

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2008

BUDGET ACTIVITY		PE NUMBER AND TITLE							
<b>7 - Operational system development</b>		<b>0203735A - Combat Vehicle Improvement Programs</b>							
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	13873	41192	141114	227194	344944	217001	171890	135000	1292208
330 ABRAMS TANK IMPROVE PROG	12130	35628	34696	49645	79532	72208	34581	135000	453420
371 BRADLEY BASE SUSTAIN	1743	5564	106418	177549	265412	144793	137309		838788

**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 spin out of 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 spiral technologies. M1A2 SEP has virtually reached the upper limits for space, weight, and power. Future enhancements may require trade-offs in capabilities or re-architecting existing systems in order to add new capabilities. Spiral Development will leverage experience in an urban environment and Future Combat Systems (FCS) technologies to integrate them into current systems. 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 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) will provide the Heavy Brigade Combat Team (HBCT) with an improved capability to effectively fight in current and future environments. The BFVS redesign will meet the new Capability Development Document requirements which provide more combat over match through a combination of enhanced survivability, lethality, mobility and situational awareness subsystems. Improved survivability will leverage and build on lessons learned from Operation Iraqi Freedom to ensure 360 degree protection to current and future threats in both asymmetric and full spectrum warfare. Improved sensors and optics will enable the detection and identification of targets faster and at greater distances. Improved lethality will complement sensors and optics to enable the crew to engage targets faster with more precision at greater ranges. This provides the Bradley fleet the capability to complement the Abrams Tank in the HBCT and Future Combat Systems mission profiles. 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		
<b>7 - Operational system development</b>	<b>0203735A - Combat Vehicle Improvement Programs</b>		
<b><u>B. Program Change Summary</u></b>	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	14380	27615	6020
Current BES/President's Budget (FY 2009)	13873	41192	141114
Total Adjustments	-507	13577	135094
Congressional Program Reductions		-263	
Congressional Rescissions			
Congressional Increases		13840	
Reprogrammings	-102		
SBIR/STTR Transfer	-405		
Adjustments to Budget Years			135094
Change Summary Explanation: Funding - FY 2009: Funding increase in support of the Abrams Tank Improvement Program (+28,900) and the Bradley Base Sustain Program (+106,194).			

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

**February 2008**

<b>BUDGET ACTIVITY</b> <b>7 - Operational system development</b>			<b>PE NUMBER AND TITLE</b> <b>0203735A - Combat Vehicle Improvement Programs</b>					<b>PROJECT</b> <b>330</b>		
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total Cost	
330 ABRAMS TANK IMPROVE PROG	12130	35628	34696	49645	79532	72208	34581	135000	453420	

**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 (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 spiral technologies. M1A2 SEP has virtually reached the upper limits for space, weight, and power. Future enhancements may require trade-offs in capabilities or re-architecting existing systems in order to add new capabilities. Spiral Development will leverage experience in an urban environment and Future Combat Systems (FCS) technologies to integrate them into current systems. 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 FCS on the battlefield. The objective is to maintain Survivability, Combat Overmatch and reduce Operational and Support (O&S) costs.

<b><u>Accomplishments/Planned Program:</u></b>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Power Train Improvement & Integration Optimization Program (e.g., Total Integrated Engine Revitalization (TIGER), Transmission, Common Controller, Auxiliary Power Unit (APU), Common Power Management)		1500	
Improved Situational Awareness/Supportability/Survivability (e.g. Driver's Rear Facing Camera, 360 Situational Awareness (SA), Active Protection System (APS), OIF Survivability, Environmental Systems (TMS/NBC), Improved Diagnostics and Embedded Training).	7400	11516	6020
Improved Lethality (Profile Verification Program (PVP), Advanced Munitions Integration)	400	4100	1000
Advanced Technology Assessments and Insertion	3330	8015	24676
Testing	1000	1300	3000
Transmission Improvement Program (e.g.Electronic Controls for the Abrams X1100 Transmission)		3800	
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	
Small Business Innovative Research/Small Business Technology Transfer Programs (SBIR/STTR)		997	
<b>Total</b>	<b>12130</b>	<b>35628</b>	<b>34696</b>

<b><u>B. Other Program Funding Summary</u></b>	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	To Compl	Total Cost
Abrams Upgrade Program (GA0750)	596351	225000	351179	351100	351430	332409	13308		2220777

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

**February 2008**

BUDGET ACTIVITY	PE NUMBER AND TITLE							PROJECT	
<b>7 - Operational system development</b>	<b>0203735A - Combat Vehicle Improvement Programs</b>							<b>330</b>	
Abrams Vehicle Modification (GA0700)	828501	784997	341569	253231	334989	261041	25673	1993900	4823901
System Enhancement Pgm (GA0730)	1153637								1153637
M1A2 Tank Training Devices (GB1302)	809								809
Training Device Mod (GA5208)	895								4599
Initial Spares (GE0161)									3295

Comment:

**C. Acquisition Strategy** General Dynamics Land Systems Division (GDLS) is the prime contractor for the vehicle integration effort. General Dynamics is also a part of the Boeing and Raytheon Team contracted for the Active Protection System (APS).

# ARMY RDT&E COST ANALYSIS (R3)

February 2008

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 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Power Train Improvement & Integration Optimization Program (TIGER)	C-CPAF	Honeywell International Phoenix, AZ	24427								24427	191659
Common Power Management	TBD					1500	2Q				1500	
Forward Looking InfraRed (FLIR) integration into tank	SS-CPFF	General Dynamics Sterling Heights, MI	7000								7000	
Integration of improved engine into vehicle	SSCE	General Dynamics, Sterling Heights, MI	11459								11458	84786
Abrams Suspension Improvement Program (Track)	TBD	United Defense Limited Partnership, Anniston, AL	1933								1933	
Improved Situational Awareness/Supportability/Survivability	CPFF	General Dynamics, Sterling Heights, MI	10100	7400	2Q	11516	2Q	6020	2Q		35036	
Improved Lethality	MIPR	PM, MAS	830	400	2Q	4100	2Q	1000			6130	
Advance Technology Insertion	CPFF	General Dynamics, Sterling Heights, MI	4345	3330	2Q	8015	2Q	24676	2Q	189966	230332	
FLIR	FFP	Raytheon Company, Mc Kinney, TX	7521								7521	
DRS-Test & Energy Management	FP	Huntsville, AL	542								542	
Abrams M1A1 Vehicle Prognostics Development			10012								10012	
DRS - Tactical Systems		Palm Bay, FA	35								35	
Transmission Improvement Program		Allison Transmission, Indianapolis , IN				3800	2Q				3800	
Component Optimization for Ground Systems		Various				1600	3Q				1600	
GCS Open Architecture Electronic Enhancements		Curtiss Wright Roseland, NJ				2800	3Q				2800	
Small Business Innovative						997					997	

# ARMY RDT&E COST ANALYSIS (R3)

February 2008

BUDGET ACTIVITY				PE NUMBER AND TITLE							PROJECT		
<b>7 - Operational system development</b>				<b>0203735A - Combat Vehicle Improvement Programs</b>							<b>330</b>		
Research/Small Business Technology Transfer Program													
Subtotal:				78204	11130		34328		31696		189966	345123	276445
II. Support Costs	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
Engineering Support	MIPR	Various	3804								3804		
Subtotal:			3804								3804		
III. Test And Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
M1A1-FLIR	MIPR	Aberdeen Proving Ground, MD	1300								1300		
Track testing	MIPR	Yuma Proving Ground, AZ	1725								1725		
Improved Situational Awareness/Supportability/Survivability	MIPR	Aberdeen Proving Ground, MD	166								166		
Various sites	MIPR	Aberdeen Proving Ground, MD; Yuma Proving Ground, AZ; White Sands Missile Range, NM	3000	1000	2-4Q	1300	2-4Q				5300		
Advance Technology Insertion Testing		Aberdeen Proving Ground, MD; Yuma Proving Ground, AZ; White Sands Missile Range, NM						3000	2-4Q	46000	49000		
Subtotal:			6191	1000		1300		3000		46000	57491		

# ARMY RDT&E COST ANALYSIS (R3)

February 2008

BUDGET ACTIVITY <b>7 - Operational system development</b>	PE NUMBER AND TITLE <b>0203735A - Combat Vehicle Improvement Programs</b>	PROJECT <b>330</b>
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IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal:												
<b>Project Total Cost:</b>			<b>88199</b>	<b>12130</b>		<b>35628</b>		<b>34696</b>		<b>235966</b>	<b>406418</b>	<b>276445</b>

# Schedule Profile (R4 Exhibit)

February 2008

BUDGET ACTIVITY  
**7 - Operational system development**

PE NUMBER AND TITLE  
**0203735A - Combat Vehicle Improvement Programs**

PROJECT  
**330**

Event Name	FY 07				FY 08				FY 09				FY 10				FY 11				FY 12				FY 13			
	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
Common Power Management																												
Improved Situational Awareness																												
Active Protection System (APS)																												
Improved Lethality - Future Ammo Integration																												
Advanced Technology Assessments and Insertion																												
(1) SPINOUT 1 Safety Release, (2) SPIN OUT 1 Exercise									▲ 1 2																			
Requirements Decomposition																												
Initial Modeling & Simulation																												
Trade Studies																												
(3) Milestone B, (4) CDR																	▲ 3				▲ 4							
Prototype Vehicle Build																												
Development Test																												

**Schedule Detail (R4a Exhibit)**

**February 2008**

BUDGET ACTIVITY <b>7 - Operational system development</b>		PE NUMBER AND TITLE <b>0203735A - Combat Vehicle Improvement Programs</b>					PROJECT <b>330</b>	
<u>Schedule Detail</u>	<u>FY 2007</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>	
Common Power Management		2Q - 4Q	1Q					
Improved Situational Awareness								
Active Protection System (APS)		2Q - 4Q	1Q - 4Q	1Q				
Improved Lethality - Future Ammo Integration		2Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	
Advanced Technology Assessments and Insertion								
SPINOUT 1 Safety Release		1Q						
SPIN OUT 1 Exercise		1Q - 4Q						
Requirements Decomposition	3Q - 4Q	1Q - 3Q						
Initial Modeling & Simulation	2Q - 4Q	1Q - 4Q	1Q - 4Q					
Trade Studies	2Q - 4Q	1Q - 4Q	1Q - 4Q					
Milestone B				1Q				
CDR					2Q			
Prototype Vehicle Build					3Q - 4Q	1Q - 4Q	1Q - 2Q	
Development Test						1Q - 4Q	1Q - 4Q	

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

**February 2008**

<b>BUDGET ACTIVITY</b> <b>7 - Operational system development</b>		<b>PE NUMBER AND TITLE</b> <b>0203735A - Combat Vehicle Improvement Programs</b>						<b>PROJECT</b> <b>371</b>	
COST (In Thousands)	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total Cost
371 BRADLEY BASE SUSTAIN	1743	5564	106418	177549	265412	144793	137309		838788

**A. Mission Description and Budget Item Justification:** The Bradley Fighting Vehicle System (BFVS) will provide the Heavy Brigade Combat Team (HBCT) with an improved capability to effectively fight in current and future environments. The BFVS redesign will meet the new Capability Development Document requirements which provide more combat over match through a combination of enhanced survivability, lethality, mobility and situational awareness subsystems. Improved survivability will leverage and build on lessons learned from Operation Iraqi Freedom to ensure 360 degree protection to current and future threats in both asymmetric and full spectrum warfare. Improved sensors and optics will enable the detection and identification of targets faster and at greater distances. Improved lethality will complement sensors and optics to enable the crew to engage targets faster with more precision at greater ranges. This provides the Bradley fleet the capability to complement the Abrams Tank in the HBCT and Future Combat Systems mission profiles. 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.

<b>Accomplishments/Planned Program:</b>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Electronic System Modeling, electronics modeling framework capable of executing a system model of the entire Bradley electronics.	1743	1408	
Vehicle Health Management System Development		4000	
Bradley A3 Version 2 - Improved capability, increased protection, survivability, lethality, mobility and improved situational awareness			101414
Program Management Support			5004
Small Business Innovative Research/Small Business Technology Transfer Programs (SBIR/STTR)		156	
<b>Total</b>	<b>1743</b>	<b>5564</b>	<b>106418</b>

<b>B. Other Program Funding Summary</b>	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	To Compl	Total Cost
G80718 Bradley Program	2080047	839466	171989	144813	162470	7426	8120	Continuing	Continuing
GZ2400 Bradley Program (MOD)	201736	85357	311925	323790	393734	351581	12607	Continuing	Continuing
GZ2500 Bradley Training Devices (MOD)	4363	4652	4386					Continuing	Continuing

Comment:

**C. Acquisition Strategy** The Acquisition Strategy for the Bradley A3 Version 2 Program plans to award a Sole Source Contract to BAE Systems, the Original Equipment

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2008

BUDGET ACTIVITY

**7 - Operational system development**

PE NUMBER AND TITLE

**0203735A - Combat Vehicle Improvement Programs**

PROJECT

**371**

Manufacturer (OEM) for the Bradley Fighting Vehicle 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. The award date anticipated is February 2009.

# ARMY RDT&E COST ANALYSIS (R3)

February 2008

BUDGET ACTIVITY			PE NUMBER AND TITLE							PROJECT		
<b>7 - Operational system development</b>			<b>0203735A - Combat Vehicle Improvement Programs</b>							<b>371</b>		
I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Bradley A3 Version 2	SS/CPIF	BAE, San Jose, CA	64919					101414	2Q	636684	803017	
Electronic System Modeling	CPIF	BAE, San Jose, CA		1743	2Q	1408	2Q				3151	
Vehicle Health Management	CPIF	BAE, San Jose, CA				4000	2Q				4000	
Small Business Innovative Research/Small Business Technology Transfer Program						156					156	
Subtotal:			64919	1743		5564		101414		636684	810324	
II. Support Costs	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
PMO	MIPR	PMO, Warren, MI	8478					5004	1Q	46200	51204	
Subtotal:			8478					5004		46200	51204	
III. Test And Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Bradley A3 Version 2	MIPR	Army Test Center (Aberdeen and Yuma test sites)								47200	47200	
Subtotal:										47200	47200	
IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract

# ARMY RDT&E COST ANALYSIS (R3)

February 2008

BUDGET ACTIVITY <b>7 - Operational system development</b>			PE NUMBER AND TITLE <b>0203735A - Combat Vehicle Improvement Programs</b>						PROJECT <b>371</b>		
	Type				Date		Date		Date		Contract
Subtotal:											

<b>Project Total Cost:</b>			<b>73397</b>	<b>1743</b>		<b>5564</b>		<b>106418</b>		<b>730084</b>	<b>908728</b>
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# Schedule Profile (R4 Exhibit)

February 2008

BUDGET ACTIVITY  
**7 - Operational system development**

PE NUMBER AND TITLE  
**0203735A - Combat Vehicle Improvement Programs**

PROJECT  
**371**

Event Name	FY 07				FY 08				FY 09				FY 10				FY 11				FY 12				FY 13			
	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 Version 2	[Redacted]																											
Electrical Power Upgrade	[Redacted]																											
Common Modular Power System	[Redacted]																											
Engineering Vehicle Mission Equipment Package	[Redacted]																											
Active Protective System	[Redacted]																											

# Schedule Detail (R4a Exhibit)

February 2008

BUDGET ACTIVITY		PE NUMBER AND TITLE					PROJECT	
<b>7 - Operational system development</b>		<b>0203735A - Combat Vehicle Improvement Programs</b>					<b>371</b>	
<u>Schedule Detail</u>	<u>FY 2007</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>	
Bradley A3 Version 2			2Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	
Electrical Power Upgrade			2Q - 4Q	1Q				
Common Modular Power System			2Q - 4Q	1Q - 4Q	1Q - 4Q	1Q		
Engineering Vehicle Mission Equipment Package				2Q - 4Q	1Q			
Active Protective System			2Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	