

UNCLASSIFIED

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 1999
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability
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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	25545	16614	22978	23723	23053	23248	24287	25736	Continuing	Continuing
AH15 Ground Combat Identification Technology	3268	3546	3354	3494	3578	3674	3920	4113	Continuing	Continuing
AH16 S3I Technology	14962	10242	16608	17018	16181	16165	16798	17847	Continuing	Continuing
A140 High Power Microwave (HPM) Technology	2632	2826	3016	3211	3294	3409	3569	3776	Continuing	Continuing
A142 Passive Millimeter Wave (MMW) Camera	4683	0	0	0	0	0	0	0	0	4683

A. Mission Description and Budget Item Justification: The objectives of this program are: (1) to provide sensor, signal and information processing technology for advanced reconnaissance, surveillance, and target acquisition (RSTA), ground to ground and air to ground combat identification (ID), and fire control systems as well as the fuzing and guidance integrated fuzing functions in future munitions; and (2) to determine and reduce the susceptibility and vulnerability of Army equipment and systems to nuclear and radio frequency (RF)/high power microwave (HPM) environments. Three critical technologies are addressed to increase the combat effectiveness of tactical Army forces: (1) high power microwave (HPM) technology; (2) combat identification technology; (3) sensors, signatures, signal and information processing (S3I) technology. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Force Modernization Plan and Project Reliance.

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B. Program Change Summary	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (<u>FY 1999</u> PB)	25855	18738	19532	20996
Appropriated Value	26794	16895		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-939	-281		
b. SBIR / STTR	-233			
c. Omnibus or Other Above Threshold Reductions	-77			
d. Below Threshold Reprogramming				
e. Rescissions				
Adjustments to Budget Years Since <u>FY 1999</u> PB			+3446	+2727
Current Budget Submit (<u>FY 2000 / 2001</u> PB)	25545	16614	22978	23723

Change Summary Explanation: Funding – FY 1999 – Congressional reduction to President's Budget request (-1843).
 FY 2000 (+3446) and FY 2001 (+2727) increase to transition products from the Advanced Sensors Fed Lab and transfer of NATO R&D funding.

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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)								DATE February 1999		
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability					PROJECT AH15	
COST (In Thousands)	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
AH15 Ground Combat Identification Technology	3268	3546	3354	3494	3578	3674	3920	4113	Continuing	Continuing
<p>Mission Description and Justification: This program provides the enabling technology necessary to demonstrate advanced Combat Identification (CI) concepts and systems for mission areas not considered to date. The hardware and software improvements and modeling and simulation advances provided by this project are essential to expand and build upon the midterm CI architecture. The operational impacts to be realized are reduced fratricide and a significant increase in combat effectiveness. CI is also strongly related to the Army's larger objective of Battlefield Digitization and synergistically supplements that effort by addressing the fusion of situational awareness (SA) and point-of-engagement target identification (TI).</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 3268 - Completed integration of combat identification for the dismounted soldier (CIDDS) function into Land Warrior (LW) equipment suite. - Analyzed and developed target identification (ID) concepts for the dismounted soldier, to include soldier-to-vehicle and vehicle-to-soldier. - Completed architecture study using constructive simulation to assess operational effectiveness of different CI architectures and cost information to define performance vs. cost trade-offs. <p>Total 3268</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 3457 - Demonstrate integration of CIDDS functionality during the Force XXI LW Integrated Technology Demonstration. - Complete prototyping and integration of the vehicle to dismounted soldier CI system. - Demonstrate integration of ID data from situation awareness (SA) and Target ID sources through the sight display in a virtual experiment. - Determine optimum CI technical approach for Fire Support Teams and Apache Longbow. • 89 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 3546</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 3354 - Demonstrate integration of CIDDS functionality with BCIS to provide vehicle-to-soldier ID capabilities. - Conduct evaluations of selected CI solutions for Apache Longbow. - Demonstrate an automated single channel ground and airborne radio system (SINCGARS) based ID capability for Fire Support Teams (FiST). - Develop algorithms for fusion of point-of-engagement target ID data with SA. <p>Total 3354</p>										
Project AH15			Page 3 of 12 Pages				Exhibit R-2A (PE 0602120A)			

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602120A Sensors and Electronic Survivability	AH15
FY 2001 Planned Program:		
•	3494 - Demonstrate an integrated target ID and SA capability for vehicle ID.	
	- Demonstrate a proof of concept of ID capabilities for Apache Longbow.	
	- Evaluate the different CI architectures as a function of performance (operational), cost, maturity and interoperability.	
Total	3494	
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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)								DATE February 1999		
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability					PROJECT AH16	
COST (In Thousands)	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
AH16 S3I Technology	14962	10242	16608	17018	16181	16165	16798	17847	Continuing	Continuing
<p>Mission Description and Justification: This project provides for the synergistic development of sensors; signal processors; sensor and information processing; and automatic target recognition (ATR) technology for RSTA, fire control, smart munitions and fuzing systems. In the RISTA and fire control area, the project will develop and demonstrate: (1) advanced ultra wide band (UWB) radar technology for adverse weather, wide-area detection, location and recognition of tactical ground targets concealed in foliage, and buried mines; (2) innovative algorithms for the detection, discrimination, and classification of stationary targets from a low flying helicopter; (3) ATR algorithms that synergistically use outputs of forward looking infrared (FLIR), millimeter wave (MMW) radar and laser radar (LADAR) sensors to identify combat vehicles and perform signature predictions in many bands (infrared, visible, MMW, and LADAR) from targets and backgrounds at specified times, weather conditions and locations; (4) affordable, lightweight target acquisition radar technology for man-portable and battlefield platform applications; (5) advanced optical processing techniques to automatically process, at the sensor, the received signals into target information of sufficiently narrow bandwidth to be compatible with Army communications systems; (6) advanced battlefield sensor and information processing to conduct a dynamic and real time situation assessment to present a common picture of the battlespace to commanders; and (7) advanced information processing methods to provide automatic information systems support to enable commanders to utilize widely dispersed sensor and legacy information sources. Project goals in the smart munitions and fuzing area include development of advanced microwave, millimeter wave (MMW), acoustic, electrostatic, and LADAR technologies to reliably sense low cross section targets in high countermeasures and clutter environments. These technologies support the Force XXI modernization efforts, the Army battlefield digitization effort, Advanced Technology Demonstrations/ Advanced Concept Technology Demonstrations (ATD/ACTD) such as: Intelligent Minefield; Target Acquisition; Remote Sentry; Rapid Force Projection Initiatives; Battlespace Command and Control; Joint Combat Identification; and rapid Battlefield Visualization; and systems such as: Longbow, advanced submunitions, standoff fuzing for anti-armor munitions, proximity fuzing, range finding for bursting munitions, smart mines, multi-option fuze for artillery; guided and unguided tank, mortar and artillery ammunition, and anti-aircraft applications including projectile and missile fuzing..</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 2344 - Designed, simulated, fabricated and evaluated optical interconnect circuitry consisting of oxidized 8x8 Vertical Cavity Surface Emitting Laser (VCSEL) array flip-chip bonded to Complementary Metal Oxide Semiconductor (CMOS) drive circuits. <ul style="list-style-type: none"> - Designed, fabricated and tested imaging Acoustic-Optical Tunable Filter (AOTF) in the visible. Designed imaging AOTF for the infrared. • 4137 - Demonstrated target acquisition and tracking of ground vehicles using testbed. <ul style="list-style-type: none"> - Reported on capability to perform Ultra Wide Band (UWB) Synthetic Aperture Radar (SAR) processing steps in real-time on an airborne platform. - Demonstrated stationary target discrimination techniques for real beam radars that increase probability of detection in diverse environments. 7001 - Developed acoustic sensors to passively detect, locate, track, and identify ground vehicles, aircraft, artillery and mortar fire, and other battlefield targets. <ul style="list-style-type: none"> - Developed new algorithms for the detection of infrasonic signals generated by cruise missile signatures, missile launches, artillery fire, etc. 										
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability	PROJECT AH16
<ul style="list-style-type: none"> - Researched, built/modeled prototype, evaluated and integrated ultrasonic sensors for Parachute Soft Lander. - Developed acoustic sensors to monitor soldier physiological signs. 		
<p>FY 1998 Accomplishments: (continued)</p>		
<ul style="list-style-type: none"> - Demonstrated effective detection of extremely low frequency (ELF) signature on helicopters in clutter environments. -Developed an improved 8-12 micron target recognizer using compact target signature representations • 1480 - Developed a set of algorithms, methods, and Application Programmers Interface based software subsystems, and modules to enhance the access and display of battlefield sensor information in an integrated 2D / 3D environment. - Demonstrated concepts for improved processing and algorithms for the real-time transformation of sensor and environmental information, such as integrated weather and chem / bio agents with terrain data into a unified battlefield visualization environment - Developed a multi-modality human / computer module which will enable the user to interact with multiple displays and/or display modalities through a more multi-modal interface which includes gesture, eye tracking and natural language. The results of this research are being leveraged by Defense Information Systems Agency (DISA) to help stage the Defense Information Infrastructure/Common Operator Environment (DII / COE) standards for 3D visualization of sensor and other C2 data. <p>Prototype 2D / 3D visualization environment is a strong candidate for transition to the OSD Demo 3 Robotics Program as the display for platform status and sensor information.</p>		
Total	14962	
<p>FY 1999 Planned Program:</p>		
<ul style="list-style-type: none"> • 3286 -Integrate second-generation stationary target information algorithms into wideband testbed. -Report on performance of UWB SAR algorithms to provide reliable discrimination of mines in clutter. -Improve stationary target classification for real beam radars by using adaptively weighted mean square error metrics and efficient multi-resolution template pruning strategies. • 2850 -Demonstrate optoelectronic processor interconnect circuit involving advanced CMOS drive circuits capable of some processing functions and VCSEL array interconnects. -Design, fabricate and evaluate infrared (IR) imaging AOTF. -Develop novel emissive display structures -Characterize optical limiters -Optical/Digital Imaging and diffractive optical elements (DOE) development • 4106 -Develop acoustic detection algorithm for multiple target identification. Develop body-worn sensor for soldier performance monitoring; develop capability for medic to interrogate soldiers remotely; evaluation of mortar munition test firings to demonstrate capability to glide extended ranges in excess of 12km with a 120mm mortar munition; evaluate potential impact of magnetic sensors for unattended ground sensors; -Develop concepts and tools for sensor fusion on unattended ground sensors. -Train an ATR algorithm originally developed using 8-12 micron thermal emission phenomenology with 3-5 micron data and assess performance. 		
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability	PROJECT AH16
Total	10242	
FY 2000 Planned Program:		
•	4305 -Evaluate field techniques for calibration of coherent fully polarimetric active and passive MMW target acquisition systems. -Evaluate performance of second-generation mine detection algorithms and performance of forward-looking vehicle mounted sensors. -Investigate impact of near and far field signatures on MMW target acquisition emulations and algorithm development.	
•	2100 - Demonstrate visible imaging microsensor and IR imaging microsensor designs. -Evaluate magnetic sensor capabilities for unattended ground sensors	
•	4281 -Develop advanced acoustic target identification algorithms -Demonstrate multi-target acoustic tracking -Develop a fused 3-5 micron and 8-12 micron ATR algorithm exploiting unique characteristics of each and assess performance	
•	3183 -Perform remote sensing and hyperspectral imaging experiments with IR AOTF's. -Develop algorithm and processing architecture for hyperspectral imaging. -Demonstrate beam steering with micro-scale diffractive optical elements. -Demonstrate breadboard optical limiters.	
•	2039 - Demonstrate and validate an integrated set of reasoning, visualization, data access and touchless computer interface algorithms for transition to CECOM's Cyber Command Post Program. - Investigate techniques for the auto-rectification of submeter resolution sensor data for viewing in an integrated 2D / 3D environment. - Integrate (from AH48) intelligent system technology that compares, in the background, sensed information against user specified priority information requests and focuses user attention to the sensed information. - Integrate untethered gesture recognition research (from Displays Fed Lab) into touchless computer interface modules.	
•	700 - Next- Generation Autonomous Vehicle Navigation Control System (AUTOVAV) (Partner: Germany): Continue design and development of an advanced autonomous vehicle navigation control system. Complete sub-system tests of obstacle detection, classification, and avoidance technologies.	
Total	16608	
FY 2001 Planned Program:		
•	4645 -Validate second generation mine detection algorithms with plastic mines in new environments. -Extend functionality of MMW radar emulation to smart weapons like millimeter wave (MMW) Longbow Hellfire and Tank Extended Range Munitions (TERM). -Apply calibration and image formation techniques to field tests to support development of Ka-Band vehicle mounted multifunction RF sensor.	
•	3274 -Demonstrate electro-optical processor capability for image processing -Investigate flexible displays	
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability	
<ul style="list-style-type: none"> • 1300 -Demonstrate integrated acoustic/seismic/imaging microsensor network. -Develop sensor fusion concepts for acoustic/seismic/magnetic sensor -Demonstrate magnetic sensor capabilities in Warrior Extended Battlespace Sensors (WEBS) testbed 		
<p>FY 2001 Planned Program: (continued)</p>		
<ul style="list-style-type: none"> • 4871 -Demonstrate advanced acoustic target identification algorithms with real targets -Develop first iteration of a multi-band spectral imager-based ATR algorithm compatible with land warfare scenarios 		
<ul style="list-style-type: none"> • 2328 - Demonstrate intelligent agents for mission planning, rehearsal and status monitoring of physical RSTA agents and visualize the process in an integrated 2D/3D display environment. - Demonstrate and validate final integrated set of reasoning, visualization, data access and touchless computer interface algorithms into CECOM Cyber Command Post Program. 		
<ul style="list-style-type: none"> • 600 - Next- Generation Autonomous Vehicle Navigation Control System (AUTOVAV) (Partner: Germany): Continue design and development of an advanced autonomous vehicle navigation control system. Complete sub-system tests of obstacle detection, classification, and avoidance technologies. 		
Total	17018	

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BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability				PROJECT A140			
COST (In Thousands)		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
A140	High Power Microwave (HPM) Technology	2632	2826	3016	3211	3294	3409	3569	3776	Continuing	Continuing
<p>Mission Description and Justification: The objective of this project is to develop the tools, techniques and methodology to assess the susceptibility and vulnerability of Army equipment and systems to various types of radio frequency (RF)/high power microwave (HPM) environments, and to identify, develop, and evaluate the technologies required to protect and harden US equipment as well as to enable weaponization. This program is coordinated and, when appropriate, leveraged with HPM programs in the Air Force, Navy, Defense Special Weapons Agency, National Labs, University Consortia and relevant industry and foreign partners.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 2632 -Determined RF susceptibility levels for selected air targets and conducted a feasibility study for counter-air directed energy capability in support of US Army Air Defense Artillery School (USADASC). <ul style="list-style-type: none"> -Conducted RF effects investigation of threat artillery/mortar fuzes for potential improvements to SHORTSTOP in support of CECOM. -Conducted studies, experiments and design efforts on standard shelters in support of NATICK RF mitigation efforts and future digital force survivability. -Completed the design of an L-band slotted waveguide antenna for Army vehicles and RF field tests, and developed an RF propagation formulation for the prediction of high frequency field levels over earth or sea. -Demonstrated effects of commercial off-the-shelf (COTS) RF threats on commercial electronics for the Joint Program Office on Special Technology Counter Measures. -Provided expertise to Army RDECs, PMs, Inspector General, and the National Intelligence Council regarding DE threat environments, effects, and hardening technology insertion. -Completed preliminary design for improved high average power Reltron HPM source buncher cavities. Designed Reltron test bed and beam stick. -Completed design of buncher cavity, preliminary design of beam stick, modulator and diagnostics for high average power broadband klystron amplifier. Deliverables included technical papers and presentations. -Designed high average power tube development test bed (construction dependent on other funding). -Formulated experimental, numeric and analytic models and techniques that will permit high confidence cost-effective assessments and evaluations of stand-alone and networked equipment exposed to RF/HPM threats. Efforts concentrated on the evaluation of RF propagation and the effects of building structures in enhancing RF susceptibilities of contained equipment (an observed but ill understood problem). -Formulated and modeled the data and information flow, into, out of, and within the Abrams M1A2 and Longbow Apache AH64-D. <p>Total 2632</p>											
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BUDGET ACTIVITY		February 1999
2 - Applied Research	PE NUMBER AND TITLE	PROJECT
	0602120A Sensors and Electronic Survivability	A140
FY 1999 Planned Program:		
<ul style="list-style-type: none"> • 2790 -Determine system design requirements for enhanced counter-air capability (ECAC) and conduct an electromagnetic compatibility (EMC) analysis of a counter-air weapon system in support of US Army Air Defense Artillery School (USADASC). -Conduct RF effects investigation & experiments of selected target(s) of interest to TRADOC, CECOM RDEC, and Joint Live Fire Test & Evaluation (JLFT&E) office. -Complete the design of EM shielding components for the High Mobility Multipurpose Wheeled Vehicle (HMMWV) shelter for NRDEC. -Identify, evaluate and consult on FXXI Land Warrior electronic systems for NRDEC. -Conduct research into new weapon systems with tunable capabilities for lethal, non-lethal, anti-personnel, and anti-materiel applications in support of ARDEC for the AAN. - Provide expertise to Army RDECs, PMs, DoD IG, TRADOC, and intelligence community regarding DE threat environments, effects, and hardening technology insertion. -Complete design of beam stick and output cavities for high average power broadband klystron amplifier and report on possibilities for size and weight reduction. -Conduct theoretical study of electron beam dynamics in linear beam tubes such as Reltron and klystron. -Develop/acquire full complement of linear beam design and simulation codes. -Design antennas such as high power small element arrays for use on Army platforms and field tests. -Conduct theoretical study of broadband klystron amplifiers for Army applications. -Support RDEC demos and application studies. -Validate benign and threat effects Abrams and Longbow Apache information flow models, and transfer to U.S. Army Communications and Electronics Command's (CECOM's) suite of System Performance Models. -Develop new test and simulation methods to study the effects and mitigation of RF-DEW on military and commercial systems. • 36 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs 		
Total	2826	
FY 2000 Planned Program:		
<ul style="list-style-type: none"> • 3016 -Perform RF effects investigation of threat UAVs to support US Army Air Defense Artillery School. -Conduct RF effects investigation and experiments of selected target(s) of interest to TRADOC, CECOM RDEC, and Joint Live Fire Test and Evaluation (JLFT&E) office. -Support WMRD in the fabrication of a composite High Mobility Multipurpose Wheeled Vehicle (HMMWV) shelter, conduct shielding effectiveness tests, and support RF mitigation efforts undertaken by NRDEC for the Future Land Warrior technologies. -Conduct RF DEW effects and mitigation investigations of selected First Digitized Division systems in conjunction with ARL-SLAD and in support of the digital force survivability. 		
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BUDGET ACTIVITY		February 1999
2 - Applied Research	PE NUMBER AND TITLE	PROJECT
	0602120A Sensors and Electronic Survivability	A140
FY 2000 Planned Program: (continued)		
<ul style="list-style-type: none"> -Conduct research into new weapon systems with tunable capabilities for lethal, non-lethal, anti-personnel, and anti-materiel applications in support of ARDEC for the AAN. - Provide expertise to Army RDECs, PMs and TRADOC regarding DE threat environments, effects, and hardening technology insertion. -Initiate designs for size/weight reduction of linear beam tubes (e.g. Reltrons) for Army applications. -Complete designs for series of experimental Reltron linear beam tubes. -Develop designs for principal broadband amplifier components including diode, cavities, and beam stick. -Develop short pulse (ultra wide band) antennas and techniques for Army applications. -Support RDEC demos and application studies. 		
Total	3016	
FY 2001 Planned Program:		
<ul style="list-style-type: none"> • 3211 -Perform detailed design of enhanced counter-air capability for TRADOC and CECOM. -Conduct RF effects investigation and experiments of selected target(s) of interest to TRADOC, CECOM, RDEC, and Joint Live Fire Test and Evaluation (JLFT&E) office. -Support NRDEC RF mitigation efforts in standard shelter design and Future Land Warrior technologies. -Conduct RF DEW effects and mitigation investigations to assure survivability of US Forces on the digital battlefields of the future. -Conduct research into new weapon systems with tunable capabilities for lethal, non-lethal, anti-personnel, and anti-materiel applications in support of ARDEC for the AAN. - Provide expertise to Army RDECs, PMs and TRADOC regarding DE threat environments, effects, and hardening technology insertion. -Complete first stage designs for size/weight reduction of linear beam tubes. -Construct experimental designs for series of broadband klystron amplifier experiments. -Design a high gain, broadband antenna or antenna system for high power applications. -Support RDEC demos and application studies. 		
Total	3211	
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BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602120A Sensors and Electronic Survivability				PROJECT A142		
COST <i>(In Thousands)</i>	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
A142 Passive Millimeter Wave (MMW) Camera	4683	0	0	0	0	0	0	0	0	4683
<p><u>Mission Description and Justification:</u> This is a Congressionally funded program, not part of the Army's core mission funded program. The goal is to develop technology for a passive/active MMW imaging system and to demonstrate its performance capabilities as a covert all-weather surveillance and target acquisition system. Research is also performed on enabling MMW technologies in support of passive/active MMW imaging. These funds have been provided to ARL as a result of Congressional interest for the development of a Passive MMW Camera (PMC). The FY98 funds complete the assembly of a flight-worthy PMC on an airborne test platform that may allow map-of-the-earth navigation and obstacle avoidance, reconnaissance, landing guidance, and search and rescue mission scenarios under conditions of adverse weather.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 4683 - Completed development of a flight worthy passive millimeter wave (MMW) imaging system for integration into an airborne test platform. <li style="padding-left: 20px;">- Completed development of enabling MMW antenna and receiver technologies for sensor systems. <p>Total 4683</p> <p>FY 1999 Planned Program: Project not funded in FY 1999.</p> <p>FY 2000 Planned Program: Project not funded in FY 2000.</p> <p>FY 2001 Planned Program: Project not funded in FY 2001.</p>										
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