Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603125A *I Combating Terrorism - Technology Development*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	44.088	36.757	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	80.845
DF5: *Agile Integration & Demonstration*	-	27.088	3.757	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	30.845
DW4: *Energy Technologies (Congressional Adds (CAs))*	-	17.000	33.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	50.000

Note

In FY 2020, this PE is being eliminated, with continuity of effort realigned to the following PEs:
* 0602145A (Next Generation Combat Vehicle Technology)

A. Mission Description and Budget Item Justification

This PE demonstrates and evaluates emerging technologies and systems with high payoff potential to address current technology shortfalls or future capability gaps. Efforts include hybrid electric power technologies to reduce use of fossil fuel in tactical generators; collaboration with the United States (U.S.) Department of Energy (DOE) to demonstrate technologies that provide significant gains in ground vehicle energy efficiency; demonstration of ground platform power management, generation, and distribution technologies that increase energy efficiencies and support the integration of advanced future capabilities; and field demonstrations to stress and assess emerging technologies earlier in the systems development life cycle, thus reducing potential vulnerabilities and providing an improved understanding of employment risks against potential threats.

Work in this Project is complementary to and is fully coordinated with PE 0602618A (Ballistics Technology) / Project H80 (Ballistics Technology/Survivability and Lethality Technology), PE 0602601A (Combat Vehicle and Automotive Technology), and PE 0603005A (Combat Vehicle and Automotive Advanced Technology).

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

This work is performed by the U.S. Army Futures Command.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army	Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603125A *I Combating Terrorism - Technology Development*

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	26.903	3.762	2.741	-	2.741
Current President's Budget	44.088	36.757	0.000	-	0.000
Total Adjustments	17.185	32.995	-2.741	-	-2.741
• Congressional General Reductions	-0.022	-0.005			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	17.000	33.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	1.260	-			
• SBIR/STTR Transfer	-1.053	-			
• Adjustments to Budget Years	-	-	-2.741	-	-2.741

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: DW4: *Energy Technologies (Congressional Adds (CAs))*		
Congressional Add: *Congressional Increase.*	17.000	-
Congressional Add: *Atificial Intelligence Enabled Sensor Networks*	-	8.000
Congressional Add: *Enhanced Propulsion Systems for UAS*	-	6.000
Congressional Add: *Lightweight Low Power Radar System*	-	8.000
Congressional Add: *Long Endurance UAV Research*	-	8.000
Congressional Add: *Open Source ISR Research*	-	3.000
Congressional Add Subtotals for Project: DW4	17.000	33.000
Congressional Add Totals for all Projects	17.000	33.000

Change Summary Explanation

FY18 congressional adds for Lightweight Low Power Radar Systems ($6.000 million), Long Endurance UAV Research ($8.000 million), and Open Source ISR Research ($3.000 million).

FY19 congressional adds for artificial intelligence enabled sensor networks ($8.000 million), enhanced propulsion systems for UAS ($6.000 million), lightweight low power radar systems ($8.000 million), long endurance UAV research ($8.000 million), and open source ISR research ($3.000 million).

FY20 adjustments realign program funds to PE 0602145A (Next Generation Combat Vehicle Technology).

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603125A / *Combating Terrorism - Technology Development*	Project (Number/Name) DF5 / *Agile Integration & Demonstration*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
DF5: *Agile Integration & Demonstration*	-	27.088	3.757	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	30.845

Note

In FY 2020 this Project is being realigned to:
PE 0602145A (Next Generation Combat Vehicle Technology), Projects:
* BH5 (Platform Electrification and Mobility Tech)
* BI4 (Materials Application and Integration Technology)

A. Mission Description and Budget Item Justification

This Project demonstrates and evaluates emerging technologies and systems with high payoff potential to address current technology shortfalls or future capability gaps. Efforts include hybrid electric power technologies to reduce use of fossil fuel in tactical generators; collaboration with the United States Department of Energy (DOE) to demonstrate technologies that provide significant gains in ground vehicle energy efficiency; demonstration of ground platform power management, generation, and distribution technologies that increase energy efficiencies and support the integration of advanced future capabilities; and field demonstrations to stress and assess emerging technologies earlier in the systems development life cycle, thus reducing potential vulnerabilities and providing an improved understanding of employment risks against potential threats.

Work in this Project is complementary to and is fully coordinated with PE 0602618A (Ballistics Technology) / Project H80 (Ballistics Technology/Survivability and Lethality Technology), PE 0602601A (Combat Vehicle and Automotive Technology), and PE 0603005A (Combat Vehicle and Automotive Advanced Technology).

The cited work is consistent with the Under Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy. FY 2020 realignments are due to financial restructuring in support of Army Modernization Priorities.

This work is performed by the U.S. Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Ground Platform Subsystem Demonstrations	4.006	1.073	-
Description: This effort contributes to the Army's ground platform risk reduction efforts which seek to address technical and integration challenges in the areas of mobility, survivability, vehicle architecture, and systems integration. Specifically, this effort focuses on maturing and demonstrating integrated vehicle power management, generation and distribution technologies to increase ground vehicle energy efficiencies and ensure ground platforms have enough power to enable future capabilities such as electromagnetic armor, active protection systems, improvised explosive device detect and defeat technologies, advanced			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603125A / *Combating Terrorism - Technology Development*	**Project (Number/Name)** DF5 / *Agile Integration & Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
situational awareness and future network integration technologies. This effort is coordinated with PE 0603005A (Combat Vehicle and Automotive Advanced Technology). ***FY 2019 Plans:*** Complete optimization of VEA Mobile Demonstrator (VMD) performance during hardware integration onto vehicle platform, and validate system performance against future power and data requirements. Complete validation of powertrain controls architecture and algorithms, improving powertrain efficiencies and minimizing parasitic losses. Complete validation of integrated starter generator, advanced thermal management system, and advanced modular lithium ion battery technologies to improve subsystem fuel efficiency and increase electrical power generation. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** This effort ends in FY 2019.			
Title: Ground Vehicle Power and Energy ***Description:*** This effort matures and demonstrates advanced technologies that enable military ground vehicles to become significantly more energy efficient. It collaborates with the DOE to demonstrate technologies in: advanced combustion engines and transmissions; lightweight structures and materials; energy recovery and thermal management; alternative fuels and lubricants; hybrid propulsion systems; batteries and energy storage; and analytical tools (e.g., modeling and simulation). This effort is coordinated with PE 0602601A (Combat Vehicle and Automotive Technology). ***FY 2019 Plans:*** Continue to support the AVPTA with the DOE to mature and demonstrate technologies within the alliance technology focus areas. Develop methodology and software for optimal sizing of fuel cells and battery packs for military vehicles. Develop advanced electrolytes to increase Lithium Metal Battery energy density, performance and life. Develop and test Thermal Barrier Coatings to reduce heat loss/improve fuel economy of combustion engines. Develop and evaluate next-generation, light-weight materials, manufacturing and related processes. Support the AVPTA project portfolio via "Extended Enterprise" efforts such as Improving the Fuel Efficiency of the Current Ground Tactical Fleet; JP-8 Fuel Cell Power; and other activities that will enhance Operational Energy efficiency and reduce energy consumption. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Beginning in FY 2020, this sub-effort realigns to PE 0602145A (NGCV Technology) / Project BH5 (Platform Electrification and Mobility Tech) and PE 0602145A (NGCV Technology) / Project BI4 (Materials Application and Integration Technology) as part of the financial restructure to continue the AVPTA partnership with the DOE.	5.413	2.563	-
Title: Red Teaming Field Demonstration	7.450	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603125A / *Combating Terrorism - Technology Development*	**Project (Number/Name)** DF5 / *Agile Integration & Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: This effort conducts field demonstrations to stress emerging technologies in realistic environments and scenarios, using warfighters and adaptive adversaries. Field demonstration activities seek to place emerging technologies in the hands of Warfighters early in the development cycle to leverage their feedback and to uncover potential vulnerabilities in future systems, allowing identification of design fixes and improvements while mitigations are less expensive. Red Teaming Field Demonstration activities are coordinated with PE 0602618A (Ballistics Technology).			
Title: Red Teaming Systems Intensive Analysis ***Description:*** This effort conducts in-depth analysis (from concepts to employment to interoperability) of selected high priority emerging technology sub-systems and systems with planned transitions to future programs of record. The intent is assess technologies using virtual and laboratory experiments across a broad range of potential threat vectors, environments, and use cases to identify and mitigate any identified vulnerabilities as early as possible.. These venues allow for detailed analysis in areas that would be too dangerous or too expensive to assess during a live, field demonstration.	4.394	-	-
Title: Red Teaming Vulnerability Exercises ***Description:*** This effort conducts tabletop exercises for in-depth assessments of emerging threats and technologies to anticipate future challenges in contested and congested environments, inform threat concepts, adapt system development practices, and maintain overmatch capability. Outputs of these exercises influence technologies and scenarios chosen for Systems Analysis and Field Demonstrations.	2.866	-	-
Title: Unmanned Teaming Technology Assessment ***Description:*** This effort provides an assessment of technology components and enablers required to establish a manned-unmanned teaming capability for enhanced combat power in complex and contested environments. The assessment will consider Soldiers, unmanned ground vehicles, unmanned air vehicles, command and control, communications, and lethality technologies.	2.959	-	-
Title: FY 2019 SBIR / STTR Transfer ***Description:*** FY 2019 SBIR / STTR Transfer ***FY 2019 Plans:*** FY 2019 SBIR / STTR Transfer ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2019 SBIR / STTR Transfer	-	0.121	-
Accomplishments/Planned Programs Subtotals	27.088	3.757	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603125A / *Combating Terrorism - Technology Development*	**Project (Number/Name)** DF5 / *Agile Integration & Demonstration*

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 2020 Army												Date: March 2019
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603125A / *Combating Terrorism - Technology Development*				Project (Number/Name) DW4 / *Energy Technologies (Congressional Adds (CAs))*			
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
DW4: *Energy Technologies (Congressional Adds (CAs))*	-	17.000	33.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	50.000

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for technology development and demonstration.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Congressional Increase. ***FY 2018 Accomplishments:*** Congressional Increase.	17.000	-
Congressional Add: Atificial Intelligence Enabled Sensor Networks ***FY 2019 Plans:*** Atificial Intelligence Enabled Sensor Networks	-	8.000
Congressional Add: Enhanced Propulsion Systems for UAS ***FY 2019 Plans:*** Enhanced Propulsion Systems for UAS	-	6.000
Congressional Add: Lightweight Low Power Radar System ***FY 2019 Plans:*** Lightweight Low Power Radar System	-	8.000
Congressional Add: Long Endurance UAV Research ***FY 2019 Plans:*** Long Endurance UAV Research	-	8.000
Congressional Add: Open Source ISR Research ***FY 2019 Plans:*** Open Source ISR Research	-	3.000
Congressional Adds Subtotals	17.000	33.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603125A / *Combating Terrorism - Technology Development*	**Project (Number/Name)** DW4 / *Energy Technologies (Congressional Adds (CAs))*

E. Performance Metrics

N/A