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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604201A / <i>Aircraft Avionics</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	31.401	8.414	2.764	-	2.764	7.285	3.259	2.508	0.000	Continuing	Continuing
C97: <i>ACFT Avionics</i>	-	16.114	4.937	1.928	-	1.928	6.358	2.226	1.263	0.000	Continuing	Continuing
EW7: <i>Degraded Visual Environment</i>	-	14.185	2.661	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	16.846
VU3: <i>Networking And Mission Planning</i>	-	1.102	0.816	0.836	-	0.836	0.927	1.033	1.245	0.000	0.000	5.959

Note

Project EW7 Degraded Visual Environment completed development and test efforts in Fiscal Year (FY) 2020.

A. Mission Description and Budget Item Justification

The Fiscal Year (FY) 2021 budget estimate request funds the development of Aircraft Avionics systems required to horizontally and vertically integrate the battlefield and the integration of those systems into Army aircraft. Tasks in this Program Element support research, development, and test efforts in the Engineering and Manufacturing Development phases of these systems.

The Doppler Global Positioning System Navigation Set (DGNS) Upgrade program completes system engineering trade studies to reduce space, weight, and power with the introduction of new navigation support capabilities such as an inertial sensor interface card and Instrument Flight Rules map display. The DGNS upgrade includes Non-Recurring Engineering for the Computer Display Unit (CDU) which replaces the current CDU faceplate with a touch screen display, provides a moving navigation map capability, and optimizes pilot interface to promote safer flight operations. The CDU upgrade will support Assured-Position Navigation and Timing (A-PNT) operations in conjunction with additional system upgrades and upgrades to existing DGNS hardware in order to accommodate A-PNT in identified operational environments, and incorporates Military-Code (M-Code). This includes anti-jam antenna capabilities and supports the requirement to maintain A-PNT throughout operations.

The Enhanced Aviation Global Air Traffic Management (GATM) Localizer Performance with Vertical Guidance (LPV) Embedded Global Positioning System (GPS) Inertial (EGI) Navigation System (EAGLE) A-PNT integration program assesses current capabilities in identified operational PNT environment levels, tests identified upgrades to existing EGI hardware in order to accommodate A-PNT in identified operational environments, and incorporates M-Code. It supports the requirement to maintain A-PNT throughout operations and requires assessment and follow-on upgrade to the EGI navigation system. The EAGLE upgrade will perform an assessment of A-PNT assurance levels to understand system performance, associated PNT capability gaps, integrate anti-jam antenna capabilities, and evaluate candidate solutions to cover any identified gaps.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604201A / <i>Aircraft Avionics</i>	
<p>The Multi-platform Anti-jam GPS Navigation Antenna (MAGNA) is a GPS anti-jam adaptive antenna system that will be capable of receiving legacy and modernized NAVSTAR GPS satellite signals. The MAGNA reduces the effect of GPS jamming by rejecting the interfering signals before they disrupt the GPS receiver enabling the Warfighter continued access to GPS-provided PNT in a GPS degraded environment.</p> <p>The Degraded Visual Environment (DVE) program portfolio includes the DVE Army Directed Requirement (DR) and the Environment Exploitation System (EES).</p> <p>The DVE DR is to provide DVE systems to 15 HH-60M Blackhawk MEDEVAC helicopters and 25 Special Operations aircraft. The DVE DR fulfills an immediate DVE requirement while bridging the gap between future DVE capabilities. The DVE DR system provides a forward looking, situational awareness, fused-sensor image for single aircraft takeoff and landing in brownout conditions. The program completed development and test efforts in FY 2019.</p> <p>The EES program focuses on active and passive sensor technology, synthetic vision, sensor and software data fusion, imagery processing, user interface, and multicore processing technologies to enable current and future capabilities and innovative technical solutions for the Army aviation fleet.</p> <p>The Improved Data Modem (IDM) is the common solution for digitizing Army Aviation and is fielded on every modernized, rotary-wing Army aircraft, including the CH-47 Chinook, AH-64 Apache and UH-60 Black Hawk. The IDM provides the Army rotary wing fleet with critical communication capabilities, enables connectivity to multiple radios used by rotary-wing aircraft and the Blue Force Tracking transceiver, and provides the means for rapid data transfer. The Aviation Mission Common Server (AMCS) effort is a capability upgrade and replacement for the current Army IDM-401. The AMCS program will implement IDM and Common Operating Environment capabilities utilizing a flexible open systems architecture and distributed processing resources to perform an array of non-flight critical computing, data processing, radio and communications management, and graphics generation functions for the enduring and future Army Aviation fleet and de-couple non-flight critical mission system technology integration from flight critical components. The AMCS program will satisfy Army Future Airborne Capability Environment (FACE) requirements for hardware, software, and firmware and be able to satisfy cybersecurity requirements. The AMCS program will replace the current IDM-401 with a common server capability to support current IDM-401 functionality, provide enhanced data and graphics processing, and provide a FACE architecture through which Aviation platforms will be able to rapidly integrate technology upgrades required to keep pace with evolving threats. The AMCS program will enable the rapid insertion and update of capabilities into Army Aviation operations without requiring lengthy, costly and out of sync software updates to flight mission computers; resulting in affordable, synchronized integration and fielding of Aviation capabilities required for the Multi-Domain Battlefield. The AMCS program will be the center of the future Common Digital Backbone for the enduring and future Army Aviation fleets, and is the key enabler for Army Aviation Multi-Domain Operations.</p> <p>The Aviation Mission Planning System (AMPS) is a system used to conduct pre-mission and aircraft performance planning. It receives data from multiple sources and provides that data digitally to the aircraft to support aviation missions. AMPS is used for automated mission planning, risk assessment, and transfer of mission data to aviation platforms within an Aviation unit. This includes route generation, performance planning, communications planning, terrain analysis, data transfer, and mission rehearsal. These efforts include development and testing of a new underlying architecture to support the move of Army Aviation Mission Planning from the current structure to one that supports synchronization both vertically and horizontally between Aviation and Ground forces. It will allow aircrews to continually plan and update route, threat, and performance data throughout all phases of an Aviation mission. Development of a mobile aircraft performance planning/weight and balance calculator is currently underway and will be the first migration of AMPS capabilities to a mobile hardware agnostic environment.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Army	Date: February 2020
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Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604201A / <i>Aircraft Avionics</i>
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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	32.253	29.164	7.673	-	7.673
Current President's Budget	31.401	8.414	2.764	-	2.764
Total Adjustments	-0.852	-20.750	-4.909	-	-4.909
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-20.750			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.852	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-4.909	-	-4.909

Change Summary Explanation

FY 2021 reflects a decrease in funding to better align with Army Aircraft Avionics requirements.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics				Project (Number/Name) C97 / ACFT Avionics			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
C97: ACFT Avionics	-	16.114	4.937	1.928	-	1.928	6.358	2.226	1.263	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Fiscal Year FY 2021 budget request funds the development of Aircraft Avionics systems required to horizontally and vertically integrate the battlefield and the integration of those systems into Army aircraft. Tasks in this Project support research, development, and test efforts in the Engineering and Manufacturing Development phases of these systems.

The Doppler Global Positioning System Navigation Set (DGNS) Upgrade program completes system engineering trade studies to reduce space, weight, and power with the introduction of new navigation support capabilities such as an inertial sensor interface card and Instrument Flight Rules map display. The DGNS upgrade includes Non-Recurring Engineering for the Computer Display Unit (CDU) which replaces the current CDU faceplate with a touch screen display, provides a moving navigation map capability, and optimizes pilot interface to promote safer flight operations. The CDU upgrade will support Assured-Position Navigation and Timing (A-PNT) operations in conjunction with additional system upgrades and upgrades to existing DGNS hardware in order to accommodate A-PNT in identified operational environments, and incorporates M-Code. This includes anti-jam antenna capabilities and supports the requirement to maintain A-PNT throughout operations.

The Enhanced Aviation Global Air Traffic Management (GATM) Localizer Performance with Vertical Guidance (LPV) Embedded Global Positioning System (GPS) Inertial (EGI) Navigation System (EAGLE) A-PNT integration program assesses current capabilities in identified operational PNT environment levels, tests identified upgrades to existing EGI hardware in order to accommodate A-PNT in identified operational environments, and incorporates M-Code. It supports the requirement to maintain A-PNT throughout operations and requires assessment and follow-on upgrade to the EGI navigation system. The EAGLE upgrade will perform an assessment of A-PNT assurance levels to understand system performance, associated PNT capability gaps, integrate anti-jam antenna capabilities, and evaluate candidate solutions to cover any identified gaps.

The Multi-platform Anti-jam GPS Navigation Antenna (MAGNA) is a GPS anti-jam adaptive antenna system that will be capable of receiving legacy and modernized NAVSTAR GPS satellite signals. The MAGNA reduces the effect of GPS jamming by rejecting the interfering signals before they disrupt the GPS receiver enabling the Warfighter continued access to GPS-provided PNT in a GPS degraded environment.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: DGNS / A-PNT Assessment	1.849	0.965	-	-	-
Description: The DGNS Upgrade program completes system engineering trade studies to reduce space, weight, and power with the introduction of new navigation support capabilities such as inertial sensor interface card and Instrument Flight Rules (IFR) map display. It also prepares ECPs to the existing DGNS LRU as a result of those trade studies. The DGNS upgrade continues with execution of Non-Recurring Engineering for					

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Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) C97 / ACFT Avionics
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
<p>CDU and Signal Data Converter LRU ECP packages. The DGNS CDU Upgrade replaces the current CDU faceplate with a touch screen display, provides a moving navigation map capability and optimized pilot interface to augment existing IFR capability and promote safer flight operations. It also enables CDU support for A-PNT operations in conjunction with additional system LRU upgrades, including anti-jam antenna capabilities.</p> <p>FY 2020 Plans: Completed Airworthiness Qualification of Resiliency & Software Assurance Modification software modifications and completed Airworthiness Qualification of the Multi-platform Anti-jam GPS Navigation Antenna (MAGNA).</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY2021 decrease is due to completion of GPS anti-jam antenna efforts and MAGNA development.</p>					
<p>Title: EAGLE Navigation System A-PNT Integration</p> <p>Description: The EAGLE Navigation System A-PNT integration program assesses current capabilities in identified operational PNT environment levels and tests identified upgrades to existing EGI hardware to accommodate A-PNT in identified operational environments.</p> <p>FY 2020 Plans: Completed M-Code integration into the EAGLE system and begun final EAGLE-M airworthiness qualification testing.</p> <p>FY 2021 Base Plans: Continue EAGLE-M airworthiness qualification testing and Resiliency & Software Assurance Modification integration onto legacy GPS receivers. Continue EAGLE M-code development.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreases in FY 2021 due to completion of GPS anti-jam antenna - MAGNA Development in FY 2020.</p>	14.265	3.748	1.928	-	1.928
<p>Title: FY 2020 SBIR/STTR Transfer</p> <p>Description: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638</p>	-	0.224	-	-	-
Accomplishments/Planned Programs Subtotals	16.114	4.937	1.928	-	1.928

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army	Date: February 2020
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Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) C97 / ACFT Avionics
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• AA0723: Comms, Nav Surveillance	156.969	164.315	101.355	-	101.355	63.669	71.084	83.360	62.916	Continuing	Continuing
• AA0704: GATM - Rotary Wing Aircraft	26.848	30.966	12.180	-	12.180	9.034	7.668	6.141	4.933	Continuing	Continuing

Remarks

D. Acquisition Strategy

This project is comprised of multiple systems supporting aircraft avionics. While the detailed acquisition strategy varies from program to program, the general strategy is for each individual program to complete the development and testing efforts in coordination with the aircraft platforms on integration issues, use the various contracts of the aircraft platforms original equipment manufacturers on integration efforts, and utilize the United States Army Combat Capabilities Development Command Aviation & Missile Center for software development. This requires the use of various contract methods and types to accomplish the aircraft avionics development efforts. All required acquisition program documentation is prepared.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) C97 / ACFT Avionics
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PM Services (DGNS Upgrade/ DGNS A-PNT)	Various	Development Command Aviation & Missiles Center SED : Redstone Arsenal, AL	0.898	0.224	Oct 2018	0.047	Oct 2019	-		-		-	0.000	1.169	-
PM Services (EAGLE)	Various	Development Command Aviation & Missiles Center : Redstone Arsenal, AL	0.287	0.212	Oct 2018	0.047	Oct 2019	-		-		-	0.000	0.546	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.224		-		-		-	0.000	0.224	-
Subtotal			1.185	0.436		0.318		-		-		-	0.000	1.939	N/A

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
DGNS A-PNT Assessment and Upgrade	SS/CPFF	BAE Systems : Wayne, NJ	6.621	1.100	Apr 2019	0.918		-		-		-	0.000	8.639	-
DGNS Anti-Jam Antenna Development - MAGNA	SS/CPFF	Mayflower Communications, Inc. : Bedford, MA	1.156	0.275	Nov 2018	-		-		-		-	0.000	1.431	-
EGI/EAGLE A-PNT Assessment and Upgrade/ M-Code Integration	SS/CPFF	Honeywell : Clearwater, FL	5.649	10.569	Mar 2019	3.701	Jan 2020	-		-		-	0.804	20.723	-
EGI Anti-Jam Antenna Development - MAGNA	SS/CPFF	Mayflower Communications, Inc. : Bedford, MA	7.514	3.165	Nov 2018	-		-		-		-	0.000	10.679	-
EGI/RSAM Development	SS/CIPIF	Honeywell International : Clearwater, FL	-	-		-		0.928	Dec 2020	-		0.928	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army												Date: February 2020			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
2040 / 5				PE 0604201A / Aircraft Avionics				C97 / ACFT Avionics							
Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
EGI/EAGLE M-Code	SS/CPIF	Honeywell International : Clearwater, FL	-	-		-		0.930	Jun 2021	-		0.930	Continuing	Continuing	-
Subtotal			20.940	15.109		4.619		1.858		-		1.858	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
DGNS RSAM Flight Test Support	Various	Development Command Aviation & Missiles Center Engineering Directorate : Redstone Arsenal, AL	-	0.125	Mar 2019	-		-		-		-	0.000	0.125	-
EAGLE M-Code / EGI RSAM Flight Test Support	Various	Development Command Aviation & Missiles Center Engineering Directorate : Redstone Arsenal, AL	-	0.173	May 2019	-		0.035	Jun 2021	-		0.035	0.000	0.208	-
Subtotal			-	0.298		-		0.035		-		0.035	0.000	0.333	N/A
Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
DGNS RSAM Airworthiness Qualification Testing	RO	Redstone Test Center : Redstone Arsenal, AL	-	0.125	Jul 2019	-		-		-		-	0.000	0.125	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) C97 / ACFT Avionics
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Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
DGNS A-PNT Assessment and RSAM Upgrade																												
DGNS Anti-Jam Antenna Development																												
EGI/EAGLE A-PNT Assessment and Upgrade/ M-Code Integrati																												
EGI/EAGLE Anti-Jam Antenna Development																												
EGI/RSAM Development																												
EGI/EAGLE M-Code Development																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) C97 / ACFT Avionics
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
DGNS A-PNT Assessment and RSAM Upgrade	3	2018	4	2020
DGNS Anti-Jam Antenna Development	4	2016	4	2019
EGI/EAGLE A-PNT Assessment and Upgrade/ M-Code Integration	2	2018	2	2021
EGI/EAGLE Anti-Jam Antenna Development	4	2016	4	2019
EGI/RSAM Development	2	2021	2	2025
EGI/EAGLE M-Code Development	4	2018	3	2023

Note

DGNS: Doppler Global Positioning System (GPS) Navigation Set
A-PNT: Assured-Position Navigation and Timing
RSAM: Resiliency & Software Assurance Modification
M-Code: Military-Code
EGI: Embedded GPS Inertial

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics				Project (Number/Name) EW7 / Degraded Visual Environment			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
EW7: <i>Degraded Visual Environment</i>	-	14.185	2.661	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	16.846
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project EW7 Degraded Visual Environment completed development and test efforts in Fiscal Year (FY) 2020.

A. Mission Description and Budget Item Justification

The FY 2021 budget request funds the development and integration of the Environment Exploitation System (EES) on an Army aviation platform to mature sensor and Multi-Core Processing capabilities to meet emerging Army requirements.

The Degraded Visual Environment (DVE) project portfolio includes the DVE Army Directed Requirement (DR) and the EES.

The DVE DR is to provide DVE systems to 15 HH-60M Blackhawk MEDEVAC helicopters and 25 Special Operations aircraft. The DVE DR fulfills an immediate DVE requirement while bridging the gap between future DVE capabilities. The DVE DR system provides a forward looking, situational awareness, fused-sensor image for single aircraft takeoff and landing in brownout conditions. Project EW7 Degraded Visual Environment completed development and test efforts in FY 2019.

The EES focuses on active and passive sensor technology, synthetic vision, sensor and software data fusion, imagery processing, user interface, and multicore processing technologies to enable current and future capabilities and innovative technical solutions for the Army aviation fleet.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Degraded Visual Environment (DVE)	14.185	2.540	-	-	-
Description: The DVE project portfolio includes the DVE Army DR and the EES.					
The DVE DR is to provide DVE systems to 15 HH-60M Blackhawk MEDEVAC helicopters and 25 Special Operations aircraft. The DVE DR fulfills an immediate DVE requirement while bridging the gap between future DVE capabilities. The DVE DR system provides a forward looking, situational awareness, fused-sensor image for single aircraft takeoff and landing in brownout conditions. The program completed development and test efforts in support of the DVE DR in FY 2019.					
The EES program focuses on active and passive sensor technology, synthetic vision, sensor and software data fusion, imagery processing, user interface, and multicore processing technologies to enable current and future					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) EW7 / Degraded Visual Environment

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
capabilities and innovative technical solutions for the current Army aviation fleet to safely operate in DVE. The EES program will equip Combat Aviation Brigades with evolving modular DVE solutions creating revolutionary tactical advantages while increasing survivability.					
FY 2020 Plans: Completed application development for aviation mission common server, sensor characterization, and technology demonstration efforts.					
FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreases due to completion of application development for aviation mission common server, sensor characterization, and technology demonstration efforts.					
Title: FY 2020 SBIR/STTR Transfer	-	0.121	-	-	-
Description: Funding transferred in accordance with Title 15 USC ?638					
FY 2020 Plans: Funding transferred in accordance with Title 15 USC ?638					
FY 2020 to FY 2021 Increase/Decrease Statement: Funding transferred in accordance with Title 15 USC ?638					
Accomplishments/Planned Programs Subtotals	14.185	2.661	-	-	-

C. Other Program Funding Summary (\$ in Millions)			FY 2021 Base	FY 2021 OCO	FY 2021 Total					Cost To Complete	Total Cost
Line Item	FY 2019	FY 2020				FY 2022	FY 2023	FY 2024	FY 2025		
• A00713: Degraded Visual Environment	30.000	49.450	0.000	1.916	1.916	-	-	-	-	0.000	81.366

Remarks

D. Acquisition Strategy

The DVE DR acquisition strategy for development leveraged a competitively awarded contract through the Technology Applications Program Office. The production contract also leverages a contract awarded through the Technology Applications Program Office. The Aviation Field Maintenance Directorate is performing the installation of the DVE DR system onto the designated aircraft. A disposition analysis of the DVE DR will inform future DVE requirements for both current and future Army aviation platforms.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) EW7 / Degraded Visual Environment
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PM Support for DR	Various	Various : Various	1.606	2.678	Mar 2020	-		-		-		-	0.000	4.284	-
PM Support for EES	Various	Various : Various	-	1.067	Jun 2019	0.220	Sep 2020	-		-		-	0.000	1.287	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.121		-		-		-	0.000	0.121	-
Subtotal			1.606	3.745		0.341		-		-		-	0.000	5.692	N/A

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Develop and qualify the A-Kit software and hardware for DR	MIPR	Aviation Development Directorate-Eustis : Ft. Eustis, Virginia	2.819	2.364	Aug 2019	-		-		-		-	0.000	5.183	-
Develop and qualify software and hardware for DR	MIPR	Combat Capabilities Development Command : Redstone Arsenal, AL	-	0.122	Aug 2019	-		-		-		-	0.000	0.122	-
Develop and qualify the software and hardware for EES	MIPR	Combat Capabilities Development Command : Redstone Arsenal, AL	-	0.063	Apr 2019	2.180	Mar 2020	-		-		-	0.000	2.243	-
Develop hardware configuration DVE EES	Various	various : various	-	4.436	Mar 2020	-		-		-		-	0.000	4.436	-
Subtotal			2.819	6.985		2.180		-		-		-	0.000	11.984	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) EW7 / Degraded Visual Environment
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
System Engineering, Logistics and Technical Support for DR	MIPR	Combat Capabilities Development Command : Redstone Arsenal, AL	1.411	0.671	Jul 2019	-		-		-		-	0.000	2.082	-
System Engineering, Logistics and Technical Support for EES	MIPR	Combat Capabilities Development Command : Redstone Arsenal, AL	-	0.487	Aug 2019	0.070	Mar 2020	-		-		-	0.000	0.557	-
Subtotal			1.411	1.158		0.070		-		-		-	0.000	2.639	N/A

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Airworthiness and Qualification Testing for DR	MIPR	Redstone Test Center, Aviation Applied Technology Directorate : Redstone Arsenal, AL	2.105	-		-		-		-		-	0.000	2.105	-
DVE DR System Assessment	MIPR	Fort Bliss Testing Center; Redstone Test Center : Fort Bliss, Texas; Redstone Arsenal, AL	-	2.297	Jun 2019	-		-		-		-	0.000	2.297	-
Airworthiness and Qualification Testing for EES	TBD	TBD : TBD	-	-		0.070	Mar 2020	-		-		-	0.000	0.070	-
Subtotal			2.105	2.297		0.070		-		-		-	0.000	4.472	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) EW7 / Degraded Visual Environment
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Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Degraded Visual Environment Directed Requirement (DVE DR)																												
Operational Test				▲ 1 DVE DR																								
Production Decision				▲ 2 DVE DR																								
DVE Technology Development & Maturation																												
DVE-Mitigation Science & Technology Transition								▲ 3 DVE-M Capstone																				
AMCS/Environment Exploitation System (EES) Modular Capability Demonstration												▲ 4 AMCS/EES Demo																

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) EW7 / Degraded Visual Environment
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Degraded Visual Environment Directed Requirement (DVE DR)	3	2017	4	2019
Critical Design Review	3	2018	3	2018
Operational Test	4	2019	4	2019
Production Decision	4	2019	4	2019
DVE Technology Development & Maturation	1	2018	4	2021
DVE-Mitigation Science & Technology Transition	4	2020	4	2020
AMCS/Environment Exploitation System (EES) Modular Capability Demonstration	4	2021	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army										Date: February 2020		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics				Project (Number/Name) VU3 / Networking And Mission Planning			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
VU3: <i>Networking And Mission Planning</i>	-	1.102	0.816	0.836	-	0.836	0.927	1.033	1.245	0.000	0.000	5.959
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Fiscal Year (FY) 2021 budget estimate submission request funds the development of Networking and Mission Planning systems required to horizontally and vertically integrate the battlefield and the integration of those systems into Army aircraft. Tasks in this Project support research, development, and test efforts in the Engineering and Manufacturing Development phases of these systems.

The Improved Data Modem (IDM) is the common solution for digitizing Army Aviation and is fielded on every modernized, rotary-wing Army aircraft, including the CH-47 Chinook, AH-64 Apache and UH-60 Black Hawk. The IDM provides the Army rotary wing fleet with critical communication capabilities, enables connectivity to multiple radios used by rotary-wing aircraft and the Blue Force Tracking transceiver, and provides the means for rapid data transfer. The Aviation Mission Common Server (AMCS) effort is a capability upgrade and replacement for the current Army IDM-401. The AMCS program will implement IDM and Common Operating Environment capabilities utilizing a flexible open systems architecture and distributed processing resources to perform an array of non-flight critical computing, data processing, radio and communications management, and graphics generation functions for the enduring and future Army Aviation fleet and de-couple non-flight critical mission system technology integration from flight critical components. The AMCS program will satisfy Army Future Airborne Capability Environment (FACE) requirements for hardware, software, and firmware and be able to satisfy cybersecurity requirements. The AMCS program will replace the current IDM-401 with a common server capability to support current IDM-401 functionality, provide enhanced data and graphics processing, and provide a FACE architecture through which Aviation platforms will be able to rapidly integrate technology upgrades required to keep pace with evolving threats. The AMCS program will enable the rapid insertion and update of capabilities into Army Aviation operations without requiring lengthy, costly and out of sync software updates to flight mission computers; resulting in affordable, synchronized integration and fielding of Aviation capabilities required for the Multi-Domain Battlefield. The AMCS program will be the center of the future Common Digital Backbone for the enduring and future Army Aviation fleets, and is the key enabler for Army Aviation Multi-Domain Operations.

The Aviation Mission Planning System (AMPS) is a system used to conduct pre-mission and aircraft performance planning. It receives data from multiple sources and provides that data digitally to the aircraft to support aviation missions. AMPS is used for automated mission planning, risk assessment, and transfer of mission data to aviation platforms within an Aviation unit. This includes route generation, performance planning, communications planning, terrain analysis, data transfer, and mission rehearsal. These efforts include development and testing of a new underlying architecture to support the move of Army Aviation Mission Planning from the current structure to one that supports synchronization both vertically and horizontally between Aviation and Ground forces. It will allow aircrews to continually plan and update route, threat, and performance data throughout all phases of an Aviation mission. Development of a mobile aircraft performance planning/weight and balance calculator is currently underway and will be the first migration of AMPS capabilities to a mobile hardware agnostic environment.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Improved Data Modem (IDM)	1.102	0.778	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Army		Date: February 2020
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) VU3 / Networking And Mission Planning

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Funding transferred in accordance with Title 15 USC 7638					
Accomplishments/Planned Programs Subtotals	1.102	0.816	0.836	-	0.836

C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• AA0712: Network And Mission Plan	118.614	98.236	77.432	-	77.432	42.391	50.477	43.275	41.057	Continuing	Continuing

Remarks

D. Acquisition Strategy

This project is comprised of multiple systems supporting aircraft avionics. While the detailed acquisition strategy varies from program to program, the general strategy is for each individual program to complete the development and testing efforts in coordination with the aircraft platforms on integration issues, use the various contracts of the aircraft platforms original equipment manufacturers on integration efforts, and utilize the Aviation & Missile Research, Development, and Engineering Center for software development. The Product Office continues to look for other competitive options to decrease cost and schedule.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) VU3 / Networking And Mission Planning
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
PM Support (IDM)	MIPR	PdM A2E2 : Redstone Arsenal, AL	0.050	-		0.022	Mar 2019	-		-		-	0.000	0.072	-
FY 2020 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.038		-		-		-	0.000	0.038	-
Subtotal			0.050	-		0.060		-		-		-	0.000	0.110	N/A

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Develop software for IDM	C/Various	Combat Communications Development Command, Aviation & Missile Center : Redstone Arsenal, AL	0.578	0.940		0.756	Mar 2019	-		-		-	0.000	2.274	-
Aviation Mission Common Server (AMCS)	C/Various	Combat Communications Development Command, Aviation & Missile Center : Redstone Arsenal, AL	-	-		-		0.803	Mar 2021	-		0.803	Continuing	Continuing	Continuing
Subtotal			0.578	0.940		0.756		0.803		-		0.803	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
System Engineering, Logistics, and Technical Support (IDM)	MIPR	Aviation Missile Research Development	0.172	0.162	Feb 2019	-		-		-		-	0.000	0.334	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) VU3 / Networking And Mission Planning
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Event Name	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
AMCS Airworthiness Studies and Assessments	1 <small>Completion of Airworthiness Certification Plan Development</small>																											
AMCS/Environment Exploitation System (EES) Modular Capability Demonstration													2 <small>AMCS/EES DEMO</small>															

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Army **Date:** February 2020

Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604201A / Aircraft Avionics	Project (Number/Name) VU3 / Networking And Mission Planning
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Qualify ADEC Hardware and Software	2	2011	2	2018
Milestone B (ADEC)	4	2016	4	2016
Develop hardware and software (ACN)	1	2012	4	2016
Develop AMPS Software	1	2018	4	2018
Develop IDM Software	4	2018	4	2018
AMCS Airworthiness Studies and Assessments	2	2019	2	2019
AMCS/Environment Exploitation System (EES) Modular Capability Demonstration	4	2021	4	2021

Note

ACN: Aircraft Notebook
ADEC: Aviation Data Exploitation Capability
AMCS: Aviation Mission Common Server
AMPS: Aviation Mission Planning System
EES: Environment Exploitation System
IDM: Improved Data Modem