Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army											Date: May 2017	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603710A *I Night Vision Advanced Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	-	39.329	44.468	47.135	-	47.135	61.419	63.343	54.054	55.292	-	-
K70: *Night Vision Adv Tech*	-	25.691	27.293	21.529	-	21.529	32.793	36.122	36.337	37.068	-	-
K86: *Night Vision, Abn Sys*	-	13.638	17.175	25.606	-	25.606	28.626	27.221	17.717	18.224	-	-

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates sensor technologies that increase Warfighter situational understanding, 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 and other degraded visual environments). Project K70 pursues technologies that improve the Soldier's ability to see at night and to provide rapid wide area search. It also demonstrates technologies that provide the ability to perform multispectral aided target detection (AiTD), to integrate disparate sensor architectures, and to enable passive long range target identification (ID). Project K86 matures and evaluates sensors and algorithms designed to detect targets (vehicles and personnel) in camouflage, concealment and deception from airborne platforms. It provides pilotage and situational understanding imagery to multiple pilots/crew members independently for enhanced operations in day/night/adverse weather conditions.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this PE is fully coordinated with efforts in PE 0602120A (Sensors and Electronic Survivability), PE 0602270A (Electronic Warfare Technology), PE 0602709A (Night Vision and Electro-Optics Technology), PE 0602712A (Countermine Systems), PE 0603001A (Warfighter Advanced Technology), PE 0602211A (Aviation Technology), PE 0603003A (Aviation Advanced Technology), PE 0603005A (Combat Vehicle and Automotive Advanced Technology), PE 0603606A (Landmine Warfare and Barrier Advanced Technology), PE 0603774A (Night Vision Systems Advanced Development) and PE 0604710A (Night Vision Systems Engineering Development).

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

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army					Date: May 2017
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*		**R-1 Program Element (Number/Name)** PE 0603710A *I Night Vision Advanced Technology*			
B. Program Change Summary ($ in Millions)	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**
Previous President's Budget	40.929	44.468	40.635	-	40.635
Current President's Budget	39.329	44.468	47.135	-	47.135
Total Adjustments	-1.600	0.000	6.500	-	6.500
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.600	-			
• Adjustments to Budget Years	0.000	0.000	6.450	-	6.450
• Civ Pay Adjustment	0.000	0.000	0.050	-	0.050

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603710A / *Night Vision Advanced Technology*	Project (Number/Name) K70 / *Night Vision Adv Tech*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
K70: *Night Vision Adv Tech*	-	25.691	27.293	21.529	-	21.529	32.793	36.122	36.337	37.068	-	-

A. Mission Description and Budget Item Justification

This Project matures and demonstrates high-performance sensor technologies and architectures that enhance situational understanding, increase target detection and identification ranges, reduce target acquisition (TA) timelines, enable threat detection and mitigation and support operations in degraded environments against threats that are partially obscured by terrain, weather or other features. Provides improved capabilities for mounted and dismounted Soldiers and tactical vehicles.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States (U.S.) Army 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 2016	FY 2017	FY 2018
Title: Advanced Sensors for Precision	11.118	4.249	-
Description: This effort matures and demonstrates technologies that allow combat vehicle commanders and crewmen to detect, identify and locate threat targets more rapidly to enable fire control for platform weaponry. The effort matures and integrates advanced Infrared (IR) imaging technology, 3-Dimensional (3D) imaging sensor techniques, emerging laser technologies and precise far target location technology to increase situational understanding and enable early warning, Hostile Fire Detection (HFD), and active countermeasure capabilities. This provides increased protection against current and emerging threats. Follow on work for Fiscal Year (FY) 17 is also captured in “Advanced Wide Area Search Sensors”.			
FY 2016 Accomplishments: Demonstrated uncooled IR camera for situational awareness (SA) and muzzle flash detection and on the move performance of ground HFD and algorithms; optimized design for detection of hostile uncooled and cooled IR sensors prior to threat engagement; demonstrated hostile fire clutter rejection techniques for reduced false alarms and threat sensor point of origin determination, and assessed performance for an expanded threat set; validated laser technologies and limitations for pre-shot suppression of threat sensors; demonstrated stationary pre-shot detection/suppression of threat imaging sensors at objective ranges; performed perception experiments on pre-shot suppression to determine metrics and system requirements.			
FY 2017 Plans:			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K70 / *Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Will mature and demonstrate a multi-function uncooled IR camera static system with real-time algorithms for HFD with reduced false alarms and local situational awareness on a technology demonstrator; exploit findings from static technology demonstrator to support on-the-move system support requirements.			
Title: Sensor Interoperability ***Description:*** This effort matures and demonstrates an interoperability sensor architecture that allows a system to dynamically discover and leverage other systems on a network without any specific or prior knowledge. The goal is to develop standards, data models, and protocols that provide a common language for sensor systems to connect, publish their capabilities and needs, and interact with other systems, even on disadvantaged networks. The benefits are increased sensor collaboration, reduced decision timelines, reduced soldier load, and reduced integration costs. ***FY 2016 Accomplishments:*** Developed methodologies for sensor interoperability and appropriate data flow across security classification domains; developed approaches to tailoring data request results that minimize network bandwidth requirements; improved the architecture and framework using distributed networked resources, such as storage, processing, bandwidth, to provide redundancy, robustness, and fault tolerance in both Enterprise and Tactical networks. ***FY 2017 Plans:*** Will develop methods to enhance existing security to provide intrusion detection within an integrated sensor architecture (ISA) framework, which allows a system to dynamically discover and leverage other systems on a network without any specific or prior knowledge, across the Enterprise and Tactical networks; mature methodologies for minimizing network bandwidth and demonstrate approaches; improve sensor planning and management techniques across the architecture to maximize sensor capabilities. ***FY 2018 Plans:*** Will mature dynamic discovery of sensor systems on a network and techniques for sensor planning and management to maximize sensor capability; mature and demonstrate methods to provide sensor interoperability and fault tolerance across Enterprise and Tactical networks; mature and provide application layer reliability; provide data aggregation and summary; support data for disconnected sensor nodes; improve service on demand for networked sensors, including sensor data, location of video feeds, and collaboration between sensors; demonstrate simplified integration strategies for non-integrated sensor architecture (non-ISA) assets to improve situational understanding and exploit sensor capability, to include joint and multinational assets.	3.362	2.500	3.004
Title: Soldier System Architecture ***Description:*** This effort designs, develops and optimizes interfaces for Soldier sensors, optics, displays and electronic systems that will be incorporated into the larger Soldier system architecture to improve the individual Soldier's effectiveness and efficiency	0.978	1.005	1.001

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K70 / *Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
while reducing burden and total operational costs. This effort is coordinated with Program Element (PE) 0603001A/Project J50, PE 0602716A/Project H70, PE 0602786A/Project H98, PE 060315A/Project S28, and PE 0603004A/Project 232. ***FY 2016 Accomplishments:*** Evaluated measures of effectiveness (MOE) and measures of performance (MOP) for the sensor, optics, displays and electronic systems used by the individual Soldier and refine MOE/MOPs as part of the overall Soldier System Architecture. ***FY 2017 Plans:*** Will perform analyses of hardware components for sensors, optics, displays and electronic systems to inform reference architectures for Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Soldier equipment as well as planned developmental technologies; will refine MOE/MOPs for the sensor, optics, displays and electronic systems. ***FY 2018 Plans:*** Will update analyses of hardware components for sensors, optics, displays, and electronic systems to inform reference architectures for Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Soldier equipment, and provide data to populate database for Library of Soldier (LOS) reference documentation; support development of framework, models and systems engineering processes and tools for the Soldier Research and Development (R&D) community.			
Title: Ground Based Sensors and Integration for Degraded Visual Environments (DVE) ***Description:*** This effort provides uncooled IR sensor technologies to improve survivability through increased SA in all conditions and environments, to include DVE, for manned and unmanned ground vehicle systems. Current uncooled IR requires improvement in sensitivity and development of signal processing techniques to penetrate obscurants. Integration of improved sensors, signal processing algorithms, and data fusion will maintain mission capabilities in DVE (e.g. smoke, dust, fog). Demonstration of scalable, multi-function (360 degree SA, HFD, Aided Driving), low cost SA systems with in-vehicle displays that can be tailored to the ground platform and mission requirements will bring timely and useful information to the vehicle crew and squad. Joint effort with the Tank Automotive Research, Development and Engineering Center (TARDEC) under PE 0602601/ Project C05 and PE 0603005/Project 221. Fully coordinated with PE 0602709/Project H95. ***FY 2016 Accomplishments:*** Assessed technologies that support ground SA in DVE, to include optimized uncooled IR sensors with optical filtering or signal processing techniques, integration of sensor combinations and modalities, and fusion of sensor data; assess concepts for	4.650	5.897	5.112

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K70 / *Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
scalable, multi-function sensor capabilities that can be applied to tactical vehicles and combat platforms; explored industry approaches for automotive driving aids for automated personnel and obstacle detection with applicability to military environments. ***FY 2017 Plans:*** Will demonstrate optical filtering and image processing enhancements in DVE to assess uncooled IR sensor performance; utilize industry approaches for automotive driving aids with applicability to military environments to begin integration of driving aids with sensor/image processing enhancements; validate a personnel/obstacle detection enhanced SA capability for convoy vehicles. ***FY 2018 Plans:*** Will integrate sensors, driving aids and DVE processing on vehicle platform and conduct on the move (OTM) field experiment to evaluate real time driving and maneuver capabilities in DVEs; assess alternate UCIR sensor to improve sensitivity and reduce sensor noise; provide focal plane array (FPA) performance requirements to inform next generation of uncooled infrared (UCIR) sensors; validate suitability of fusing commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) active sensors, to include millimeter wave (MMW)/Radar, to supplement UCIR imagery and provide low latency cues suitable for driving; evaluate low latency region based local area processing and generic dictionary convex programming techniques to provide operationally suitable imagery in real time under various DVEs; continue definition of real time region based processing and optimal sensor system parameters, such as sensitivity, instantaneous field of view (IFOV), frame rate, to enable remote sensing and navigation in heavy DVEs.			
Title: Soldier Maneuver and Lethality Sensors ***Description:*** This effort matures and demonstrates dismounted Soldier capabilities that improve Soldier mobility, maneuver, situational understanding, threat detection, targeting and lethality. Innovative technologies for Soldier weapon or head mounted sensors, head mounted displays, and tactical lasers will be provided for user evaluation. The technologies provided through this effort address human factors/human dimension and provide lower weight, reduced cost, and improved performance for Soldier based sensor systems. ***FY 2016 Accomplishments:*** Designed head mounted High Definition (HD) color displays to replace heavier and larger prism based devices to enable use with protective eyewear; incorporated improved display components for injection node and holograms to increase brightness and reduce image distortion for day/night usability; improved Soldier target engagement by evaluating crosswind profile measurement, automated bore sighting reticle, and thru sight situational awareness technologies. ***FY 2017 Plans:*** Will demonstrate a see-through, wide field-of-view (FOV), HD color display that interfaces with current standard issue helmet mounts and Smart Battery packs; will integrate an ISA interface, which will provide rapid target acquisition during daytime operations by enabling the display to receive input from any dynamically discoverable sensor available on a network; will integrate	5.583	5.935	2.892

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K70 / *Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
an Intra Soldier Wireless (ISW) interface to provide heads-up situational awareness by enabling imagery to be wirelessly transferred from a weapon site to the display; will demonstrate the capability of displaying Mission Command Information on the display. ***FY 2018 Plans:*** Will validate head mounted wide FOV, see thru, HD color display with high brightness for daytime operation; integrate augmented reality for improved situational understanding and dismounted mobility and interfaces with existing Soldier equipment to include the Nett Warrior End User Device, Enhanced Night Vision Goggle, and Family of Weapon Sights.			
Title: Advanced Wide Area Search Sensors ***Description:*** This effort matures and demonstrates sensing capabilities that enable platforms to detect, identify, and react to the evolving asymmetric threat to maintain operational momentum. This effort allows combat vehicle commanders and crewmen to detect difficult or concealed small unit threats as well as to identify and apply countermeasures to enable maneuver or response. The effort leverages advanced IR imaging technology, multispectral laser technologies and precise far target location technology to increase target detection and reduce target acquisition timelines. This effort supports the Army's initiatives in new sensing modalities that integrate with existing on board systems for multi-function capabilities, with minimal weight, to enable protected mobility to increase protection against current and emerging threats. This work is a follow on of work from “Advanced Sensors for Precision” to provide an additional level of detail. ***FY 2017 Plans:*** Will mature pre-shot threat detection/suppression imaging sensors and lasers, which identify and eliminate threats before they can engage friendly forces; conduct field demonstration; validate IR sensor jamming techniques; characterize expendable target assets for damage thresholds; assimilate threat information into a single database.	-	7.707	-
Title: Augmented Reality for Tactical Operations ***Description:*** This effort will mature and demonstrate an integrated mounted and dismounted tactical Augmented Reality (AR) capability that provides a Common Operating Picture (COP) for mounted and dismounted elements, increased maneuverability and survivability, and enhanced situational understanding by integrating sensor imagery, geo-location information, accurate real time Situational Understanding (SU) and command and control information for all warfighter operational environments. Leverages work performed in PE 0602709A/Project H95, PE 0602784A/Project 855, and PE 0602784A/Project T42. ***FY 2018 Plans:***	-	-	2.002

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K70 / *Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Will conduct analyses and trade studies to support a display agnostic augmented reality capability for Dismounted and Mounted Warfighters; establish specifications for a common SU hardware approach and information presentation to the mounted and dismounted Soldiers; initiate design of a common operating picture.			
Title: New Long Range Advanced Scout Surveillance System (LRAS3) ***Description:*** This effort matures and demonstrates sensor technologies that provide reconnaissance crews the ability to rapidly detect, identify, and respond to hybrid threats beyond their current tactical capability to include integration of third-generation forward looking infrared (FLIR) with low cost optics, multi-function laser module enabling range finding, marking and pointing, rapid detection of threat optical systems, precision target location, and advanced image processing and aided target recognition algorithms. ***FY 2018 Plans:*** Will perform predictive range performance modeling to refine the third-generation FLIR optical system design to maximize performance; develop multi-spectral/multi-function laser technologies for threat detection, target handoff, range-finding, and threat jamming; define threat sets and evaluate sensor susceptibility to detection and jamming techniques. Design and validate a demonstrator digital read-out integrated circuit (DROIC) long wave infrared (LWIR) camera in an environmentally sealed closure.	-	-	5.412
Title: Down Range Electro-Optical Wind Sensing ***Description:*** This effort will integrate crosswind sensing and range measurement with real time compensation of the aim-point offset for a shooter to rapidly and accurately engage targets from effective weapon ranges. The program will develop sensing and imaging technologies to measure path integrated crosswinds and range to provide an aim-point compensation of the bullet trajectory to increase the first round probability of hit. ***FY 2018 Plans:*** Will conduct systems analysis and complete design for an integrated down range electro-optical (EO) wind sensing system with weapon sight and reticle aim point adjustment; validate design approach to meet system performance specifications and begin fabrication of system demonstrator.	-	-	2.106
Accomplishments/Planned Programs Subtotals	25.691	27.293	21.529

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K70 / *Night Vision Adv Tech*

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603710A / *Night Vision Advanced Technology*	Project (Number/Name) K86 / *Night Vision, Abn Sys*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
K86: *Night Vision, Abn Sys*	-	13.638	17.175	25.606	-	25.606	28.626	27.221	17.717	18.224	-	-

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 pilotage sensors, high-resolution heads-up displays, sensor fusion, and aided target recognition (AiTR) capabilities for Army vertical lift aircraft, utility helicopters and unmanned aerial systems (UAS) in day/night, obscured, smoke, adverse weather and other degraded visual environment. 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 Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

Work in this Project is fully coordinated with Program Element (PE) 0602211A (Aviation Technology) and PE 0603003A (Aviation Advanced Technology).

Work in this Project is performed by the United States (U.S.) Army 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 2016	FY 2017	FY 2018
Title: Multifunction Imagers for Rotary Wing	9.616	-	-
Description: This effort matures and demonstrates an economical sensor capability by developing multifunction sensor modules for increased performance of pilotage capability in a Degraded Visual Environment (DVE) at lower total life cycle cost than separate sensor systems. Work in this effort is coordinated with DVE efforts in PE 0602211A, Aviation Technology, Project 47A. ***FY 2016 Accomplishments:*** Completed integration of dual-purpose infrared (IR) sensors with other low-light night vision technology; characterized performance of threat warning algorithms and pilotage sensor under brownout and rain DVE through a series of laboratory, performed field and flight test measurements; identified performance issues and optimize threat warning algorithms and pilotage sensors.			
Title: Local Area Intelligence, Surveillance, and Reconnaissance (ISR) for Tactical Small Units	2.022	5.050	5.089
Description: This effort develops and demonstrates sensors enabling simultaneous display of wide and narrow field-of-view (FOV) infrared imagery for enhanced situational awareness/targeting and multi-band image fusion and the ability to image battlefield laser spot locations for improved targeting accuracy and reduced fratricide caused by laser misalignment.			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K86 / *Night Vision, Abn Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
FY 2016 Accomplishments: Completed design to retrofit existing turret with optical components to provide simultaneous wide FOV and independently steerable narrow FOV capability; demonstrated compact, high definition, 3-band (visible, near infrared, shortwave infrared) camera module. ***FY 2017 Plans:*** Will mature and optimize upgrade designs for existing turret electronics and hardware to provide compatibility (command, control and data handling/processing) with the improved camera modules and associated new capabilities; demonstrate and validate performance of optical components for simultaneous wide and independently steerable narrow field of view capability in preparation for integration into the turret; optimize multi-spectral band fusion approaches for use with high definition 3-band camera module. ***FY 2018 Plans:*** Will integrate 3-band camera module into the Common Sensor Payload (CSP) turret to demonstrate the ability to see battlefield lasers; finalize design of optical components for simultaneous wide and independently steerable narrow field of view and integrate into CSP turret; verify functionality of turret modifications.			
Title: Pilotage Sensor Fusion ***Description:*** This effort develops and matures sensor fusion utilizing combinations of sensing modalities (active and/or passive) and associated real-time processing algorithms and architectures to produce synthetic scene representations that provide increased information content as opposed to scenes produced from existing single mode sensor solutions. ***FY 2016 Accomplishments:*** Validated exploitable features associated with multiple sensing modalities to aid with operations under DVE; demonstrated algorithm approach for fusion of two sensor modalities that provides increased situational awareness to the pilot as compared to either single sensor modality.	2.000	-	-
Title: Sensors and Sensor Fusion for Rotorcraft Degraded Visual Environment (DVE) Mitigation ***Description:*** This effort leverages work previously accomplished under the “Multifunction Imagers for Rotary Wing” and “Pilotage Sensor Fusion” efforts and will mature sensing and processing approaches to improve pilotage in degraded visual environments. It develops Long wave Infrared (LWIR) imaging sensors capable of providing actionable imagery over a wide range of DVEs. It also demonstrates a distributed aperture sensing (DAS) approach in which sensing modules are placed around the airframe to enable 360 degree coverage and provide information on potential threats and obstacles for increased situational awareness. The effort implements DVE-specific multimodal fusion techniques to leverage the strengths and mitigate the weaknesses of multiple sensor modalities. Work in this effort is coordinated with DVE efforts in PE 060211A, Aviation Technology, Project 47A, and PE	-	12.125	9.257

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K86 / *Night Vision, Abn Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
0603003A, Aviation Advanced Technology, Project 313. ***FY 2017 Plans:*** Will mature and demonstrate fusion and DAS approaches utilizing Passive and Active IR, and Radio Detection And Ranging (RADAR) sensing modalities; simulate the performance of multiple sensor combinations in DVEs; conduct airborne data collections with collocated Passive and Active IR and RADAR sensors in snow and whiteout degraded conditions; demonstrate baseline DAS scene rendering that combines data from all distributed sensors to form a 360 degree view around the aircraft; demonstrate fusion approaches that combine two and three dimensional sensor data; define the baseline approach for the implementation of sensor fusion and synthetic vision in a real-time environment; conduct trade studies to identify candidates for real-time computing hardware and architectures; exploit and leverage ongoing research in the area of digital read out integrated circuit (DROIC) technology to develop a D-ROIC longwave infrared camera to address DVE requirements. ***FY 2018 Plans:*** Will quantify performance of multi-modal fusion approaches operating on previously collected airborne DVE data sets; assess the impacts of varying sensor performance levels on the fused data product; implement DAS scene rendering approaches that decrease processing latency; generate a coherent three-dimensional (3D) world model that may be queried by other related flight control and cueing systems. Demonstrate synthetic vision scene rendering in a real-time environment and implement advanced navigation and location algorithms such as simultaneous localization and mapping (SLAM) and 3D feature matching to refine aircraft navigation/location solutions. Finalize designs for real-time computing hardware and architectures to support flight test and experimentation. Complete fabrication and test of large well-capacity, high-sensitivity cooled LWIR sensors and wide field of view uncooled infrared sensors for inclusion in the DVE DAS/Fusion system.			
Title: Digital Dual Use Sensors (DDUS) ***Description:*** This program will develop the core camera technology for a multi-spectral, multi-mode distributed aperture pilotage system while supporting aircraft survivability. This synergistic single sensor technology will support aircraft survivability by providing hostile fire and missile warning cues while simultaneously providing pilotage and situational understanding in degraded visual environments. It leverages technology from the Dual Band Infrared Focal Plane Arrays (IRFPA) ManTech as well as from the 3D DROIC Science and Technology Objective (STO) to fabricate the digital multi-function readout circuit to enable the multi-function capability. ***FY 2018 Plans:*** Will initiate the development and fabrication of a dual band (millimeter wave infrared (MWIR) and long wave infrared (LWIR)) small pitch 2K x 2K pixel Focal Plane Arrays (FPA) and a multi-function DROIC matched to the dual color FPA to provide the frame rates and data quality required to support aperture sharing element (ASE) function as well as sensitivity and resolution for	-	-	11.260

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603710A / *Night Vision Advanced Technology*	**Project (Number/Name)** K86 / *Night Vision, Abn Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
pilotage in DVE; initiate and evaluate dewar designs to employ advanced optical data feed though technology which is necessary to enable the high data rates associated with the multi-function capability of the sensor.			
Accomplishments/Planned Programs Subtotals	13.638	17.175	25.606

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A