ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE
2 - Applied Research	**0602709A - NIGHT VISION TECHNOLOGY**

	COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
	Total Program Element (PE) Cost	35324	34924	25647	26381	26905	26929	26974
H95	NIGHT VISION & EO TECH	23023	24194	25647	26381	26905	26929	26974
K90	NIGHT VISION COMPONENT TECHNOLOGY (CA)	12301	10730					

A. Mission Description and Budget Item Justification: This program element (PE) researches, designs, and applies core night vision and electronic sensor technologies to improve the Army's capability to operate in all battlefield conditions. The technologies funded in project H95 have potential to provide the Army with new, or enhanced, capabilities to see and target farther on the battlefield, operate in obscured conditions, and maintain a higher degree of situational awareness (SA). These technologies support Future Combat Systems (FCS), the Future Force, and, where feasible, exploit opportunities to enhance Current Force capabilities. This project will fund efforts that will determine the benefits of using fused long wave infrared (LWIR) and very near infrared (VNIR) imagery for the dismounted Soldier in all day/night visibility conditions and research component technology for transition to future Soldier systems. Techniques to be explored include: super resolution, non-uniformity correction, image fusion, analog to digital conversion, region of interest (windowing) and motion detection, all contained in a single chip, and low power electronics for both cooled and uncooled infrared. This project will fund efforts to perform research to dramatically reduce the time necessary to acquire targets, and collect intelligence data. Additional efforts include providing the capability to incorporate lightweight laser designators on small unmanned aerial vehicle (UAV) and unmanned ground vehicle (UGV) platforms and portable Soldier systems, and research new infrared (IR) FPA technologies for both cooled, high performance IR FPAs and uncooled, low cost IR FPAs. Sensor models will be created to accomplish trade studies, performance predictions, and also support constructive simulation/wargaming for analysis of alternatives. In addition, this project will focus on sensor modeling and simulation technology maturation in critical areas such as; modeling target acquisition tasks of search, detection, recognition, and identification for currently inadequate representations in military operations in urban terrain, specific targets, and moving targets; modeling representations for advanced sensor technologies. Multispectral sensor simulations will support end-to-end predictive modeling and evaluation of new technologies in a virtual environment. This project will assess and evaluate laser materials to produce a covert ladar system. Project K90 funds congressional special interest items.

Work in this PE is related to and is fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermine Technology), and PE 0603710A (Night Vision Advanced Technology). The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this PE is performed by the Army Research, Development, and Engineering Command/Communications-Electronics Research, Development, and Engineering Center/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

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B. Program Change Summary	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	36203	24391	25662
Current BES/President's Budget (FY 2009)	35324	34924	25647
Total Adjustments	-879	10533	-15
Congressional program reductions		-267	
Congressional rescissions			
Congressional increases		10800	
Reprogrammings	-323		
SBIR/STTR Transfer	-556		
Adjustments to Budget Years			-15

Eight FY08 congressional adds totaling $10800 were added to this PE.

($800) Personal Miniature Thermal Viewer (PMTV)
($800) Robotics Workforce and Military Curriculum
($1000) Miniaturized Sensors for Small and Tactical Unmanned Aerial Vehicles (MINISENS)
($1000) Next Generation Communications System
($1600) Enhanced Micro-Image Display Technology
($1600) Hyperspectral Sensor for UAV Surveillance/Targeting
($1600) Small Business Infrared Materials Manufacturing - Silicon Alternatives
($2400) Power Efficient Microdisplay Development for US Army Night Vision

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602709A - NIGHT VISION TECHNOLOGY**	**H95**

COST (In Thousands)		FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
H95	NIGHT VISION & EO TECH	23023	24194	25647	26381	26905	26929	26974

A. Mission Description and Budget Item Justification: This project funds the design, and development of core night vision and electronic sensor technologies and components to improve the Army's capability to operate in all battlefield conditions. The technologies funded in project H95 have potential to provide the Army with new, or enhanced, capabilities to see and target farther on the battlefield, operate in obscured conditions, and maintain a higher degree of situational awareness (SA). These technologies support the Future Force, and, where feasible, exploit opportunities to enhance Current Force capabilities. The Soldier Mobility Vision System effort determines the benefits of using fused long wave infrared (LWIR) and visible near infrared (VISNIR) imagery for the dismounted Soldier in all day/night visibility conditions and researches component technology for transition to future Soldier systems. Techniques to be explored that enhance SA include: super resolution, non-uniformity correction, image fusion, analog to digital conversion, region, of interest (windowing) and motion detection, all contained on a single low power chip for both cooled and uncooled infrared. The Distributed Aided Target Recognition (AiTR) effort develops the ability to dramatically reduce the time necessary to acquire targets and collect intelligence data. The Lightweight Laser Designator effort pursues technologies that enable the incorporation of lightweight laser designators on small unmanned aerial and ground vehicle platforms and portable Soldier systems. In an attempt to satisfy the Warfighter needs for persistent surveillance and threat warning, increasingly complex sensors (e.g. large (2000 by 2000 pixel) single color focal plane array (FPA), and multi-spectral) are required resulting in higher cost sensors systems. Mercury Cadmium Telluride (HgCdTe), the only mature material technology that can operate in the infrared from ~1-30 microns, is currently deposited on small-size, very costly Cadmium Zinc Telluride (CdZnTe) substrates, which are solely available from one foreign source. Depositing HgCdTe on low cost substrates, e.g., silicon, enables very large format FPAs, and multi-spectral sensors at costs not attainable with current technology. In addition efforts focus on sensor, modeling, and simulation technology maturation in the following critical areas: target acquisition tasks of search, detection, recognition and identification in urban terrain; and accurate representations for advanced sensor technologies. Multispectral sensor simulations support end-to-end predictive modeling and evaluation of new technologies in virtual combat simulations; advanced multifunction laser efforts assess and evaluate laser materials to produce a covert ladar technology. High Performance Small Pixel Uncooled Infrared FPA efforts demonstrate the feasibility of smaller pixel, lower cost, uncooled technology for short range ground, and unmanned aerial vehicle sensors, head-mounted thermal imaging, and thermal weapon sights, cost effective targeting systems, distributed aperture sensor systems, driver vision sensors, and sensors for precision attack munitions.

Work in this project is related to and is fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermine Technology), and PE 0603710A (Night Vision Advanced Technology). The cited work is consistent with the Department of Defense Research and Engineering Strategic Plan, the Army Science and Technology Master Plan, the Army Modernization Strategy, and the Army Posture Statement. Work in this PE is performed by the Army Research, Development, and Engineering Command/Communications-Electronics Research, Development, and Engineering Center/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

Accomplishments/Planned Program:	FY 2007	FY 2008	FY 2009
Soldier Vision System Components: In FY07, evaluated low power, high performance, large format night imagers for head mounted applications; developed an image enhancing processor for a head mounted high definition color display; designed and evaluated prototype multi image architecture components and alogithms for head mounted opto-mechanical configuration; conducted field studies on several Micro Channel Plate Complementary Metal Oxide Semiconductor /electron bombarded active pixel sensor system.	3953		

Distributed Aided Target Recognition (AiTR) Evaluation Center of Excellence: In FY07, conducted phenomenology study of fusing multiple ground based sensors against man-made and natural highly cluttered environments for stationary and mobile target detection, and identification. In FY08, conduct field tests to determine the effectiveness of fusing multiple ground based sensors against man-made and natural cluttered environments. In FY09, will complete data collection efforts (archive and ground truth data); will evaluate data collected to determine optimal sensor fusion techniques.	1389	1257	1235
Lightweight Laser Designators: In FY07, developed and evaluated three brassboard compact lasers with possible application for small unmanned aerial system (UAS); assessed the power consumption and component weight.	3631		
Low Cost High Resolution Focal Plane Arrays (FPA): In FY07, demonstrated long-wave HgCdTe array in a 640 by 480 format with greater than 96 percent operability; demonstrated a 640 by 480 uncooled array, with a 5 ms time constant and a 35 mK noise equivalent temperature difference (e.g. to improve image quality/crispness). In FY08, develop and evaluate 2-color midwave infrared /longwave infrared (MWIR/LWIR) arrays with joint operability of greater than 90 percent and 96 percent respectively for both threat warning and enhanced situational awareness. In FY09, will integrate and refine sensor development to achieve an operability of greater than 95 percent/98 percent; will design FPA (image enhancing device) for mini-UAS applications.	6549	4698	4969
Modeling, Measurements and Simulation Applied Research for Sensor Design and Evaluation: In FY07, completed development and validation of third generation forward looking infrared simulation; updated the ACQUIRE family of sensor design models with metrics for the detection and discrimination of concealed weapons, and developed more robust detection and discrimination of personnel in urban environments. In FY08, design, validate and deliver an aided target recognition performance model for use in combat simulations; develop a flash signature library and discrimination model for sensor design and combat simulations. In FY09, will develop and validate sensor performance model improvements to more accurately address moving targets, environmental effects such as glint (reflective components), weather, and complex clutter (foliage and urban structures); begin design of performance models for distributed and networked imaging sensor systems.	4732	5028	5043
Advanced Multifunction Laser Technology: In FY08, assess and evaluate laser designs and materials for a multi-function laser system, including laser designation and range finding. In FY09, will develop and validate performance of the laser designator/laser rangefinder components in a relevant environment.		3002	3174
High Performance Small Pixel Uncooled Focal Plane Array: In FY07, designed and fabricated pixel structures to verify design parameters; tested and evaluated the pixel structures to verify sensitivity and noise predictions. In FY08, fabricate and test 17 micron read out integrated circuit (ROIC) (compact micro processor chip for high resolution imagery); test and evaluate the various components and verify results via modeling and simulation. In FY09, will integrate the high resolution FPA device to optimize the digital output with the ROIC and perform validation test and evaluation for advanced thermal weapon sight performance.	2769	3588	3360
Soldier Sensor Component and Signal Processing: In FY08, fabricate, assess and evaluate co-location of sensor focal plane array and processing resources on the same chip; assess and evaluate high resolution low power pixel mosaic structure display for infrared, hyperspectral, and visible sensors; conduct evaluation and design trade study of advanced adaptive light weight optics. In FY09, will complete co-location of sensing and processing resources on same chip allowing for immediate feedback of processing results to enable real-time clutter rejection for hyperspectral and multispectral applications; will complete design and fabricate demonstrator of advanced pixel mosaic, high resolution, low light visible sensor display; will fabricate and evaluate prototype advanced adaptive optics.		6419	7866
Small Business Innovative Research/Small Business Technology Transfer Programs		202	
Total	23023	24194	25647