

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

February 2008

BUDGET ACTIVITY		PE NUMBER AND TITLE							
<b>4 - Advanced Component Development and Prototypes</b>		<b>0603639A - Tank and Medium Caliber Ammunition</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	3476	47474	45866	71451	56296	106353	50757	Continuing	Continuing
656 Mounted Combat System (MCS) Ammunition	1259	44294	45866	71451	56296	106353	50757	Continuing	Continuing
694 MEDIUM CALIBER AMMUNITION	2217	3180							5497

**A. Mission Description and Budget Item Justification:** The Tank and Medium-caliber Ammunition (TMA) Program Element (PE) encompasses a comprehensive program to develop, rapidly transition to production, and field advanced tank, medium caliber, and other munitions. These programs will ensure continued battlefield overmatch and lethality of U.S. maneuver forces despite worldwide development and proliferation of enhanced armored vehicle protection technologies. To achieve this, TMA will identify and develop promising technologies through competitive development and streamlined acquisition procedures. All ammunition development funds within this PE are managed to facilitate transitions between phases, avoid administrative delays, and focus resources on the most promising areas.

FY 2009 supports the continuation of System Development and Demonstration (SDD) for the Mid Range Munition (MRM) for the FCS MCS. The MRM program has matured its technology and capability during Science and Technology phase, and has successfully completed the autonomous (April 2004) and designate (August 2006) guide-to-hit demonstrations in preparation for SDD. MRM is a significant contributor to the lethality and survivability of the MCS and Future Force. MRM will provide lethality capability at Beyond Line of Sight (BLOS) ranges (2-12km), which will expand the Maneuver Task Force Commander's battle space. MRM is the only Gun-Launched, Beyond Line of Sight (BLOS) solution that supports the FCS Brigade Combat Team (BCT). Initiation of MRM SDD in FY 2008 is critical to force effectiveness reinforcing the BLOS capability by increasing FCS Lethality and Survivability. MRM supports and allows the FCS to meet KPP#3, Networked Lethality.

Starting in FY 2012, funding supports MRM and SDD initiation of the Advanced Kinetic Energy (AKE) cartridge. The AKE will provide the MCS with a unguided direct fire Line of Sight (LOS), fast response lethality to rapidly destroy threat targets in the close in fight from 0km to 2km. AKE will allow the MCS to defeat current and future threat Main Battle Tanks (MBT) with Explosive Reactive Armor (ERA) and meet the FCS LOS requirement as specified in the FCS ORD.

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PE NUMBER AND TITLE

**4 - Advanced Component Development and Prototypes**

**0603639A - Tank and Medium Caliber Ammunition**

**B. Program Change Summary**

	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008/2009)	2572	44578	45733
Current BES/President's Budget (FY 2009)	3476	47474	45866
Total Adjustments	904	2896	133
Congressional Program Reductions		-304	
Congressional Rescissions			
Congressional Increases		3200	
Reprogrammings	976		
SBIR/STTR Transfer	-72		
Adjustments to Budget Years			133

FY 2008: Congressional increase of \$3.2M for High Explosive Airburst (HEAB) 25mm, Project 694.

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<b>BUDGET ACTIVITY</b> <b>4 - Advanced Component Development and Prototypes</b>		<b>PE NUMBER AND TITLE</b> <b>0603639A - Tank and Medium Caliber Ammunition</b>						<b>PROJECT</b> <b>656</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
656 Mounted Combat System (MCS) Ammunition	1259	44294	45866	71451	56296	106353	50757	Continuing	Continuing

**A. Mission Description and Budget Item Justification:** The Army's Future Combat System Brigade Combat Team (FCS BCT) is a joint system of systems consisting of a network and a combination of manned and unmanned systems that use an advanced network architecture to enable levels of joint connectivity, situational awareness and understanding, and synchronized operations previously unachievable. It is designed to interact with and enhance the Army's most valuable weapon - the Soldier. When fully operational, FCS will provide the Army and the joint force unprecedented capability to see the enemy, engage him on our terms, and defeat him on the 21st Century battlefield. The Army's first modernization effort in nearly four decades; FCS is the embodiment of the modular force, a modular system designed for "full spectrum" operations. It will network existing systems, systems already under development and future systems to be developed to meet the requirements of the Army's Future Force. It is adaptable to traditional warfare as well as complex, irregular warfare in various rural and urban terrains. It can also be adapted to civil support, such as disaster relief. FCS is the #1 priority acquisition program for the Army.

This project supports the development of ammunition for the Future Combat System (FCS) Mounted Combat System. The Mid Range Munition (MRM) is critical to FCS force effectiveness, reinforcing the Beyond Line of Sight (BLOS) capability, and allows FCS to meet Key Performance Parameter #3, Networked Lethality.

The MRM round is a precision-guided munition that provides the capability for the FCS BCT commander to both shape and set conditions in his battlespace to conduct decisive operations and destroy enemy forces by engaging moving and stationary targets throughout his area of operations. The MRM round will incorporate a seeker(s) that enables the munition to attack targets designated by the Mounted Combat System or another remote (manned/unmanned) sensor, or autonomously attack targets if designation is lost or not available.

MRM is a first generation fire and forget gun-launched munition that is being developed to provide the Mounted Combat System with a BLOS capability. MRM is a precision-guided munition that provides a moving or stationary Mounted Combat System the capability to engage and destroy moving and stationary enemy targets throughout his area of operations (2-12km (T) or 2-16km (O)) in a BLOS mode. MRM will have a seeker to enable it to engage designated targets or autonomously guide itself to and attack targets if designation is lost or not present.

There are three modes of operation when employing the MRM round: autonomous, designate, and designate only. The sensor/observer must decide which mode to use based on the factors of mission, enemy, troops, terrain, time, and civil considerations (METT-TC) and the commander's intent, in the Attack Guidance (AG) matrix. Autonomous shall be utilized when a sensor/observer does not want to give away his position, if a designator is not available or inoperative, or if intervisibility terrain lines prevent illumination of the target.

Prior to firing, integration of battlefield command and control information (range to target, laser designation code, etc) will be transmitted to the munition through a data link connecting the MRM to the Mounted Combat System fire control system. Once fired, no further command and control from the MCS is required. The round will guide itself to the target using on board sensors or possibly a laser reflection with a properly encoded pulse rate. The munition will employ state-of-the-art kill mechanisms to achieve the highest probability of kill possible against a variety of armored targets. The technologies that provide both guidance and lethality shall be all weather and countermeasure resistant.

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<b>BUDGET ACTIVITY</b>	<b>PE NUMBER AND TITLE</b>	<b>PROJECT</b>
<b>4 - Advanced Component Development and Prototypes</b>	<b>0603639A - Tank and Medium Caliber Ammunition</b>	<b>656</b>

Sensors for the Autonomous mode will also be enabled at a range that will reduce the probability of collateral damage.

FY 2009 supports the continuation of System Development and Demonstration (SDD) for the MRM. The MRM will provide FCS Mounted Combat System with a precision munition capable of hitting and killing all battlefield targets at BLOS ranges between 2-12km, increasing platform survivability and lethality, and expanding the Maneuver Task Force Commander's battle space. MRM supports FCS objectives of expanded battle space and multi-mission direct and indirect fire capability. MRM leverages state of the art sensor technologies to provide immediate, responsive fires to support Family of Vehicles or other scouts. MRM is the only demonstrated Gun-Launched precision, smart munition capable of meeting the BLOS requirements specified in the FCS Operational Requirements Document. MRM will allow the Mounted Combat System to fire and kill with precision on the move, at high value moving or stationary armor targets.

<u><b>Accomplishments/Planned Program:</b></u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Dual mode seeker integration (ARDEC, PM, Test Sites Contractor) MRM Chemical Energy	1259		
MRM SDD Engineering Activities. Down-select to 1 Contractor scheduled for 4QTR-FY07. SDD startup in October 2007 (FY2008).		16229	17155
Software-Seeker Integration		9347	10091
Prototype Manufacture (various components, subsystems, systems and assemblies, inspections)		7559	7597
Producibility		2019	3099
Initial Cartridge Integration Test		7812	
Follow-on Cartridge Integration Test			7924
Small Business Innovative Research/Small Business Technology Transfer Programs		1328	
<b>Total</b>	<b>1259</b>	<b>44294</b>	<b>45866</b>

<u><b>B. Other Program Funding Summary</b></u>	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	To Compl	Total Cost
SSN: E88103 - Cartridge, MCS, Mid Range Munition (MRM)					24634	47624	61762	2013223	2147243
0604660A FCS Manned Grd Vehicles & Common Grd Vehicle Components		592254	774257	785575	358641	214207	103230	Continuing	Continuing
0604661A FCS System of Systems Engr & Program Management		1497321	1413945	1874987	1916207	1290308	1034307	Continuing	Continuing
0604662A FCS Reconnaissance (UAV) Platforms		43388	34379	14296	9235	4556	1336	Continuing	Continuing
0604663A FCS Unmanned Ground Vehicles		90091	96918	64744	43601	26855	3580	Continuing	Continuing
0604664A FCS Unattended Ground Sensors		10929	12967	18968	16754			Continuing	Continuing
0604665A FCS Network Hardware & Software		647649	539145	334085	365287	290790	169526	Continuing	Continuing

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0604646A Non Line of Sight - Launch System	313981	253075	200099	40043	5957			Continuing	Continuing
0604647A Non Line of Sight - Cannon	108689	136929	89841	71396	43222	28775		Continuing	Continuing
0604666A FCS Spin Outs	27900	64385	64900	67021	51026	56287	14637	Continuing	Continuing
0603639A FCS MRM		44294	45866	71451	56296	106353	50757	Continuing	Continuing
0604715A STRICOM/NAWCTSD Support		378	388	398	406	415	426	Continuing	Continuing
WTCV G86100 FCS Core Program		80932	154583	148028	677820	2175327	5744649	Continuing	Continuing
WTCV G86200 FCS Spin Out Program		19987	176667	367962	550821	766274	944999	Continuing	Continuing
AMMO E88103					24634	47624	61762		134020
0604645 F52 UAV Recon & Sensors	41813							Continuing	Continuing
0604645 F53 UGV	104301							Continuing	Continuing
0604645 F54 UGS	10391							Continuing	Continuing
0604645 F55 SUSTAINMENT	104302							Continuing	Continuing
0604645 F57 MANNED GROUND VEHICLES	516217							Continuing	Continuing
0604645 F61 SoS Engineering and Program Management	2150508							Continuing	Continuing

Comment:

**C. Acquisition Strategy** The Mid Range Munition (MRM) Program completed the Technology Development phase. MRM achieved Design Requirements in both autonomous and designated firing modes, and transitioned (Milestone B) to Systems Development and Demonstration (SDD) at the end of FY 2007. There were two competing technical concepts by Raytheon Inc. and Alliant Tech Systems. A single contractor Raytheon with one design was selected based on a full and open competition in the first quarter of FY 2008. The MRM schedule coincides with the Mounted Combat System's development schedule, supporting the Future Combat System (FCS) Initial Operational Capability (IOC) milestone. The SDD effort will integrate MRM into the Mounted Combat System.

This strategy will deliver a proven, fully capable multi-mode munition that will meet the FCS MCS requirements and support the FCS IOC milestone.

# ARMY RDT&E COST ANALYSIS (R3)

February 2008

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<b>4 - Advanced Component Development and Prototypes</b>			<b>0603639A - Tank and Medium Caliber Ammunition</b>							<b>656</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
Raytheon	CPIF/AF	Tucson, AZ				35830	1Q	37483	2Q	171830	245143	245530
Raytheon	SS-CPFF	Tucson, AZ	8709	700	2Q						9409	9409
Electro-Radiation, Inc	SS-CPFF	Fairfield, NJ	4833								4833	4833
PM-MAS	MIPR	Picatinny Arsenal, NJ		30	2-4Q	1200	1-4Q	1293	1Q	2929	5452	5688
Miscellaneous	MIPR	Multiple	1120	307	1-4Q	1000	1Q	123	3Q		2550	1381
Alliant Tech Systems	SSCPFF	Clearwater, FL	3708								3708	3708
Subtotal:			18370	1037		38030		38899		174759	271095	270549
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
TACOM-ARDEC/Benet Labs	MIPR	Picatinny Arsenal, NJ	3795	132	1Q	4107	1Q	4495	1Q	10068	22597	22760
Subtotal:			3795	132		4107		4495		10068	22597	22760
Remarks: Not Applicable												
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
YPG, ATC	MIPR	Yuma AZ/APG, MD	1430			200	3Q	1124	1Q	9226	11980	12881
Army Research Lab	MIPR	Aberdeen PG, MD	1780	50	1Q	120	3Q	848	1Q	2400	5198	5908
Army Research Lab	MIPR	White Sands, NM				50	3Q	250	1Q	750	1050	1250
Redstone Arsenal	MIPR	Huntsville, AL	3400	15		50	3Q	250	1Q	750	4465	4650
Miscellaneous	MIPR	Multiple	1042								1042	1042
Subtotal:			7652	65		420		2472		13126	23735	25731

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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
MISCELLANEOUS	MIPR	Multiple	665	25	3Q	497	2Q				1187	956
SBIR/STTR						1240					1240	36
Subtotal:			665	25		1737					2427	992
<b>Project Total Cost:</b>			<b>30482</b>	<b>1259</b>		<b>44294</b>		<b>45866</b>		<b>197953</b>	<b>319854</b>	<b>320032</b>

# Schedule Profile (R4 Exhibit)

February 2008

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
	Dual Mode Demonstration MRM CE	Dual																										
GPS Anti-Jam Development																												
(1) Captive Flight Test MRM CE					1 Flight Test																							
SDD Source Selection					SDD Source Selection																							
(2) Follow On Guide-to-Hit Test					2 Guide-To-Hit Test																							
(3) Milestone B					3 MS B																							
System Development and Demonstration													System Development and Demonstration															
(4) Initial Cartridge Integration Test									4 Initial Integration Test																			
(5) Follow-on Cartridge Integration Test													5 Follow-On Integration Test															
(6) Design Readiness Review													6 DRR															
Production Prove-Out Test																	PPT											
(7) Milestone C Low Rate Initial Production																					7 MS C LRIP							
LRIP Production																					LRIP Production							
Limited User Test																					Limited User Test							

## Schedule Detail (R4a Exhibit)

February 2008

BUDGET ACTIVITY		PE NUMBER AND TITLE					PROJECT	
<b>4 - Advanced Component Development and Prototypes</b>		<b>0603639A - Tank and Medium Caliber Ammunition</b>					<b>656</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>	
Dual Mode Demonstration MRM CE	1Q - 3Q							
GPS Anti-Jam Development	1Q							
Semi-Active Laser (SAL) Testing MRM CE								
Captive Flight Test MRM CE	1Q							
SDD Source Selection	2Q - 4Q	1Q						
Release Request for Proposal	2Q							
Follow On Guide-to-Hit Test	3Q							
Milestone B	4Q							
System Development and Demonstration		1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 3Q	
Initial Cartridge Integration Test			1Q					
Follow-on Cartridge Integration Test				1Q				
Design Readiness Review				4Q				
Production Prove-Out Test						1Q - 4Q		
Milestone C Low Rate Initial Production						3Q		
LRIP Production						4Q	1Q - 4Q	
Limited User Test						2Q - 3Q		