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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 7: Operational Systems Development					R-1 Program Element (Number/Name) PE 0205410A I Materials Handling Equipment							
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	-	1.519	1.462	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
EE9: Material Handling Equipment - Advance Development	-	1.519	1.462	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program element supports component development and Material Handling Equipment (MHE) prototyping, and stays abreast of emerging and available technologies to be integrated into military MHE to address identified capability gaps and warfighter objectives. This project enables the development of selected technologies and transition to system integration and development or production of MHE products. MHE includes Rough Terrain Forklifts, Rough Terrain Container Handlers (RTCH) and Cranes, as well as ancillary MHE equipment, to support distribution of critical supplies in the theater of operations.

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020 Base</b>	<b>FY 2020 OCO</b>	<b>FY 2020 Total</b>
Previous President's Budget	1.582	1.464	0.743	-	0.743
Current President's Budget	1.519	1.462	0.000	-	0.000
Total Adjustments	-0.063	-0.002	-0.743	-	-0.743
• Congressional General Reductions	-0.001	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.062	-			
• Adjustments to Budget Years	-	-	-0.743	-	-0.743

**Change Summary Explanation**

Funding realigned from 603804A Project G14



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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army										Date: March 2019		
Appropriation/Budget Activity 2040 / 7					R-1 Program Element (Number/Name) PE 0205410A / Materials Handling Equipment				Project (Number/Name) EE9 / Material Handling Equipment - Advance 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
EE9: Material Handling Equipment - Advance Development	-	1.519	1.462	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project supports component development and Material Handling Equipment (MHE) prototyping and stays abreast of emerging and available technologies to be integrated into military MHE to address identified capability gaps and warfighter objectives. This project enables the development of selected technologies and transition to system integration and development or production of MHE products. MHE includes Rough Terrain Forklifts, Rough Terrain Container Handlers (RTCH) and Cranes, as well as ancillary MHE equipment, to support distribution of critical supplies in the theater of operations.

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

	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020 Base</b>	<b>FY 2020 OCO</b>	<b>FY 2020 Total</b>
<b>Title:</b> Robotic Assist on Material Handling Equipment (MHE) Enhancement	0.816	0.530	-	-	-
<b>Description:</b> Integrate and demonstrate Commercial-off-the-Shelf (COTS) technologies to enhance Material Handling Equipment (MHE) operations. System technologies will include obstacle detection, electronic control systems, electric-hydraulic controls, driveline control technology, and work tool automation.					
<b>FY 2019 Plans:</b> Continue to Integrate Commercial-off-the-Shelf (COTS) obstacle detectors, similar to collision sensors, to increase situational awareness of MHE operator. Integrate COTS controllers, similar to gaming devices to enable MHE operator to control machine from outside the cab. Research the integration and replacement of levers with joysticks for improved operator efficiency. Research steering and driving control devices which will allow semi or full autonomous control. Research and integrate COTS technology such as self-aligning forks and boom extension for telescoping boom forklift.					
<b>FY 2019 to FY 2020 Increase/Decrease Statement:</b> No funding received in FY 2020, project will come to an end.					
<b>Title:</b> System Engineering/Program Management	0.456	0.493	-	-	-
<b>Description:</b> Fund for Material Handling Equipment System Engineering and Program Management.					
<b>FY 2019 Plans:</b>					



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Exhibit R-2A, RDT&E Project Justification: PB 2020 Army				Date: March 2019		
Appropriation/Budget Activity 2040 / 7		R-1 Program Element (Number/Name) PE 0205410A / Materials Handling Equipment		Project (Number/Name) EE9 / Material Handling Equipment - Advance Development		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Provide funding for Material Handling Equipment System Engineering and Program Management.						
FY 2019 to FY 2020 Increase/Decrease Statement: No funding received in FY 2020						
Title: Driver Assist  Description: Research and demonstrate technologies which would enhance operation such as the inclusion of cameras, collision sensors, and lifting aids.  FY 2019 Plans: Integrate COTS cameras, similar to backup cameras, to increase situational awareness of MHE operator. Integrate COTS collision warning sensors to increase situational awareness of MHE operator. Integrate discrete lifting aids to assist rough terrain forklifts with non-pallet lift missions.  FY 2019 to FY 2020 Increase/Decrease Statement: No funding received in FY 2020.		-	0.392	-	-	-
Title: Atlas II Enhancement  Description: The purpose of the project is to develop and integrate an Automated Material Handling Technology (AMHT) kit for the Army's ATLAS II 10,000 pound capability forklift. This includes the hardware and software necessary for the vehicle to conduct its missions both autonomously and semi-autonomously, and to demonstrate the AMHT kit through a series of tests and obstacle courses that were developed from the vehicle's performance specification and were designed to imitate its mission profile.		0.247	-	-	-	-
Title: 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.		-	0.047	-	-	-
Accomplishments/Planned Programs Subtotals		1.519	1.462	-	-	-



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Appropriation/Budget Activity 2040 / 7				R-1 Program Element (Number/Name) PE 0205410A / Materials Handling Equipment				Project (Number/Name) EE9 / Material Handling Equipment - Advance Development			
C. Other Program Funding Summary (\$ in Millions)											
			<u>FY 2020</u>	<u>FY 2020</u>	<u>FY 2020</u>					<u>Cost To</u>	
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>Base</u>	<u>OCO</u>	<u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Complete</u>	<u>Total Cost</u>
• G41001: Family Of Forklifts	9.000	12.901	14.864	5.152	20.016	13.564	18.960	20.393	17.162	Continuing	Continuing
• MA4501: MODIFICATION KITS	20.980	25.201	34.587	4.234	38.821	16.407	16.840	16.354	7.393	0.000	141.996
Remarks											
D. Acquisition Strategy											
Procure prototype component items for engineering tests and demonstrations with subject matter experts. Conduct trades between cost and improved maintainability and environmental risk reduction. Process engineering change proposals, update technical manuals and training materials, and prepare supporting acquisition documents and data to procure new training aids.											
E. Performance Metrics											
N/A											



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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army												Date: March 2019			
Appropriation/Budget Activity 2040 / 7						R-1 Program Element (Number/Name) PE 0205410A / Materials Handling Equipment				Project (Number/Name) EE9 / Material Handling Equipment - Advance Development					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Robotic Assist on Material Handling Equipment Enhancement	MIPR	TARDEC : Warren, MI	0.461	0.816	May 2019	0.530	Mar 2019	-		-		-	0.000	1.807	-
Operational Energy Technologies	MIPR	Various : Various	0.143	-		-		-		-		-	0.000	0.143	-
Driver Assist	Various	Various : Various	-	-		0.392	Mar 2019	-		-		-	0.000	0.392	-
Atlas II Enhancement	MIPR	TARDEC : Warren, MI	-	0.247	Jun 2018	-		-		-		-	0.000	0.247	-
FY 2019 SBIR / STTR Transfer	TBD	TBD : TBD	-	-		0.047		-		-		-	0.000	0.047	-
Subtotal			0.604	1.063		0.969		-		-		-	0.000	2.636	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
System Engineering/ Program Management	MIPR	Various : Warren, MI	0.240	0.456	Jan 2019	0.493	Jan 2019	-		-		-	0.000	1.189	-
Subtotal			0.240	0.456		0.493		-		-		-	0.000	1.189	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Lightweight Armor for ATLAS II	Various	Various : Various	0.170	-		-		-		-		-	0.000	0.170	-
Subtotal			0.170	-		-		-		-		-	0.000	0.170	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			1.014	1.519		1.462		-		-		-	0.000	3.995	N/A



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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2020 Army							<b>Date:</b> March 2019			
<b>Appropriation/Budget Activity</b> 2040 / 7			<b>R-1 Program Element (Number/Name)</b> PE 0205410A / <i>Materials Handling Equipment</i>			<b>Project (Number/Name)</b> EE9 / <i>Material Handling Equipment - Advance Development</i>				
	<b>Prior Years</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020 Base</b>	<b>FY 2020 OCO</b>	<b>FY 2020 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>	
<b>Remarks</b>										



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**Appropriation/Budget Activity**  
2040 / 7

**Project (Number/Name)**  
EE9 / *Material Handling Equipment -  
Advance Development*

**R-1 Program Element (Number/Name)**  
PE 0205410A / *Materials Handling Equipment*

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2020 Army			<b>Date:</b> March 2019
<b>Appropriation/Budget Activity</b> 2040 / 7	<b>R-1 Program Element (Number/Name)</b> PE 0205410A / <i>Materials Handling Equipment</i>	<b>Project (Number/Name)</b> EE9 / <i>Material Handling Equipment - Advance Development</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Material Handling Equipment Enhancement (Robotic Assist)	2	2019	4	2019
Driver Assist	2	2019	4	2019
System Engineering/Program Management	2	2019	4	2019
Atlas II Enhancement	3	2018	4	2019