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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2)									DATE February 1995	
BUDGET ACTIVITY 2 - Exploratory Development			PE NUMBER AND TITLE 0602618A Ballistics Technology							
COST (In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	29478	25710	28126	33995	36035	39719	39850	40671	Continuing	Continuing
AH80 Ballistics Technology	24021	22755	23249	26875	28041	31670	31793	32407	Continuing	Continuing
AH81 Armor/Anti-Armor Technology	5457	2955	4877	7120	7994	8049	8057	8264	Continuing	Continuing

A. Mission Description and Budget Item Justification: This program element (PE) provides ballistic technologies required for defensive (armor) and offensive (anti-armor) weapons systems to counter changing threats. Project AH80 is focused on anti-armor warhead mechanics, penetrator mechanics, munition-target interactions, terminal effects, propulsion dynamics, launch and flight dynamics, remote sensing, and computational physics. It also includes work in hypervelocity penetrators and electro thermal chemical (ETC) technology that will greatly increase anti-armor capabilities. Corresponding emphasis is placed on advanced armor technology and vulnerability, lethality and survivability analyses and efforts to optimize effectiveness and survivability of armored combat vehicles. Project AH81 taps the innovation of industry and pursues the most promising and affordable approaches to developing armor/anti-armor technologies. These projects include non-system specific development efforts pointed toward specific military needs and therefore are appropriate to Budget Activity 2.

Project AH80 - Ballistics Technology: This project produces ballistic technologies required for offensive and defensive materiel in response to heavy, medium and light threats in a global context. This project contains ballistic technology advances in vehicle survivability, direct fire armament capabilities, indirect fire support, and weapon effectiveness evaluation in order to be able to design the most lethal weapon capabilities and optimally protect against the most dangerous threats. The Army will leverage Navy PEs 0603795N and PE 0603217N and Defense Nuclear Agency PE 0602715H ETC activities during ETC technology demonstrations. Also, emphasis is placed on advancement of simulation and modeling technologies to foster the establishment of the electronic battlefield and exploitation of the Army's supercomputer network. This project continues to support extensive experimental programs to advance the state-of-the-art of ballistics technologies.

FY 1994 Accomplishments:

- Expanded hybrid integrated ram (HIRAM) large caliber facility to achieve ram acceleration of high mass (3-5 kilograms) projectiles to hypervelocity (> 2.1 kilometers/second). (3440)
- Designed and demonstrated critical constructs for indirect and direct fire systems, including increased projectile payload capability and enhanced accuracy and lethality. (9606)
- Demonstrated a prototype self-contained inertial reticle system as a fire control device. (2349)
- Developed tools, techniques and methodology to improve vulnerability/lethality analyses for terminal ballistics and external blast. (5775)
- Developed resin transfer and injection molding simulation algorithms and software for manufacturing composite components for Comanche and the composite armored vehicle. (2851)

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EXHIBIT ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602618A Ballistics Technology	
<p>FY 1995 Planned Program:</p> <ul style="list-style-type: none"> Finalize designs for a weaponizable reverse annular piston liquid propellant gun and demonstrate muzzle velocity enhancement for solid propellant electro thermal chemical (ETC) concepts. (2647) For indirect fire, demonstrate an all-composite HICAP prototype with equivalent payload mass; for direct fire, design an advanced sabot for long rod penetrators. (5903) Evaluate ability of ceramic/composite armor concepts to defeat novel Kinetic Energy penetrators. (5249) Evaluate performance of a moving inertial reticle system against moving targets; evaluate preliminary north finding technologies with 0.5 degree accuracy and make down selection. (2594) Develop next generation vulnerability, lethality and survivability methodologies for analyzing conventional ballistics using the multi-platform unix vulnerability estimation suite (MUVES) environment. (4267) Extend resin transfer and injection molding simulation into a synthetic environment for manufacturing composite pre-forms and material insertion. (2095) <p>FY 1996 Planned Program:</p> <ul style="list-style-type: none"> Investigate diode laser technology for the direct ignition of solid/liquid propellants and models in bore and free flight projectile stability, surface heating and ablation of hypervelocity projectiles. (3968) Demonstrate an armor capable of defeating projectiles over a wide velocity spectrum; optimize a self-protection system utilizing an electrically launched rod/plate to counter incoming projectiles. (4316) Integrate ETC tank cartridge (plasma generator, bullets, propellant), and demonstrate improved electrical enhancement factors while maintaining enhanced performance. (500) For spinning projectiles or submunitions, develop a rotation-compensated warhead concept; for long rod penetrators, demonstrate a micro-rocket motor to reduce drag. (5345) Integrate target acquisition, image stabilization and target cueing with the inertial reticle system fire control for secondary armament. (2674) Develop methodologies to improve vulnerability and lethality analyses for ballistic shock and use vulnerability codes to enhance the visual display of solids (for armor penetration). (4327) Develop software for thick composite resin process for composite hull. (2119) <p>FY 1997 Planned Program:</p> <ul style="list-style-type: none"> Demonstrate an optimized high-density/high-energy solid electrothermal/chemical propellant and develop multi-dimensional hydrocode for electro thermal chemical concepts. (4276) Fabricate a prototype artillery projectile capable of providing gliding flight utilizing attitude control and demonstrate a rotation-compensated explosive device for use on spinning projectiles or submunitions. (4308) Develop an inertial reticle fire control system for secondary armament for potential application to an M1A2 tank. (4884) 		

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Exhibit ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602618A Ballistics Technology	
<ul style="list-style-type: none"> • Design a full-scale pro-active armor system based on the results of a FY 96 range demonstration of an electrically launched munition countering an incoming kinetic energy threat. (3441) • In an ETC gun, demonstrate a 25% muzzle energy increase at electrical enhancement factors > 3. (3000) • Develop a prototype interactive ballistic vulnerability/lethality module to interface with the distributed interactive simulation (DIS) environment for more realistic war gaming. (4676) • Apply resin transfer molding models and validate against experimental manufacturing processes. (2290) <p>Project AH81 - Armor/Anti-Armor Technology - The overall objective of this project is to provide significantly increased levels of protection and survivability to existing and future combat systems, and to provide significantly increased lethality and effectiveness to existing and future anti-armor munitions by seeking novel and innovative solutions from industry. This project began as a joint program among the U.S. Army, Advanced Research Projects Agency (ARPA) PE 602702E, and the U.S. Marine Corps to enhance the national capability in armor/anti-armor (A3) technologies. The primary armor thrust is overhead protection for all classes of vehicles from tactical vehicles used in contingency operations to heavy combat vehicles. The program has transitioned to the Army.</p> <p>FY 1994 Accomplishments:</p> <ul style="list-style-type: none"> • Developed U.S. manufacturing capability for cubic boron nitride appropriate for lightweight personnel and aircraft armor. (1495) • Utilized new concepts for precision warhead liners that permit exact scaling of the alternative warhead design. (2170) • Completed design and hardware fabrication for a candidate lightweight Javelin precursor employing the free form shaped charge concept. (1792) <p>FY 1995 Planned Program:</p> <ul style="list-style-type: none"> • Examine and baseline selected warhead concepts for defeat of a new class of armor protection. (116) • Prove out gun launch of KE precursor concepts for defeat of reactive range targets. (768) • Initiate top attack armor technology development with two competing contractor teams. (2009) • Funds will be reprogrammed for SBIR/STTR Programs in accordance with the Small Business Innovation Research Program Reauthorization Act of 1992. (62) <p>FY 1996 Planned Program:</p> <ul style="list-style-type: none"> • Develop warheads and penetrators capable of defeating a new class of armor protection. (1001) • Perform livefire tests to defeat reactive appliqué target with gun launched KE projectiles incorporating KE precursor concepts. (1538) • Select and demonstrate the best technical approach for two overhead armors, one for heavy combat vehicles, such as AFAS, one for light vehicles. (1990) • Initiate development of fuze for Active Protection Systems (APS) defeat (348) <p>FY 1997 Planned Program:</p> <ul style="list-style-type: none"> • Conduct a laboratory test of anti-armor technologies to defeat a new class of armor protection. (1405) • Select and develop KE precursor concepts for defeat of a new class of armor protection (2477) 		

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2 - Exploratory Development	0602618A Ballistics Technology			
<ul style="list-style-type: none"> • Complete development of overhead protection armors and transition to system managers as appropriate. (2488) • Continue development of fuze for APS defeat (750) 				
B. Program Change Summary				
	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>FY 1997</u>
Previous President's Budget	29510	25692	28437	31405
Appropriated Value	29510	25710		
Adjustments to Appropriated Value	-32			
a. SBIR/STTR decrement (-88)				
b. Reprogramming (+56)				
Current President's Budget Submit	29478	25710	28126	33995

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<p>C. Other Program Funding Summary: N/A</p> <p>D. Schedule Profile: The efforts funded in this project are non-system specific and represent continuing exploratory development research in the area of Ballistics Technology, therefore no milestones or events are provided.</p>										

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