Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Office of Secretary Of Defense											DATE: April 2013	
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 5: *System Development & Demonstration (SDD)*					R-1 ITEM NOMENCLATURE PE 0604709D8Z: *Joint Robotics EMD*							
COST ($ in Millions)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	-	2.705	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
609: *Joint Robotics EMD*	-	2.705	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

(U) This Program Element (PE) was established in response to Congressional guidance to consolidate DOD robotic programs on unmanned ground systems and related robotic technologies in order to increase focus of the Services' robotic programs on operational requirements. Technologies in the PE support the continued development of technologies in Budget Activity 3 and 4 (PEs 0603711D8Z and 0603709D8Z) for technology transitions and transformations and closing war fighter requirement capability gaps. By exercising its oversight role through a technology advisory board, O-6 Council and Senior Steering Group (Flag level), Joint Ground Robotics applies this PE to enable coordination between the Services and places emphasis on interoperability and commonality among unmanned ground systems. This PE supports the effort to overcome technology barriers in thrust areas of unmanned ground system technologies to include Autonomous & Tactical Behaviors, Manipulation Technologies, Collaborative Operations, Interoperability, Man-portable Unmanned Ground System Technologies, and Technology Transition/ Transformation. The purpose is to further the development and fielding of affordable and effective mobile ground robotic systems, develop and transition technologies necessary to meet evolving user requirements, and serve as a catalyst for insertion of robotic systems and technologies into the force structure. Through application of funds against the thrust areas of unmanned ground system technologies, this PE supports the integration of technologies into representative models or prototype systems in a high fidelity and realistic operating environment and expedites technology transition from the laboratory to operational use. Emphasis is on proving component and subsystem maturity prior to integration in major and complex systems and may involve risk reduction initiatives. Within this PE, funded efforts will continue the delivery of advanced technology needs directed at enhancing the war fighters' capabilities identified during concept development, operational assessments and field feedback of current unmanned systems.

B. Program Change Summary ($ in Millions)	**FY 2012**	**FY 2013**	**FY 2014 Base**	**FY 2014 OCO**	**FY 2014 Total**
Previous President's Budget	2.715	0.000	0.000	-	0.000
Current President's Budget	2.705	0.000	0.000	-	0.000
Total Adjustments	-0.010	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.010	-			
• SBIR/STTR Transfer	-	-			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Office of Secretary Of Defense			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604709D8Z: *Joint Robotics EMD*	PROJECT 609: *Joint Robotics EMD*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
609: *Joint Robotics EMD*	-	2.705	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles												

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This Program Element (PE) was established in response to Congressional guidance to consolidate DoD unmanned ground systems and related robotic technologies in order to increase focus of the Services' robotic programs on operational requirements. Technologies in this PE supported the continued development of technologies in Budget Activity 3 and 4 (PEs 0603711D8Z and 0603709D8Z) to fulfill Warfighter requirement capability gaps. By exercising its oversight role through a Technology Advisory Board, O-6 Council and Senior Steering Group (Flag level), the Joint Ground Robotics Enterprise applied this PE to enable coordination between the Services and places emphasis on interoperability and commonality among unmanned ground systems. This PE supported the effort to overcome technology barriers in thrust areas of unmanned ground system technologies to include: Navigation; Perception; Vision/Sensors; Manipulation; Command, Communication & Control; Mission/ Platform Specific; Interoperability; and Outreach & Harmonization. The purpose is to further the development and fielding of affordable and effective mobile ground robotic systems, develop and transition technologies necessary to meet evolving user requirements, and serve as a catalyst for insertion of robotic systems and technologies into the force structure. Through application of funds against the thrust areas of unmanned ground system technologies, this PE supported the integration of technologies into representative models or prototype systems in a high fidelity and realistic operating environment and expedites technology transition from the laboratory to operational use. Emphasis is on proving component and subsystem maturity prior to integration in major and complex systems and may involve risk reduction initiatives. Within this PE, funded efforts continue the delivery of advanced technology needs directed at enhancing the Warfighters' capabilities identified during concept development, operational assessments and theater feedback of current unmanned systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Manipulation	1.315	0.000	0.000
Description: Incorporation of new or existing technologies to enable a greater range of robotic manipulation, support the development of mobile manipulation, and improve manipulator performance. Development of these technologies will enable unmanned systems to conduct highly dexterous tasks that today are accomplished manually, but currently place war fighters in extremely vulnerable and dangerous situations. ***FY 2012 Accomplishments:*** 1) Highly Dexterous Manipulators for Explosive Ordnance Disposal Robots - Development and completed integration of Haptic feedback - System integration (arm, end effector interface and end effector) and system testing - Dexterous hardware support			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Office of Secretary Of Defense		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604709D8Z: *Joint Robotics EMD*	PROJECT 609: *Joint Robotics EMD*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Make improvements to autonomous system and the OCU based on lessons learned during LTA 1 and LOE 1 - Conduct LTA 2. - Perform a four week LOE for Marines to assess the net military utility and determine the poetential for deploying for an Extended Evaluation.			
Title: Mission/Platform Specific ***Description:*** Development of a technology to address the requirements of a particular mission or to be integrated with a specific platform. ***FY 2012 Accomplishments:*** 1) Cargo Unmanned Ground Vehicle - Finalized system build for second MTVR as UGV - Conducted second Limited User Assessment - Conducted Limited Objective Experiment for Logistics Mission	0.000	0.000	0.000
Title: Navigation ***Description:*** Development of reliable motion planning, path planning, obstacle detection/obstacle avoidance, characterization, and decision analysis capabilities based on the perceived environment and specific missions outlined for the robot. ***FY 2012 Accomplishments:*** 1) Collision Prediction Utilizing Traversability - Advanced module development and hardware upgraded - Phase 2 validation and tests concluded - Technology demonstration and End User Support	0.407	0.000	0.000
Title: Perception ***Description:*** Development of post-processing software technologies (proprioceptive and/or exetroceptive) enhanced unmanned ground vehicle perception capabilities for navigation, manipulation, and general unmanned ground vehicle situational awareness in a wide range of environments and conditions. ***FY 2012 Accomplishments:*** 1) Long Range Obstacle Detection - Finalized sensor processing algorithm development - Finalized prototype system development - Completed system integration onto UGV platform	0.983	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2014 Office of Secretary Of Defense		DATE: April 2013
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Conducted performance verification testing - Conducted final demonstration - Compiled/delivered final report			
Accomplishments/Planned Programs Subtotals	2.705	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
• 0603709D8Z: *Joint Robotics Program*	10.932	0.000	0.000		0.000	0.000	0.000	0.000		Continuing	Continuing
• 0603711D8Z: *Joint Robotics Program/Autonomous Systems*	9.481	0.000	0.000		0.000	0.000	0.000	0.000		Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

1. Technologies were funded & developed were reviewed by Joint Capability Area focused working groups and the Joint Staff Functional Capabilities Boards to determine progress, transition plans, and relevance of each project.
2. Project plans were submitted, evaluated and analyzed by the Joint Robotics Ground Enterprise (JGRE) management and technical staff for risk and progress.
3. Project progress toward goals and milestones were assessed during mid-year and end-of-year reviews.
4. Technologies developed by the JGRE were tracked and documented using the DOD Technical Readiness Level (TRL) scale for developing TRL 3 or 4 technologies to TRL 6 and adhering to the integrated baselines with regard to cost and schedule.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2014 Office of Secretary Of Defense		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604709D8Z: *Joint Robotics EMD*	PROJECT 609: *Joint Robotics EMD*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Joint Robotics Programs	MIPR	Various:Various	-	2.705		0.000		-		-		-	Continuing	Continuing	
		Subtotal	0.000	2.705		0.000		0.000		0.000		0.000			

	All Prior Years	FY 2012		FY 2013		FY 2014 Base		FY 2014 OCO		FY 2014 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	2.705		0.000		0.000		0.000		0.000			

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2014 Office of Secretary Of Defense		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604709D8Z: *Joint Robotics EMD*	PROJECT 609: *Joint Robotics EMD*

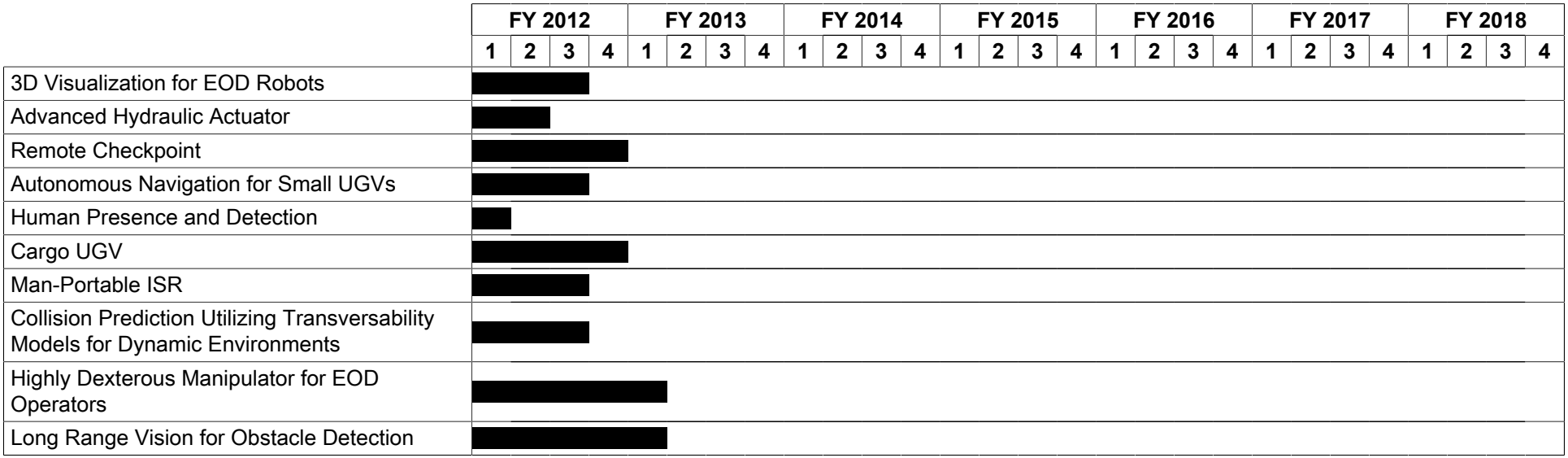

Exhibit R-4A, RDT&E Schedule Details: PB 2014 Office of Secretary Of Defense		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604709D8Z: *Joint Robotics EMD*	PROJECT 609: *Joint Robotics EMD*

Schedule Details

	Start		End	
Events	Quarter	Year	Quarter	Year
3D Visualization for EOD Robots	1	2012	3	2012
Advanced Hydraulic Actuator	1	2012	2	2012
Remote Checkpoint	1	2012	4	2012
Autonomous Navigation for Small UGVs	1	2012	3	2012
Human Presence and Detection	1	2012	1	2012
Cargo UGV	1	2012	4	2012
Man-Portable ISR	1	2012	3	2012
Collision Prediction Utilizing Transversability Models for Dynamic Environments	1	2012	3	2012
Highly Dexterous Manipulator for EOD Operators	1	2012	1	2013
Long Range Vision for Obstacle Detection	1	2012	1	2013