Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army										Date: February 2018	

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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	-	42.798	47.135	61.376	-	61.376	62.280	53.442	54.776	55.872	0.000	377.679
K70: *Night Vision Adv Tech*	-	26.260	21.529	32.750	-	32.750	35.059	35.725	36.552	37.284	0.000	225.159
K86: *Night Vision, Abn Sys*	-	16.538	25.606	28.626	-	28.626	27.221	17.717	18.224	18.588	0.000	152.520

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 provide our Warfighters with a Common Operating Picture (COP) to enable increased situational understanding and combat overmatch. Specific areas of maturation and demonstration include technologies that integrate disparate sensor architectures, perform multispectral aided target detection (AiTD), enable passive long range target identification (ID), improve day/night visualization systems, allow rapid wire area search, and facilitate augmented reality. Project K86 matures and validates airborne platform sensors and algorithms designed to detect targets (vehicles and personnel) in camouflage, concealment, and deception. This Project provides pilotage and situational understanding imagery to multiple pilots/crew members independently to 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 Research, Development, and Engineering Command (RDECOM).

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army				**Date:** February 2018	
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 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**
Previous President's Budget	44.468	47.135	61.419	-	61.419
Current President's Budget	42.798	47.135	61.376	-	61.376
Total Adjustments	-1.670	0.000	-0.043	-	-0.043
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.649	-			
• Adjustments to Budget Years	-	-	-0.043	-	-0.043
• FFRDC	-0.021	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army										Date: February 2018	

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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
K70: Night Vision Adv Tech	-	26.260	21.529	32.750	-	32.750	35.059	35.725	36.552	37.284	0.000	225.159

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. This Project provides improved capabilities and Common Operating Picture (COP) 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Advanced Sensors for Precision **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 technologies, 3-Dimensional (3D) imaging sensor techniques, emerging laser technologies, and precise far target location technologies to increase situational understanding and enable early warning, Hostile Fire Detection (HFD), and active countermeasure capabilities. This effort 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?. This effort ends in FY17.	4.003	-	-
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 of this effort is to develop standards, 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 of this effort are increased sensor collaboration, reduced decision timelines, reduced soldier load, and reduced integration costs. *FY 2018 Plans:* 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	2.500	3.004	3.000

Exhibit R-2A, **RDT&E Project Justification:** PB 2019 Army		**Date:** February 2018
Appropriation/Budget Activity 2040 *I* 3	**R-1 Program Element (Number/Name)** PE 0603710A *I Night Vision Advanced Technology*	**Project (Number/Name)** K70 *I Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2017**	**FY 2018**	**FY 2019**
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. *FY 2019 Plans:* Will improve methods for distributed interoperability management to support autonomous sensor data requesting, processing, and distribution decisions; improve methods for interoperability to optimize operation on limited-bandwidth communication networks and survive and recover from communication network denial; exploit internal interoperability management metadata to provide indicators of abnormal network behavior consistent with intrusion; mature and demonstrate methods allowing two-way interoperability across security domains; demonstrate interoperability integration and operation strategies across tactical and intelligence assets, to include joint and multinational assets. *FY 2018 to FY 2019 Increase/Decrease Statement:* Decrease in application layer reliability to support science and technology (S&T) Strategy and senior leader priorities.			
Title: Soldier System Architecture *Description:* This effort matures 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 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. This effort ends in FY18 and deliverables transition to Program Executive Office (PEO) Soldier and Research, Development, and Engineering Command (RDECOM). *FY 2018 Plans:* 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. *FY 2018 to FY 2019 Increase/Decrease Statement:* Effort ends in FY18.	1.005	1.001	-
Title: Ground Based Sensors and Integration for Degraded Visual Environments (DVE) *Description:* This effort provides uncooled infrared (UCIR) sensor technologies to improve survivability through increased Situational Awareness (SA) in all conditions and environments, to include Degraded Visual Environments (DVE), for manned	5.556	5.112	7.849

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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 2017	FY 2018	FY 2019
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-functional (360 degree SA, Hostile Fire Detection (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. This is a Joint effort with the Tank Automotive Research, Development and Engineering Center (TARDEC) under PE 0602601/Project C05 and PE 0603005/Project 221. This effort is fully coordinated with PE 0602709/Project H95. *FY 2018 Plans:* 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. *FY 2019 Plans:* Will conduct system validation of real time driving and maneuver capabilities in DVEs (dust, fog) on vehicle platforms with imaging sensors, an overlay of driving aids on sensor displays, and image enhancement algorithms; continue performance improvements from fusing COTS active sensors including MMW/Radar and scene based terrain knowledge to supplement UCIR imagery and optimize low latency cues suitable for driving; incorporate advanced UCIR sensors and image processing into unmanned systems to enhance target detection performance of convoy operations under degraded environments; demonstrate stationary hostile fire detection/cueing capabilities in real time through use of dual band UCIR with high performance detection against subsonic vehicular threats; optimize HFD algorithms for both short/long range scenarios to demonstrate low false alarm rates and validate the potential for OTM applications. *FY 2018 to FY 2019 Increase/Decrease Statement:* Validation investment increased in DVE environments to support senior leader priorities for Next Generation Combat Vehicle.			
Title: Soldier Maneuver and Lethality Sensors	5.935	2.892	3.933
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			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 *I* 3	**R-1 Program Element (Number/Name)** PE 0603710A *I Night Vision Advanced Technology*	**Project (Number/Name)** K70 *I Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
sensors, head mounted displays, and tactical lasers will be provided to users to gain feedback about performance and utility. 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. In FY 2019, work in this effort are realigned to support the Army science and technology (S&T) priorities as identified at the December 2016 S&T Army Requirements Oversight Council by the Chief of Staff of the Army. *FY 2018 Plans:* 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. *FY 2019 Plans:* Will provide design approaches for a multi-band leader weapon sight with multifunction sensors and lasers for target handoff, threat detection, and facial identification; improve sensor resolution for threat discrimination; exploit existing biometrics databases to provide standoff tactical capabilities; mature existing target detection algorithms to recognize complex obstacles using data collected with prototype high resolution airborne detection sensor system to improve situational awareness for dismounted units. *FY 2018 to FY 2019 Increase/Decrease Statement:* Increased investment in target detection algorithms to support Soldier Lethality senior leader priorities.			
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. This work ends in FY17 and transitions to PEO Soldier.	7.261	-	-
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	-	2.002	3.000

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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 2017	FY 2018	FY 2019
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:*** 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. ***FY 2019 Plans:*** Will provide vision based orientation sensors to support geo-registration of information; provide initial demonstration of Blue Force Tracking (BFT), threat icons, and Situational Awareness (SA) information display on existing vehicle displays; demonstrate video from vehicle imagers displayed on Soldier Helmet Mounted Display (HMD) via wireless connection. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increased investment to support orientation sensor work.			
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:*** 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. ***FY 2019 Plans:*** Will integrate 3rd Generation FLIR and mature high power multi-spectral laser technologies for advanced threat detection at tactical ranges; improve laser detector technology to increase range performance and range resolution; optimize optical assemblies to yield high throughput multi-wavelength designs, lowering overall system Size, Weight, and Power (SWAP); validate	-	5.412	4.883

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
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 2017	FY 2018	FY 2019
target handoff subsystem performance; demonstrate initial digital read-out integrated circuit (DROIC) and cooled long wave infrared (LWIR) camera under required environmental conditions. *FY 2018 to FY 2019 Increase/Decrease Statement:* Decrease investment in performance modeling to support Soldier Lethality senior leader priorities.			
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 effort will mature and demonstrate sensing and imaging technologies to measure crosswinds and target range to provide an aim-point compensation of the bullet trajectory and increase the first round probability of hit. *FY 2018 Plans:* 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. *FY 2019 Plans:* Will mature and demonstrate a system brass board concept for a crew served electro-optical (EO) wind sensing system with weapon sight and reticle aim point adjustment; improve rifle display assembly to provide more direct optical flow of disturbed reticle. *FY 2018 to FY 2019 Increase/Decrease Statement:* Investment increase to accelerate wind sensing capabilities in support of Soldier Lethality priorities.	-	2.106	2.908
Title: One Sensor for Fire Support/Scout Operations *Description:* This effort will optimize and demonstrate a modular and tailorable single sensor solution for both Scouts and Forward Observers integrating advanced sensor technologies with increased identification (ID) range and improved target location accuracy. The effort will enable a synchronized Situational Awareness (SA) picture to enhance overall lethality and survivability. A single sensor approach will increase human performance with common training, common materiel repair parts, and economy of scales to support expeditionary operations. *FY 2019 Plans:*	-	-	2.078

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Exhibit R-2A, **RDT&E Project Justification:** PB 2019 Army		**Date:** February 2018
Appropriation/Budget Activity 2040 *I* 3	**R-1 Program Element (Number/Name)** PE 0603710A *I Night Vision Advanced Technology*	**Project (Number/Name)** K70 *I Night Vision Adv Tech*

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2017**	**FY 2018**	**FY 2019**
Will provide trade studies to optimize single sensor design approach for both Scouts and Forward Observers; improve design for increased range performance and reduced target location error; validate design approach via sensor range performance predictive modeling.			
FY 2018 to FY 2019 Increase/Decrease Statement: Investment to support sensor applications for Scouts and Forward Observers.			
Title: Asymmetric Vision / Decide Faster	-	-	5.099
Description: This effort will mature and demonstrate sensing, image processing, display and mission decision aid capabilities to provide disaggregated mounted and dismounted teams with the ability to act autonomously, outmaneuver, and outthink the enemy in close combat with limited and intermittent access to higher echelon command and control systems. In FY19, this effort is developed from realigned funds in support of the Army science and technology (S&T) priorities as identified at the December 2016 S&T Army Requirements Oversight Council by the Chief of Staff of the Army. *FY 2019 Plans:* Will demonstrate tactical augmented reality, 3-Dimensional enriched terrain and mission planning tools; validate initial system of systems level concepts in tactically relevant environments; optimize concept data management and interoperability approaches. *FY 2018 to FY 2019 Increase/Decrease Statement:* Investment to support terrain and mission planning capabilities associated with the S&T Strategy and senior leader priorities for Soldier Lethality.			
Accomplishments/Planned Programs Subtotals	26.260	21.529	32.750

C. Other Program Funding Summary ($ in Millions)
 N/A
Remarks

D. Acquisition Strategy
 N/A

E. Performance Metrics
 N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army										Date: February 2018	

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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
K86: Night Vision, Abn Sys	-	16.538	25.606	28.626	-	28.626	27.221	17.717	18.224	18.588	0.000	152.520

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, 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 Environments (DVE). UAS payload efforts mature and demonstrate small, lightweight, and modular payloads (e.g. 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).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Local Area Intelligence, Surveillance, and Reconnaissance (ISR) for Tactical Small Units *Description:* This effort develops and demonstrates sensors enabling simultaneous display of wide and narrow field-of-view (FOV) infrared imagery for enhanced Situational Awareness (SA)/targeting. This effort optimizes multi-band image fusion and the ability to image battlefield laser spot locations for improved targeting accuracy and reduced fratricide caused by laser misalignment. *FY 2018 Plans:* 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. *FY 2019 Plans:* Will demonstrate and validate CSP turret system performance/capability improvements from a surrogate manned airborne platform to include simultaneous wide/narrow field-of-view, imaging of battlefield lasers, and extended range performance under adverse weather conditions. *FY 2018 to FY 2019 Increase/Decrease Statement:* Increase in funding to support additional validation efforts in adverse weather conditions.	4.863	5.089	5.322
Title: Sensors and Sensor Fusion for Rotorcraft Degraded Visual Environment (DVE) Mitigation	11.675	9.257	11.054

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
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 2017	FY 2018	FY 2019
Description: This effort leverages work previously accomplished under the ?Multifunction Imagers for Rotary Wing? and ? Pilotage Sensor Fusion? efforts. This effort matures sensing and processing approaches to improve pilotage in DVEs. This effort optimizes Long Wave Infrared (LWIR) imaging sensors capable of providing actionable imagery over a wide range of DVEs. This effort 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 (SA). The effort provides 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 PE0603003A, Aviation Advanced Technology, Project 313. *FY 2018 Plans:* 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. *FY 2019 Plans:* Will mature real-time computing hardware and implement previously identified software approaches for sensor fusion, DAS and synthetic scene rendering, coherent 3D world model generation, and advanced navigation/location; integrate flight-worthy real-time computing hardware/software along with baseline sensor suite (high-sensitivity cooled LWIR, RADAR, active IR and wide field of view uncooled IR) onto airborne rotary wing testbed platform; conduct a series of airborne data collections to demonstrate the achieved system performance of the baseline and several alternate sensor/processing configurations; validate demonstrated performance of DVE sensor/processing configurations and identify modifications to improve performance; demonstrate operability of data interfaces to allow 3D world model queries from the flight control, guidance, and cueing systems. *FY 2018 to FY 2019 Increase/Decrease Statement:* Increase in funding to support additional demonstrations and data validation efforts to meet senior leader priorities for Future Vertical Lift.			
Title: Digital Dual Use Sensors (DDUS) *Description:* This effort will mature and demonstrate 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	-	11.260	12.250

Exhibit R-2A, **RDT&E Project Justification:** PB 2019 Army		**Date:** February 2018
Appropriation/Budget Activity 2040 *I* 3	**R-1 Program Element (Number/Name)** PE 0603710A *I Night Vision Advanced Technology*	**Project (Number/Name)** K86 *I Night Vision, Abn Sys*

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2017**	**FY 2018**	**FY 2019**
survivability by providing hostile fire and missile warning cues while simultaneously providing pilotage and situational understanding in Degraded Visual Environments (DVEs). This effort leverages technology from the Dual Band Infrared Focal Plane Arrays (IRFPA) ManTech as well as from the 3D Digital Read-Out Integrated Circuit (DROIC) Science and Technology Objective (STO) to fabricate the digital multi-function readout circuit to enable the multi-function capability. ***FY 2018 Plans:*** 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 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. ***FY 2019 Plans:*** Will mature multiple dual band DROIC designs; optimize DROICs based on the two most promising designs; electrically probe DROIC parts will be validated for functionality and performance in preparation to bond DROICs to the dual band Midwave/Longwave Infrared (MWIR/LWIR) detector material; mature the integrated dewar and cooler assemblies (IDCAs) required for DDUS FPAs; mature optical lenses to demonstrate and validate performance of DDUS sensor technology. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Investment increase to support additional DROIC validation efforts.			
Accomplishments/Planned Programs Subtotals	16.538	25.606	28.626

C. Other Program Funding Summary ($ in Millions)

 N/A

Remarks

D. Acquisition Strategy

 N/A

E. Performance Metrics

 N/A