

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

May 2009

BUDGET ACTIVITY	PE NUMBER AND TITLE				
7 - Operational system development	0203735A - Combat Vehicle Improvement Programs				
COST (In Thousands)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	42809	143041	190301	Continuing	Continuing
330 ABRAMS TANK IMPROVE PROG	29130	36974	101743	Continuing	Continuing
371 BRADLEY BASE SUSTAIN	13679	106067	88558	Continuing	Continuing

A. Mission Description and Budget Item Justification: This Program Element (PE) corrects vehicle deficiencies identified in Army operations; continues technical system upgrades to include the integration of applicable Future Combat Systems technologies on ground systems; addresses needed evolutionary enhancements to tracked combat vehicles; and, develops technology improvements which have application to or insertion opportunities across multiple Ground Combat Systems vehicles. This PE provides combat effectiveness and Operating and Support (O&S) cost reduction enhancements for the Abrams tanks and Bradley Fighting Vehicles through a series of product improvements.

This project funds improvements to the Abrams Main Battle Tank (M1 series) and the Abrams Family of Vehicles (FOV). The Abrams mission is to provide necessary firepower, mobility, and survivability to overmatch all current and emerging enemy threats in achieving decisive dominant maneuver. The M1A2 SEP (current production model) refers to a System Enhancement Package, which upgraded the M1A2's computer systems and its night vision capabilities. Post SEP development efforts are focusing on improvements yielding significant life cycle cost reductions, survivability enhancements and integration of Future Combat Systems (FCS) technologies. M1A2 SEP has virtually reached the upper limits for space, weight, and power (SWaP). Future enhancements may require trade-offs in capabilities or re-architecting existing systems in order to add new capabilities. This could include items such as Survivability Enhancements, Power Management, Interoperability/networking capabilities and lethality. The Abrams tank is expected to be in service through 2045. The Abrams tank must embark on a modernization effort in order to remain relevant, maintain threat overmatch capability, and be interoperable with Future Combat Systems FCS on the battlefield. The objective is to maintain Survivability, Combat Overmatch and reduce Operational and Support (O&S) costs.

The Bradley Fighting Vehicle System (BFVS) improvements will provide the Heavy Brigade Combat Team (HBCT) with an improved capability to effectively fight in current and future environments. The BFVS improvements will return the A3 to the existing Operational Requirement Document and maintain combat over match through a combination of enhanced survivability, mobility and situational awareness subsystems. Improved survivability will leverage and build on lessons learned from Operation Iraqi Freedom to ensure protection against current and future threats in both asymmetric and full spectrum warfare. This provides the Bradley fleet the capability to complement the Abrams Tank in the HBCT. This also provides the HBCT commander with the necessary capabilities to employ the Bradley and Abrams in a combined arms approach as well as appropriate mounted and dismounted schemes of maneuver on current and future battlefields.

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BUDGET ACTIVITY	PE NUMBER AND TITLE		
7 - Operational system development	0203735A - Combat Vehicle Improvement Programs		
<u>B. Program Change Summary</u>	FY 2008	FY 2009	FY 2010
Previous President's Budget (FY 2009)	41192	141114	227194
Current BES/President's Budget (FY 2010)	42809	143041	190301
Total Adjustments	1617	1927	-36893
Congressional Program Reductions		-475	-3099
Congressional Rescissions			
Congressional Increases		2400	
Reprogrammings	2770	2	
SBIR/STTR Transfer	-1153		
Adjustments to Budget Years			-114794

Change Summary Explanation: Funding - FY 2010: Funds realigned to higher priority Army programs.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

May 2009

BUDGET ACTIVITY 7 - Operational system development		PE NUMBER AND TITLE 0203735A - Combat Vehicle Improvement Programs			PROJECT 330
COST (In Thousands)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	Cost to Complete	Total Cost
330 ABRAMS TANK IMPROVE PROG	29130	36974	101743	Continuing	Continuing

A. Mission Description and Budget Item Justification: This project funds improvements to the Abrams Main Battle Tank (M1 series) and the Abrams Family of Vehicles. The M1A2 SEP (Current Production Model) refers to a System Enhancement Package incorporated on the tank in 1998, which upgraded the M1A2's computer systems and night vision capabilities. Since that time, the M1A2 SEP has virtually reached its upper limits in space, weight and power. The Abrams Tank is planned to be in service beyond 2045 and will be modernized in accordance with a revised capabilities document to: (1) posture the tank infrastructure to enable incremental growth as a hedge against other risks and contingencies, (2) maintain threat overmatch to deter aggression, project power and protect US interests and allies around the globe - especially with regard to the lessons of counterinsurgency learned during tanks successful campaigns during Operation Iraqi freedom, and (3) leverage the mature and relevant technology enhancements from Future Combat System (spin-outs) to enable interoperability with the Army's networked Future Combat System

<u>Accomplishments/Planned Program:</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>
Systems Engineering/project management, to include requirements decomposition & flow down, trade studies, modeling & simulation, risk management			22500
Vehicle Architecture & Software, to include architecture synthesis and concepting, vetronics and software subsystem definition, power distribution architecture definition, specification development, Net-Centric and IA compliance activities			17043
Lethality Systems, to include cannon integration & characterization, fire control enhancements, future munitions integration, sensor development and integration, specification development			13200
Survivability Systems, to include armor modeling and analysis, system design and integration, hit avoidance and signature management analysis, specification development			9200
Mobility Systems, to include fuel efficiency improvement analysis, reliability/maintainability analysis, track & suspension design, specification development			12700
Auxiliary Systems, to include Auxiliary Power Unit development, Nuclear/ Biological/Chemical detection & protection technology investigation, specification development			12000
Battle Command/Communication Integration			3000
Mobility, Survivability, Vetronics and Software Integration			2500
Improved Lethality (Sensor Integration, Advanced Munitions, Cannon Integration).		1000	5100
Government Engineering Support		1310	4500
Improved Situational Awareness/Supportability/Survivability (e.g. Driver's Rear Facing Camera, 360 Situational Awareness (SA), Active Protection System (APS), Environmental Systems (TMS/NBC), Improved Diagnostics and Embedded Training).	10376	6020	
Power Train Improvement & Integration Optimization Program (e.g., Total Integrated Engine Revitalization (TIGER), Transmission,	1500		

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

May 2009

BUDGET ACTIVITY 7 - Operational system development	PE NUMBER AND TITLE 0203735A - Combat Vehicle Improvement Programs	PROJECT 330
Common Controller, Auxilliary power Unit (APU), Common Power Management		
Advanced Technology Assessments and Insertion (System Engineering/ Electronic Architecture/Battle Command/Communications)	8015	22276
Test and Evaluation	999	3000
Transmission Improvement Program (e.g.Electronic Controls for the Abrams X1100 Transmission)	3840	
Component Optimization for Ground Systems	1600	
GCS Open Architecture Electronic Enhancements (Engineering analysis and investigation in advanced electronic architecture technology opportunities for ground combat systems modernization.	2800	2400
Small Business Innovative Research/Small Business Technology Transfer Programs (SBIR/STTR)		968
Total	29130	36974

<u>B. Other Program Funding Summary</u>	FY 2008	FY 2009	FY 2010	To Compl	Total Cost
Abrams Upgrade Program (GA0750)	1238672	580543	185611		2004826
Abrams Vehicle Modification (GA0700)	1123087	766462	183829		2073378
Items Less Than \$5.0M (TCV-WTCV) (GL3100)		1595			1595
M1A2 Training Device (GB1300)		2991			2991

Comment: FY2009 Congressional increase of \$2.400M was placed in wrong project. Should be in project 371, same PE.

C. Acquisition Strategy Contractor selection for FY2010 and beyond pending contractor award.

ARMY RDT&E COST ANALYSIS (R3)

May 2009

BUDGET ACTIVITY			PE NUMBER AND TITLE								PROJECT	
7 - Operational system development			0203735A - Combat Vehicle Improvement Programs								330	
I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering/project management	CPFF	TBD						22500	2Q		22500	
Vehicle Architecture & Software	CPFF	TBD						17043	2Q		17043	
Lethality Systems	CPFF	TBD						13200	2Q		13200	
Survivability Systems	CPFF	TBD						9200	2Q		9200	
Mobility Systems	CPFF	TBD						12700	2Q		12700	
Auxiliary Systems	CPFF	TBD						12000	2Q		12000	
Cannon Integration	MIPR	ARDEC						4600	2Q		4600	
Sensor Integration	MIPR	CECOM-NVESD						500	2Q		500	
Battle Command/Communication Integration	MIPR	CECOM/PEO C3T						3000	2Q		3000	
Mobility/Survivability/Vetronics/Software Integration	MIPR	TARDEC						2500	2Q		2500	
Common Power Management	TBD			1500	2Q						1500	
Improved Situational Awareness/Supportability/Survivability	CPIF	General Dynamics, Sterling Heights, MI	18500	10376	2Q	6020	2Q				34896	
Improved Lethality	MIPR	PM, MAS	1430			1968					3398	
Advance Technology Insertion/Systems Engineering, Electronic Architecture, Battle Command/Comms	CPIF	General Dynamics, Sterling Heights, MI/To Be Determined	12020	8015	2Q	22276	2Q				42311	
Transmission Improvement Program		Allison Transmission, Indianapolis , IN		3840	2Q						3840	
Component Optimization for Ground Systems		Various		1600	3Q						1600	
Ground Combat Systems (GCS) Open Architecture Electronic Enhancements		Curtis Wright Roseland, NJ		2800	3Q	2400					5200	

ARMY RDT&E COST ANALYSIS (R3)

May 2009

BUDGET ACTIVITY				PE NUMBER AND TITLE							PROJECT	
7 - Operational system development				0203735A - Combat Vehicle Improvement Programs							330	
Subtotal:				31950	28131		32664		97243		189988	
II. Support Costs	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	MIPR	Various	5068			1310	1Q	4500	2Q		10878	
Subtotal:			5068			1310		4500			10878	
III. Test And Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Advance Technology Preparation and Testing	MIPR	Aberdeen Proving Ground, MD; Yuma Proving Ground, AZ; White Sands Missile Range, NM	7000	999	2-4Q	3000	2-4Q				10999	
Subtotal:			7000	999		3000					10999	
IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal:												
Project Total Cost:			44018	29130		36974		101743			211865	

Schedule Profile (R4 Exhibit)

May 2009

Event Name	FY 08				FY 09				FY 10				FY 11				FY 12				FY 13				FY 14				FY 15																																																																			
	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	1	2	3	4																																																																
	(1) Complete Draft Vehicle Concept																																																																																															
(2) Material Development Decision																																																																																																
(3) Milestone A																																																																																																
(4) System Requirements Review																																																																																																
(5) System Functional Review																																																																																																
Trade Studies and Analysis																																																																																																
(6) Preliminary Design Review																																																																																																
(7) Milestone B																																																																																																
(8) Critical Design Review (CDR)																																																																																																
Prototype Vehicle Build																																																																																																
Development Test																																																																																																
(9) Milestone C																																																																																																
Low Rate Initial Production																																																																																																

Schedule Detail (R4a Exhibit)

May 2009

BUDGET ACTIVITY		PE NUMBER AND TITLE						PROJECT	
7 - Operational system development		0203735A - Combat Vehicle Improvement Programs						330	
<u>Schedule Detail</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	
Complete Draft Vehicle Concept		3Q							
Material Development Decision		4Q							
Milestone A		4Q							
System Requirements Review			1Q						
System Functional Review			2Q						
Trade Studies and Analysis		1Q - 4Q	1Q - 4Q	1Q					
Preliminary Design Review		3Q							
Milestone B				1Q					
Critical Design Review (CDR)				2Q					
Prototype Vehicle Build				1Q - 4Q	1Q - 2Q				
Development Test					3Q - 4Q	1Q - 4Q			
Milestone C							1Q		
Low Rate Initial Production							1Q - 4Q	1Q - 4Q	
Full Rate Production Decision									

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

May 2009

BUDGET ACTIVITY 7 - Operational system development		PE NUMBER AND TITLE 0203735A - Combat Vehicle Improvement Programs			PROJECT 371
COST (In Thousands)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	Cost to Complete	Total Cost
371 BRADLEY BASE SUSTAIN	13679	106067	88558	Continuing	Continuing

A. Mission Description and Budget Item Justification: The Bradley Fighting Vehicle System (BFVS) improvements will provide the Heavy Brigade Combat Team (HBCT) with an improved capability to effectively fight in current and future environments. The BFVS improvements will return the A3 to the Operational Requirement Document and maintain combat over match through a combination of enhanced survivability, mobility and situational awareness subsystems. Improved survivability will leverage and build on lessons learned from Operation Iraqi Freedom to ensure protection against current and future threats in both asymmetric and full spectrum warfare. This provides the Bradley fleet the capability to complement the Abrams Tank in the HBCT. This also provides the HBCT commander with the necessary capabilities to employ the Bradley and Abrams in a combined arms approach as well as appropriate mounted and dismounted schemes of maneuver on current and future battlefields.

<u>Accomplishments/Planned Program:</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>
Electronic System Modeling, electronics modeling framework capable of executing a system model of the entire Bradley electronics.	1408		
Vehicle Health Management System Development	4000		
Bradley A3 Block 2	8271	88221	68658
Support Costs		14808	19900
Small Business Innovative Research/Small Business Technology Transfer Programs (SBIR/STTR)		3038	
Total	13679	106067	88558

<u>B. Other Program Funding Summary</u>	FY 2008	FY 2009	FY 2010	To Compl	Total Cost
G80718 Bradley Program	1677885	394800			2072685
GZ2400 Bradley Program (MOD)	181893	852005	769956		1803854
GZ2500 Bradley Training Devices (MOD)	4652	10954			15606

Comment:

C. Acquisition Strategy The Acquisition Strategy for the Bradley A3 Block 2 Program plans to award a contract for research, development and system integration of the Bradley Fighting Vehicle. The type of contract awarded would be a Cost Reimbursement/Cost Plus Incentive Fee.

ARMY RDT&E COST ANALYSIS (R3)

May 2009

BUDGET ACTIVITY			PE NUMBER AND TITLE							PROJECT		
7 - Operational system development			0203735A - Combat Vehicle Improvement Programs							371		
I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Bradley A3 Block 2 Program	SS/CPIF	To be determined				91259	3Q	68658	2-3Q		159917	
Electronic System Modeling	SS/FFP	BAE, San Jose, CA		1408	2Q						1408	
Vehicle Health Management	SS/FFP	DRS TEM, Huntsville, AL		4000	2Q						4000	
Subtotal:				5408		91259		68658			165325	
II. Support Costs	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
PMO	MIPR	PMO, Warren, MI			1Q	1858	1Q	10900	1Q		12758	
Contractor Engineering Support	SS/FFP	BAE, San Jose, CA		8271	2Q	10600	3Q	5000	2Q		23871	
Government Engineering Support	MIPR	Various sites			1Q	2350	1Q	4000	1Q		6350	
Subtotal:				8271		14808		19900			42979	
III. Test And Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal:												
IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	FY 2010 Cost	FY 2010 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal:												

ARMY RDT&E COST ANALYSIS (R3)

May 2009

BUDGET ACTIVITY

7 - Operational system development

PE NUMBER AND TITLE

0203735A - Combat Vehicle Improvement Programs

PROJECT

371

Project Total Cost:

13679

106067

88558

208304

Schedule Profile (R4 Exhibit)

May 2009

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT																														
7 - Operational system development	0203735A - Combat Vehicle Improvement Programs	371																														
Event Name	FY 08				FY 09				FY 10				FY 11				FY 12				FY 13				FY 14				FY 15			
	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	1	2	3	4
Bradley A3 Block 2 Program																																
(1) Complete Draft Tech Insertion Concept									▲ 1																							
(2) Material Development Decision									▲ 2																							
(3) Milestone A									▲ 3																							
(4) System Requirements Review									▲ 4																							
(5) System Functional Review									▲ 5																							
Trade Studies																																

Schedule Detail (R4a Exhibit)

May 2009

BUDGET ACTIVITY 7 - Operational system development	PE NUMBER AND TITLE 0203735A - Combat Vehicle Improvement Programs	PROJECT 371
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<u>Schedule Detail</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>
Bradley A3 Block 2 Program		3Q - 4Q	1Q - 4Q	1Q - 4Q				
Complete Draft Tech Insertion Concept			1Q					
Material Development Decision			2Q					
Milestone A			3Q					
System Requirements Review			4Q					
System Functional Review				1Q				
Trade Studies		1Q - 4Q	1Q - 4Q					