is the Army's major science and technology program to provide the architecture and products to implement the digitized battlefield and establish information dominance for US ground forces. It develops advanced computer science and technology solutions to redress Army-unique command and control deficiencies in the area of combined arms operations. Specifically, this project addresses technology solutions for digital information transfer and display of horizontal battlefield situation awareness data, synchronization of combined and joint forces, command and control (C2) on the move, command and control for light forces, and platform C2. Key technologies utilized include: expert system and intelligent agent decision support technology, database and distributed database architecture development, data compression, man-machine interfacing, information filtering, advanced information display technology, digital terrain display and manipulation, and automated navigation/geopositioning. Major program goals include improved force synchronization and fratricide reduction through the development and display of a common battlefield view. The battlespace command and control (BC2) advanced technology demonstration (ATD) will apply technologies for common view of the battlefield to develop prototype software capabilities and architectures supporting the Army digital battle staff requirements for merging situation awareness and battle command with mission planning/rehearsal and battlefield visualization capabilities. Digital command, control and communications (C3) hardware and software technologies will be demonstrated that integrate rapid force projection hunter-and standoff killer elements in a manner that is compatible with Force XXI battlefield operating systems and army battle command system (ABCS) components. Tri-service interoperability and supporting information architecture will also be determined. The logistics command and control (Log C2) ATD will develop course of action analysis and support software tools for combat service support and operational commanders. Joint developer/user warfighting demonstrations will be conducted in conjunction with the Mounted, Dismounted, Battle Command, and Combat Service Support Battle Labs. Products will be transitioned to Program Executive Offices (PEOs) (Command, Control and Communications Systems (C3S), Aviation, etc.) for integration within their systems and subsequent fielding.

FY 1998 Accomplishments:

- 3638 – Integrated battlefield visualization tools in a composite digital terrain/enemy/friendly visualization display with embedded, linked combat information and conducted collaborative planning experiments within battle planning and visualization prototype.
- 2472 – Developed integrated battlefield visualization tools to improve real time integrated situation awareness, reduced timelines for collaborative planning and rehearsal, and streamlined decision support activities in support of the battlefield commander as demonstrated at the Division XXI Advanced Warfighting Experiment.
 - Developed automated courses of action (COAs) and support the analysis capabilities in accordance with the doctrinal military decision making process.
- 2511 – Demonstrated commander/staff battle planning and visualization workstation in Division XXI Advanced Warfighting Experiment.

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<p>FY 1998 Accomplishments: (continued)</p> <ul style="list-style-type: none"> - Provided C2 integration support for experiments and demonstrations including the Rapid Terrain Visualization Advanced Concept Technology Demonstration. (ACTD). - Transitioned prototype mission planning tools to Maneuver Control System Block IV development. • 2480 - Delivered the Light Digital Tactical Operations Center (LDTOC) for the Rapid Force Projection Initiative (RFPI) ACTD. <ul style="list-style-type: none"> - Completed communications processor software for LDTOC and its simulator provided interface between live and virtual entities. - Completed Distributed C2 (DC2) software for LDTOC and its simulator to provide all RFPI elements a common battlefield picture and unique displays and controls to the Hunter Sensor Suite operator. - Trained user on LDTOC, DC2 software and communications processor software and supported RFPI ACTD field exercise. <p>Total 11101</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 5073 - Define/demonstrate information and data flow requirements, command and control element interfaces, and transitional data requirements to provide faster, more accurate, more intuitive mission tailored information to the commander/staff at brigade, division and corps level. • 3408 - Conduct modeling and simulation supporting critical event course of action analysis to streamline mission planning and rehearsal timelines and provide more rapid mission order execution. • 4020 - Conduct systems architecture analyses for multi-echelon command and control functions in a Joint environment. • 250 - Determine logistics operations planning criteria (LOPC) and combat service support (CSS) data requirements critical for the development of automatic decision support tools needed to reduce planning times for the Force XXI decision cycle. • 200 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs. <p>Total 12951</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 5015 - Scale, tailor and expand visualization products/tools to joint level to provide faster, more accurate, more intuitive mission tailored information to the commander/staff at corps level. • 3104 - Develop a human-in-the-loop simulation capability to provide real-time COA analysis and revision during its execution within a wargame simulation. • 3820 - Demonstrate intelligent agents which monitor mission plans and alert commanders to significant variation in expectations or execution of the plan, thereby allowing repair/modification of mission plans and resynchronization of forces as required. • 2171 - Demonstrate automated decision support software tool that enables combat commanders to plan weapon system crewing. <ul style="list-style-type: none"> - Demonstrate enhanced logistics COA analysis capability for reduced planning time and increased number of operational scenarios evaluated. 		
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603772A Advanced Tactical Computer Science and Sensor Technology	PROJECT D101
<p>FY 2000 Planned Program: (continued)</p> <ul style="list-style-type: none"> • 1998 – Develop the concept and preliminary architecture for a command post capable of highly mobile and on-the-move operation. Investigate DARPA command post of the future (CPoF) program technologies for applicability to Army command and control. <p>Total 16108</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 4424 – Demonstrate deliberate course of action (COA) software with automatic alerts for rapid replanning. – Demonstrate decision support software that optimizes weapon system management based on current fuel, ammunition and major end item situational awareness to improve readiness and resource utilization. • 7273 – Develop and integrate battlefield command and control information superiority technologies (e.g., information management, visualization, decision aids, human-computer interface, etc.) for highly mobile command posts. Select appropriate DARPA CPoF technologies to leverage to improve decision making and reduce staffing in the Army highly mobile command post. • 1724 – Develop a common, collaborative command and control and intelligence battlespace visualization and course of action capability. <p>Total 13421</p>		
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603772A Advanced Tactical Computer Science and Sensor Technology				PROJECT D243		
COST <i>(In Thousands)</i>	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D243 Sensors and Signal Processing	3628	5306	6502	5690	6272	6807	7334	7699	Continuing	Continuing
<p><u>Mission Description and Justification:</u> This project provides for advanced development of advanced radar and signal processing technologies for reconnaissance, surveillance, target acquisition, counter battery, and navigation applications. Multi-mission common module unmanned aerial vehicle (UAV) sensors advanced technology demonstration (ATD) will demonstrate an interchangeable, lightweight, low cost synthetic aperture/moving target indicator radar and electro-optic/infrared sensor payload (being developed in PE 0603710A) to provide manned and tactical unmanned air vehicles with wide area, all weather surveillance capability. A new generation of ultra-wideband radar, jointly developed by the Army, DARPA, and Air Force, will provide foliage and ground penetrating technology for aerial surveillance and targeting. An electronically scanned radar will be demonstrated to provide army reconnaissance and attack helicopters with a highly reliable, affordable, multirole sensor for targeting, combat identification, and terrain avoidance.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 3228 – Conducted requirements analysis for application of the multi-mission UAV sensors ATD compact moving target indicator (MTI)/synthetic aperture radar (SAR) sensor technology to future short and tactical UAVs, and airborne reconnaissance low/aerial common sensor for fixed wing aircraft.. <ul style="list-style-type: none"> – Completed system level design of compact MTI/SAR sensor for tactical UAV applications. – Evaluated operational moding and tactical control station software alternatives. – Conducted timeline, error rate and bandwidth utilization analyses for sensor data downlink. – Completed trade-off and design analyses to identify common gimbal, processing, and data link components that will allow MTI/SAR and EO/IR sensors to be rapidly interchanged based on mission requirements. 400 – Developed Army unique performance and aircraft integration requirements for joint service foliage penetrating (FOPEN) synthetic aperture radar (SAR) that will allow airborne surveillance platforms to detect targets concealed by foliage. <p>Total 3628</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 3600 – Design and develop compact MTI/SAR transmitter and receiver components and lightweight composite antenna structure to meet payload weight and power consumption requirements of tactical UAV platform. <ul style="list-style-type: none"> – Develop operational moding and tactical control station simulation for user evaluation and design feedback. – Design and develop modular gimbal/payload housing assembly that will allow users to rapidly employ either MTI/SAR or EO/IR payloads to optimize surveillance performance for mission and weather conditions. 										
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FY 1999 Planned Program: (continued)		
<ul style="list-style-type: none"> • 1565 	<ul style="list-style-type: none"> - Evaluate electromagnetic interference and compatibility of FOPEN SAR with army aircraft avionics to prevent interference with navigation and flight electronics. - Integrate SAR onto army aircraft to demonstrate the feasibility of using a military aircraft to perform FOPEN missions. - Integrate Ground Control and Display Station and demonstrate a functional ground processing facility to post process the SAR data and disseminate to users. 	
<ul style="list-style-type: none"> • 141 	<ul style="list-style-type: none"> - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs. 	
<p>Total</p>	<p>5306</p>	
FY 2000 Planned Program:		
<ul style="list-style-type: none"> • 4002 	<ul style="list-style-type: none"> - Complete MTI/SAR sensor development, subsystem integration and perform laboratory bench testing to verify functionality. - Test sensor payloads under environmental extremes for shock, vibration, temperature, altitude, etc. - Develop and test mechanical interface for "plug in/plug out" modularity, electrical interface to include cables, connectors, power, etc, and informational interface to include datalinks, command and control, mission planning, and ground checkout. - Conduct instrumented flight testing under dynamic flight conditions to characterize MTI/SAR sensor performance in surveillance and targeting roles. 	
<ul style="list-style-type: none"> • 2500 	<ul style="list-style-type: none"> - Conduct engineering flight tests to characterize the capabilities of the FOPEN SAR in detecting tactical targets hidden by foliage and/or camouflage cover. - Refine the algorithms to reduce false alarms to enhance the effectiveness of the automatic target detection and cueing in providing valid targets. - Conduct verification test to evaluate the achieved performance against the exit criteria and determine the readiness of a FOPEN SAR for participation in operational demonstration. 	
<p>Total</p>	<p>6502</p>	
FY 2001 Planned Program:		
<ul style="list-style-type: none"> • 3700 	<ul style="list-style-type: none"> - Complete airborne testing of multimission UAV MTI/SAR sensor payload and data collection and verify performance through data analysis. - Participate in operational demos for military assessment of multifunctional sensor suite on tactical UAV. 	

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- 1990 - Evaluate ground post processing of FOPEN data with a goal of reducing the clutter false alarms by an order of magnitude such that the image analyst can effectively discriminate tactical targets embedded in heavy foliage.
- Conduct user tests to demonstrate the real-time application of a FOPEN SAR to meet the need of an all weather detection of concealed threat targets.
 - Demonstrate/validate the concept of operation for using the FOPEN SAR to support the mission of potential users such as European Command, Southern Command, and Drug Enforcement Administration.

Total 5690

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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603772A Advanced Tactical Computer Science and Sensor Technology				PROJECT D281		
COST <i>(In Thousands)</i>	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D281 Ground Combat Identification Demonstrations	2873	0	0	0	0	0	0	0	0	25865
<p><u>Mission Description and Justification:</u> The objective of this project is to select, develop, and demonstrate techniques that minimize fratricide and increase combat effectiveness during surface-to-surface and air-to-surface engagements, and to demonstrate integration of advanced target identification (ID) and situation awareness (SA) capabilities into the Digitized, Joint battlefield environment and architecture. Selection of candidate approaches for technical and operational field evaluation are made based on results of architecture investigations for the combined arms battlefield. This Battlefield Combat Identification (BCID) advanced technology demonstration (ATD) serves as the foundation for the Joint advanced concept technology demonstration (ACTD) for air-to-surface and surface-to-surface combat ID (CID). The ACTD will utilize the Army's Task Force XXI digitized brigade advanced warfighting experiment (AWE) and other field experiments as a means to assess operational utility of these new capabilities. Information derived from these field experiments will support specification of follow-on engineering and manufacturing development (EMD) efforts.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 2873 – Completed analysis of extended positional accuracy capabilities of Enhanced Battlefield Combat Identification System (E-BCIS) based system and other BCID ATD systems. – Completed SA through sight field demonstration to include E-BCIS, Appliqué and other acquisition and target ID systems. <p>Total 2873</p> <p>FY 1999 Planned Program: Program not funded in FY 1999</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>										
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