Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603710A: *NIGHT VISION ADVANCED TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	81.157	39.912	42.414	-	42.414	40.727	41.523	42.933	43.410	Continuing	Continuing
K70: *NIGHT VISION ADV TECH*	33.855	24.491	25.767	-	25.767	24.076	25.257	25.375	25.517	Continuing	Continuing
K73: *NIGHT VISION SENSOR DEMONSTRATIONS (CA)*	32.132	-	-	-	-	-	-	-	-	Continuing	Continuing
K86: *NIGHT VISION, ABN SYS*	15.170	15.421	16.647	-	16.647	16.651	16.266	17.558	17.893	Continuing	Continuing

Note

FY10 funding increase for higher priority efforts.
FY12 funding increase for Sensor Fusion Technology demos.

A. Mission Description and Budget Item Justification

This program element (PE) matures and demonstrates sensor technologies that increase Warfighter survivability and lethality by providing sensor capabilities to acquire and engage targets at longer ranges in complex environments and operational conditions (e.g. day/night, obscured, smoke, adverse weather). This PE pursues technologies that improve the Soldier's ability to see at night, provide rapid wide area search, multispectral aided target detection (AiTD), and enable passive long range target identification (ID beyond threat detection) in both an air and ground test-beds (project K70). This PE also matures and evaluates sensors and algorithms designed to detect targets (vehicles and personnel) in camouflage, concealment and deception from airborne platforms, and provides pilotage and situational awareness imagery to multiple pilots/crew members independently for enhanced crew/aircraft operations in day/night/adverse weather conditions (project K86). Project K73 funds congressional special interest items.

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 fully coordinated with efforts in PE 0602709A (Night Vision and Electro-Optics Technology), PE 0602712A (Countermine Systems), PE 0602270A (Electronic Warfare Technology), PE 0602120A (Sensors and Electronic Survivability), PE 0603606A (Landmine Warfare and Barrier Advanced Technology), PE 0603774A (Night Vision Systems Advanced Development), PE 0604710A (Night Vision Systems Engineering Development) and PE 0603005A (Combat Vehicle and Automotive Advanced Technology).

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM)/Communications-Electronics Research, Development, and Engineering Center (CERDEC) /Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

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B. Program Change Summary ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Previous President's Budget	72.250	39.912	37.378	-	37.378
Current President's Budget	81.157	39.912	42.414	-	42.414
Total Adjustments	8.907	-	5.036	-	5.036
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	9.999	-			
• SBIR/STTR Transfer	-1.092	-			
• Adjustments to Budget Years	-	-	5.036	-	5.036

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COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
K70: *NIGHT VISION ADV TECH*	33.855	24.491	25.767	-	25.767	24.076	25.257	25.375	25.517	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates high-performance integrated sensor/multi-sensor technologies to increase target detection range, extend target identification range, and reduce target acquisition (TA) timelines for dismounted Soldiers and tactical vehicles against threats that are beyond today's detection ranges or are partially obscured by terrain, weather or other features.

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 (RDECOM)/Communications-Electronics Research, Development, and Engineering Center (CERDEC) /Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Weapon Sight Technology	5.847	9.470	6.774
Description: This effort develops, integrates, and demonstrates critical components for the next generation of weapon sight systems for mounted and dismounted Soldier use. ***FY 2010 Accomplishments:*** Developed and matured optical augmentation (OA) sensor and hardware; began Phase I weapon sight (WS) as defined in design studies and configuration definition; conducted technical evaluation of included technologies; and evaluated and selected the optimum technology demonstrator for system integration. ***FY 2011 Plans:*** Continue OA hardware prototype integration for demonstration and user evaluation; begin phase II weapon sight prototype hardware integration of down-selected configurations for dismounted and crew served applications; mature and demonstrate enhancement in Soldier situational awareness through increased target detection and engagement technologies; and conduct laboratory tests and assess the weapon sight system. ***FY 2012 Plans:*** Will complete counter surveillance system (CSS) brassboard integration; will demonstrate and conduct user evaluation then transition CSS technology to Program Manager-Soldier Sensors and Lasers (PM-SSL) and PM-Stryker; will complete weapon			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
sight brassboard integration; will demonstrate and conduct user evaluations of the weapon sight technology then transition the technology to PM-SSL.			
Title: Urban Sensor Suite ***Description:*** This effort develops and integrates 360 degree closed hatch vision capability with real time acoustic and non-real time on-the-move (OTM) moving target indicator (MTI) threat detection and cueing sensors and algorithms, high resolution interrogation sensors (for slew to cue identification), improved resolution driving sensors, and high bandwidth video capture capabilities in urban operations for improved survivability, lethality. ***FY 2010 Accomplishments:*** Evaluated threat detection sensors and baseline acoustic cueing, non-real time OTM MTI and slew to cue algorithm performance; integrated baseline detection sensors and acoustic cueing algorithms into vehicle demonstration platform; conducted demonstration of integrated detection and slew capabilities; demonstrated baseline 360 degrees video capture approach for improved situational awareness while OTM; maturated and integrated the acoustic cueing sensor system. ***FY 2011 Plans:*** Complete development of system architecture, hardware, and software for integrated processing of video and multiple threat detection alerts (acoustic/ MTI); complete integration of improved resolution driving cameras, high resolution slew to cue camera, and weapons fire detection sensors; complete maturation of software for graphical user interface with camera and sensors to assess threat detection and discrimination of imagery analysis; and complete integration, maturation, and demonstration of detection systems on vehicle platform. ***FY 2012 Plans:*** Will demonstrate advanced crew stations with the state of the art electro-optic indirect vision systems (high resolution threat interrogation and driving sensors, autonomous threat detection and cueing, and digital video recording and displays); will complete maturation of products to include: sensor interface for target handoff and pointing to/from dismounted Soldiers, high resolution forward looking infrared, image intensified and visual sensors, threat cueing sensors and algorithms for weapons fire detection/ location; will develop signal processing algoriths for pixel level sensor fusion and information fusion.	9.510	10.677	8.912
Title: Unmanned Tactical Ground Persistent Surveillance and Targeting ***Description:*** This effort matures and demonstrates high-performance integrated sensor/multi-sensor technologies to increase local situational awareness and target discrimination capabilities and reduce target acquisition (TA) timelines for dismounted Soldiers, combat vehicles, tactical robots, ground and urban sensors against threats that are beyond today's ranges or discrimination capabilities or are partially obscured by terrain.	-	-	4.800

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2012 Plans: Will initiate development of higher performance, lower cost advanced sensor technology and incorporate new sensors into manned and unmanned vehicles, as well as Soldier borne applications, to acquire targets at extreme ranges while reducing the size and power needs to the platform.			
Title: Advanced Sensors for Precision ***Description:*** This effort matures and demonstrates technologies that allow combat vehicle commanders and crewmen to detect more rapidly, identify and geo-locate threat targets to enable fire control for platform weaponry. The effort leverages advance infrared imaging technology, 3-dimensional (3-D) imaging sensor techniques, and precise far target location technology to increase target detection range, extended target and reduce target acquisition timelines. ***FY 2012 Plans:*** Will mature a 3-D sensor suite with precise target acquisition technology (target identification and location); will demonstrate and validate the performance of precision sensors for combat vehicle target acquisition sighting and fire control system for demonstration onboard a Heavy Brigade Combat Team (HBCT) vehicle.	-	-	5.281
Title: Laser Designator Technology ***Description:*** This effort leverages US Army investments in low power laser designation technology to provide advanced lightweight target detection and call for fire capability. ***FY 2010 Accomplishments:*** Completed the fabrication and demonstration of two demonstrators, a15 micrometer, 640 x 480 cooled Midwave Infrared (MWIR) imager and a 17 micrometer, 640 x 480 uncooled Longwave Infrared (LWIR) imager. Both demonstrators incorporated miniaturized electronics for an integrated far target location (FTL) capability and have an embedded see-spot capability in association with the demonstration of a prototype lightweight clip-on common designator module; continued the development of the Far Target Location Improvement effort by maturing the earth rate azimuth device and the Azimuth and Vertical Angle Module (AVAM) (these modules provide improved accuracy of the azimuth and vertical angle accuracy over the current digital magnetic compass in reducing target location error) for potential insertion into the Joint Effects Targeting System (JETS); began maturation of several efforts in the area of Micro-Electromechanical Systems (MEMS) gyroscope, MEMS accelerometer, fiber optic gyroscopes, and celestial	17.067	4.344	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
navigation design and development to further reduce the size, weight and power requirements for the AVAM devices while maintaining or improving the performance; began design and development of a data collection system that will be used to demonstrate, verify, and validate the operational scenarios for the man portable, handheld far target location systems. ***FY 2011 Plans:*** Demonstrate reduced size, weight and power of the Target Location Designation System (TLDS) Azimuth & Vertical Angle Module (AVAM) that matures a far target location (FTL) technology; demonstrate the TLDS technology capabilities simultaneously in a brass-board system; and evaluate the small pixel, large format uncooled MWIR thermal sensor target acquisition.			
Title: Sensor and Information Fusion for Improved Hostile Fire Situational Awareness ***Description:*** This effort builds on existing distributed aperture system (DAS) architecture and demonstration hardware to demonstrate mature and evaluate automated pop up target detection algorithms and a 360 degree by 90 degree digital video recording capability with enabling gunfire detection and audible sensing on a vehicle platform. ***FY 2010 Accomplishments:*** Completed hardware development efforts; matured and demonstrated driving and situational awareness (SA) indirect vision / drive-by-wire / driver assist design concepts and guidelines, with a local SA display for dismounted Soldiers.	1.431	-	-
Accomplishments/Planned Programs Subtotals	33.855	24.491	25.767

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.

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COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
K73: *NIGHT VISION SENSOR DEMONSTRATIONS (CA)*	32.132	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Night Vision advanced technology development.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Hyperspectral Sensors for Improved Force Protection (Hyper-IFP) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Integrated and tested an upgraded shortwave infrared hyperspectral system into the Cerberus architecture/platform.	1.591	-	-
Title: Brownout Situational Awareness Sensor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Matured real-time 3-D ground imagery to helicopter pilots in brownout landing and takeoff conditions (including lateral drift sensing with visual quantification and audible warning).	2.388	-	-
Title: Night Vision Advanced Technology Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed and demonstrated combined midwave and longwave infrared sensor capabilities for the: Q2 airborne turret; hyperspectral sensors for tagging, tracking, and locating technologies that supported the concepts to track terrorists over a wide area once they have been identified; persistent imaging concepts for unmanned/unattended platforms; a thermal imager that can be clipped on to existing image intensifier goggles to provide dismounted forces an IR search capability while retaining night vision capability; development of a 1280 x 1024 pixel Short Wave IR (SWIR) camera with 15 micron pixels and miniaturized camera electronics; provided improved Compact Airborne Spectral Sensor (COMPASS) with enhanced real time processing of collected data as well as a man-portable ground-to-ground sensor package. Developed hyperspectral sensor for single airborne sensor system to be used with a variety of targets.	8.953	-	-
Title: Smart Sensor Supercomputing Center	7.958	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Evaluated the robustness of sensor processing software and Real Time computing hardware to be able to pull with high probability of detection and low probability false alarms on dismounted targets in high background clutter.			
Title: Buster Backpack ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Provided an electrically powered fully autonomous, small unmanned aerial system that can be used as a test bed for small gimbaled infrared and day sensors.	0.795	-	-
Title: Enhanced Driver Situational Awareness ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Provided image-based situational awareness to military and/or civilian emergency vehicle drivers in zero-visibility conditions.	0.796	-	-
Title: Microterrain Persistent Surveillance ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Evaluated microterrain remote wireless video surveillance and sensor systems for identifying threats to the Soldier relative to enemy insurgent activities.	1.592	-	-
Title: Compact Airborne Multi-Mission Payload (CAMP) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Evaluated the design criteria for a compact airborne third generation hyperspectral system that can detect, classify and identify targets.	1.592	-	-
Title: Night Vision and Electronic Sensors Directorate ***Description:*** This is a Congressional Interest Item.	1.990	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Developed a 1280 x 1024 pixel Short Wave IR (SWIR) camera with 15 micron pixels and miniaturized camera electronics.			
Title: Bradley Third Generation (3rd Gen) Forward Looking Infrared (FLIR) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed the 3rd Gen B-Kit designed to support the modernization effort for the heavy brigade combat team (Abrams and Bradley); integrated 3rd Gen B-Kit technology, including 3rd Gen forwarding infrared, reflective a focal, high-resolution color day television, laser rangefinder, and laser designator, into either the Primary Sight (GPS) for the Abrams Gunner or the Improved Bradley Acquisition Subsystem (IBAS) Target Acquisition Subsystem (TAS).	4.477	-	-
Accomplishments/Planned Programs Subtotals	32.132	-	-

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.

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COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
K86: *NIGHT VISION, ABN SYS*	15.170	15.421	16.647	-	16.647	16.651	16.266	17.558	17.893	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates intelligence, surveillance, reconnaissance, targeting, and pilotage technologies in support of the Army's aviation and networked systems. This effort focuses on improved reconnaissance, surveillance and target acquisition and night pilotage sensors, high-resolution heads-up displays, sensor fusion, and aided target recognition (AiTR) capabilities for attack, scout, cargo, and utility helicopters and unmanned aerial systems (UAS). UAS payload efforts mature and demonstrate small, lightweight, modular, payloads (electro-optical/infrared, laser radar, designator) to support target detection, identification, location, tracking, and targeting of tactical targets for the Brigade Combat Team.

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 (RDECOM)/Communications-Electronics Research, Development, and Engineering Center (CERDEC) /Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Airborne Unmanned Persistent Imaging	1.930	7.224	10.702
Description: This effort demonstrates day and night persistent surveillance imaging (PSI) and enhanced reconnaissance, surveillance, and target acquisition (RSTA) capabilities from a single payload on the extended range/multi-purpose (ER/MP) unmanned aerial system (UAS). ***FY 2010 Accomplishments:*** Matured step-stare software; and began intelligent, tiered data processing development and hardware design trade studies. ***FY 2011 Plans:*** Complete step-stare and ground-based processing software; demonstrate brassboard for tracking, image compression, and scene segmentation software; and finalize designs for tiered data processing and integrate designs for the 3rd generation focal plane array. ***FY 2012 Plans:*** Will integrate enhanced capabilities (high definition sensors and dual color infrared (midwave/longwave)) into a high definition demonstrator; will complete intelligent data compression subsystem to provide persistent wide-area activity monitoring, personnel/ vehicle tracking, and enhanced reconnaissance, surveillance and target acquisition capabilities to include high resolution target			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
search; will complete and demonstrate the 3rd generation focal plane array turret to provide the optimal infrared imaging band for prevailing battlefield conditions.			
Title: High Definition Aviation Displays ***Description:*** This effort develops and demonstrates an advanced monocular, see-through, high definition, digital, helmet mounted display (HMD) to replace current limiting analog, cathode ray tube-based helmet and display sight systems. ***FY 2012 Plans:*** Will mature the capabilities of waveguide display optics technology; will expand field-of-view and resolution through innovative optical designs, materials and advanced display technologies; will begin to integrate and demonstrate the system (conduct laboratory and engineering flight tests).	-	-	5.945
Title: Advanced Lasers for Unmanned Aerial System (UAS) Payloads ***Description:*** This effort develops, integrates, and demonstrates an advanced target acquisition and designation laser payload to satisfy the reconnaissance, surveillance, and target acquisition (RSTA) mission requirements for the Class I unmanned aerial system (UAS) customized to a 7 lb payload capacity. ***FY 2010 Accomplishments:*** Validated performance of micro-turret payload laser, and imaging and stabilization components, and integrated them into a unified package; completed transition and incorporation of the laser designator/laser rangefinder component into the advanced demonstrator payload; matured and tested compact 2-axis laser/infrared stabilized payload components. ***FY 2011 Plans:*** Complete manufacturing and integration of the advanced demonstrator payload brassboard sensors; characterize and flight test the payloads in a relevant environment.	9.117	5.294	-
Title: Multi-mode system Payloads for Enhanced Targeting ***Description:*** This effort demonstrates improved targeting capabilities, (especially against difficult camouflage, concealment, and defilade targets), by combining the wide area search and identification capabilities of hyperspectral imaging with the three dimensional target identification and through foliage/camouflage capabilities of laser radar (LADAR) for target range interrogation). ***FY 2011 Plans:*** Leverage and mature mono-block laser technology to begin the development of a compact multi-function laser capable of providing standard eye-safe range-finding and LADAR laser functions.	-	2.903	-
Title: Objective Pilotage for Utility and Lift (OPUL)	4.123	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort develops, integrates, tests, and demonstrates a sensor suite that provides multi-pilot helicopters and crews simultaneous multi-user, wide field of regard imagery of the immediate surroundings. The OPUL system is designed for pilotage and navigation, providing advanced sensors for improved image quality under degraded and brown out conditions. ***FY 2010 Accomplishments:*** Completed human factors performance studies; and conducted extensive flight evaluations and demonstrations with varying mission scenarios and environmental conditions.			
Accomplishments/Planned Programs Subtotals	15.170	15.421	16.647

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.