ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology

	COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	38694	61300	90941	97200	61779	68190	71812	77042	Continuing	Continuing
DC62	DC62	14007	16955	0	0	0	0	0	0	0	85806
DC66	DC66	0	0	967	952	956	952	1008	1037	Continuing	Continuing
D221	Combat Vehicle Survivability	666	687	20588	18483	15898	9445	11730	15067	Continuing	Continuing
D440	Advanced Combat Vehicle Technology	5942	24283	55470	65487	26843	31959	36761	35767	Continuing	Continuing
D441	Combat Vehicle Mobility Technology	2805	4799	8136	7502	9796	14639	16383	13607	Continuing	Continuing
D497	Combat Vehicle Electronics	5813	7324	5780	3003	5628	6275	5930	11564	Continuing	Continuing
D502	HAECO II	0	795	0	0	0	0	0	0	0	800
D506	Aluminum Metal Matrix Composite (NAC)	6089	3974	0	0	0	0	0	0	0	10089
D507	PLS Commercial Engine (NAC)	3372	2483	0	0	0	0	0	0	0	5872
D515	Robotic Ground Systems	0	0	0	1773	2658	4920	0	0	0	9351

A. Mission Description and Budget Item Justification: This Program Element (PE) demonstrates the operational potential of advanced combat vehicle component technologies which can contribute to upgrades of fielded combat vehicles and advanced ground combat vehicle systems. It places emphasis on solutions to post-Cold War deficiencies, providing opportunities for more affordable, deployable, survivable, horizontally integrated and lethal power projection capabilities than are currently available. The technology areas supported by this program element include: vehicle survivability, mobility, intra-vehicular digital electronics, and integration of diverse vehicle technologies developed by the Army, other DoD laboratories and industry. These technologies are demonstrated to and experimented by various Army warfighter organizations through a series of vehicle component and system level technology demonstrations. Work in this program element is consistent with the Army Science and Technology Master Plan, Science and Technology Objectives, Army Modernization Plan, and the Ground and Sea Vehicle Defense Technology Area Plan (DTAP). This

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY **3 - Advanced Technology Development**	PE NUMBER AND TITLE **0603005A Combat Vehicle and Automotive Advanced Technology**

program is managed primarily by the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC), Warren, MI. This program adheres to Tri-Service Reliance Agreements on advanced materials, fuels and lubricants, and ground vehicles, with oversight and coordination provided by the Joint Directors of

Laboratories. Work in this program element is related to and fully coordinated with PE 0602601A (Combat Vehicle and Automotive Technology) and contains no unwarranted duplication of effort among the Military Departments. Furthermore, the project is coordinated with the Marine Corps office within the Naval Surface Warfare Center, the Naval Research Lab, Air Force Armaments Command, and ground vehicle developers within the Departments of Energy, Commerce, Transportation, and the Defense Advanced Research Projects Agency (DARPA).

B. Program Change Summary	FY 1998	FY 1999	FY 2000	FY 2001
Previous President's Budget (FY 1999 PB)	40796	54435	89083	99907
Appropriated Value	42242	61735		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-1303	-435		
b. SBIR / STTR	-895			
c. Omnibus or Other Above Threshold Reductions	-1298			
d. Below Threshold Reprogramming	-52			
e. Rescissions				
Adjustments to Budget Years Since FY 1999 PB			+1858	-2707
Current Budget Submit (FY 2000 / 2001 PB)	38694	61300	90941	97200

Change Summary Explanation: Funding – FY 1999 – Congressional add (+7300).

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology

PROJECT: D221

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D221 Combat Vehicle Survivability	666	687	20588	18483	15898	9445	11730	15067	Continuing	Continuing

Mission Description and Justification: This project demonstrates advanced technologies for protection against threats to ground combat vehicles (e.g., smart, precision guided and other munitions). Project DC62 has been restructured by transferring its funds into this project starting in FY00. The Army has concentrated active protection system demonstration in this project. Efforts will be focused on demonstrating the necessary threat sensors, software algorithms, and hard kill countermeasures needed for an active protection system (APS) that is initially effective against chemical energy (CE) munitions (e.g., shaped charge warheads), with an ultimate goal of demonstrating an effective countermeasure against kinetic energy (KE) (i.e., long rod). Defeat of KE threats by an APS poses an especially difficult challenge due to the velocity, small cross section and robustness of the long rod penetrator. APS is viewed as having tremendous potential for providing enhanced protection of all combat vehicles and is an especially attractive solution for lightweight vehicle classes. Under the APS demonstration program, the Army will evaluate several competing approaches. One of these is a Congressionally directed evaluation of a foreign vehicle self-protection system. Survivability technologies that are integrated and demonstrated under this project include those transitioned from the following exploratory developmental programs: active protection countermeasure technology development PE 0601102A (Defense Research Sciences)/ Project AH43 and BH57; sensors and countermeasures PE 0602270A (Electronic Warfare Technology)/ Project A442. Major contractors include: United Defense LP. of San Jose (prime), CA; Sanders, a Lockheed Martin Company in Nashua, NH.; TRW of Redondo Beach, CA.; Dynetics, Inc. in Huntsville, AL; Hughes Danbury, Danbury Conn.; Chang Industries, LaVerne, CA.

FY 1998 Accomplishments:

- 666 - Classified program support.

Total 666

FY 1999 Planned Program:

- 685 - Classified program support.
- 2 - Funds reprogrammed for SBIR/STTR programs in accordance with the Small Business Innovation Research Authorization Act of 1992.

Total 687

FY 2000 Planned Program:

- 1001 - In-house government support for active protection system (APS) contract.
- 19167 - Initiate detailed design, and perform APS development and testing under contract with United Defense Limited Partnership (UDLP)
  - Complete critical drawings and initiate fabrication of APS by contractor.

- Conduct component integration of all sensors and countermeasures integrated electronically and tested in subcontractor subsystem systems integration laboratory (SIL).

FY 2000 Planned Program: (continued)

- Initiate vehicle system integration with all subsystems integrated on vehicle platform; integrate software into vehicle platform and check for functionality and safety; exercise overall system on contractor vehicle SIL.

•	80	- Other government agency support.
•	40	- Purchase threat munitions test assets.
•	300	- Systems engineering support (Booz Allen Hamilton / ICRC Energy).
Total	20588	

FY 2001 Planned Program:

•	1153	- In-house government support.
	16698	- Continue APS development and testing under contract with UDLP; begin APS component integration.
		- Continue vehicle system integration and complete final in-shop checkout.
		- Perform system and subsystem performance testing with software safety and functionality test in field; perform emulation and simulation tests to incrementally exercise the system and test all functional attributes and debug software as necessary; perform live threat defeat to quantify system level performance; assess functional integration, sensor fusion, and countermeasure selection and performance.
•	200	- Other government agency support.
•	170	- Test support.
•	262	- Systems engineering support (Booz Allen Hamilton / ICRC Energy).
Total	18483	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology

PROJECT: D440

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D440 Advanced Combat Vehicle Technology	5942	24283	55470	65487	26843	31959	36761	35767	Continuing	Continuing

Mission Description and Justification: This project demonstrates the operational potential, technical feasibility and maturity of advanced combat vehicle technologies for potential product improvements to currently fielded and next generation combat vehicles. The objectives are to demonstrate innovative combat vehicle configurations, technologies and integration techniques through Integrated Product and Process Development (IPPD) yielding hardware technology demonstrations, computer simulations and full-scale demonstrations, to accomplish a more rapid and seamless transition of advanced technologies to systems applications. All demonstrations include user and developer teaming in field and/or laboratory environments. The major near term initiative funded by this project is the Future Scout and Cavalry System (FSCS) Advanced Technology Demonstration (ATD), which transitioned from applied research PE 0602601A (Combat Vehicle and Automotive Technology) to this project in FY98. This ATD integrates advanced technologies, including sensors, survivability, advanced mobility technologies and communications into a robust vehicle platform. The FSCS ATD will then undergo technical and user evaluations. The FSCS ATD is a joint United States/United Kingdom FSCS/Tactical Reconnaissance Armored Combat Equipment Requirement (TRACER) program. A Memorandum of Understanding (MOU) was signed in July 1998. The acquisition strategy for the ATD is for both countries to fund equal shares and to award contracts to two competitive US/UK consortia. The request for proposal (RFP) has been released with contract award expected in January 1999. Both countries have harmonized the User Requirements and a planned joint three-star review is planned 24 months after contract award to review and approve the final operational trade-offs prior to finalizing the ATD design configuration. Two consortia have submitted proposal. They are: SIKA Team (Lockheed Martin/British Aerospace joint venture with General Dynamics Land Systems, Vickers, and Northrup Grumman as subcontractors); LANCER Team (GEC Marconi prime contractor with United Defense Limited Partnership, GKN Defense and Raytheon Systems as subcontractors). This project funded the Composite Armored Vehicle (CAV) ATD through FY 98. The impressive results of the CAV ATD have resulted in a technology insertion, by PM Crusader, of composite technology into the Crusader design. This change has saved approximately one ton of weight in the Crusader turret design. United Defense, Limited Partnership, San Jose, CA was the prime contractor for the CAV ATD.

FY 1998 Accomplishments:

- 1571 - Completed CAV ATD 3000 mile durability testing, final report.
- 2000 - Transferred composite technology to the Crusader for turret design implementation.
- 2371 - Developed and allocated FSCS ATD design tradeoffs down to subsystems for affordability trade-off studies.
  - Negotiated and approved FSCS/TRACER MOU with UK.
  - Harmonized joint UK/US system specification for RFP, and issued RFP.

Total 5942

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603005A Combat Vehicle and Automotive Advanced Technology
	PROJECT D440

FY 1999 Planned Program:

•	19261	- Conduct source selection and award FSCS ATD contracts to two US/UK consortia to complete FSCS preliminary design and interface control, begin detailed design, develop FSCS/TRACER vehicle concepts for engineering models, begin development of FSCS ATD hardware and software, perform weapon systems trade-off studies and begin weapon systems development for FSCS/TRACER. - Transition the implementation of vehicle electronics (VETRONICS) open systems architecture (VOSA) to the FSCS ATD contractors. - Begin development of electronic interfaces between major subsystems of FSCS/TRACER (e.g., target acquisition, communication, crew control and displays, etc.) and incorporate sensor suite, crew station, and electronic interface into contractors design/systems integration laboratory (SIL) for FSCS ATD.
•	4431	- Conduct system requirement analysis for C41 workload - Initiate effort to implement simulation and modeling c0oncepts to support FSCS ATD contractor efforts. - Support and participate in Government/contractor integrated product teams (IPTs). - develop model to enable Government and contractor s to determine system cooling requirements given vehicle and propulsion system characteristics.
•	591	- Funds reprogrammed for SBIR//STTR programs in accordance with the Small Business Innovation Research Program Authorization Act of 1992.
Total	24283	

FY 2000 Planned Program:

•	19376	- Evaluate the affordability of hardware and software alternatives and system concepts by both contractors. - Complete sub-system and system trade studies to define cost effective hardware configurations by both contractors. - Develop FSCS simulations and virtual prototypes by both contractors. - Define software requirements by both contractors. - Conduct Ministry of Defense/Department of Defense System Design Reviews
•	27194	- Procure hardware and initiate fabrication of sub-system assemblies by both contractors. - Design, procure and assemble system integration laborites (SIL) by both contractors. - Initiate sub-system testing and evaluation by both contractors. - Initiate analysis of survivability design alternatives by both contractors.
•	5900	- Perform Cost as an Independent Variable (CAIV) analysis and trade studies. - Complete analysis to support refinement of Combined Operational Requirements Document requirements. - Complete Cooperative Analysis of Alternatives (CAoA) to support 3-Star Review. - Continue support and participation in Government/contractor IPTs.
•	3000	- Continue modeling and simulation concepts in support of FSCS ATD contractor efforts.

- Investigate application of Joint Tactical Radio System (JTRS) to FSCS.

Total 55470

FY 2001 Planned Program:

- 19221 - Complete all trade studies and finalize cost effective alternatives by both contractors.
  - Provide affordability data for US/UK 3-Star Affordability Review by both contractors.
  - Incorporate simulation and virtual prototyping results into their development process by both contractors.
  - Complete sub-system and SIL fabrication by both contractors.
- 38866 - Perform demonstrator vehicle fabrication and integration by both contractors.
  - Fabricate and evaluate survivability designs by both contractors.
  - Complete sub-system test and evaluation by both contractors.
  - Initiate contractor system shakedown test and evaluation efforts by both contractors.
- 7400 - Prepare and conduct 3-Star Affordability Review.
  - Prepare and release RFP for engineering and manufacturing development (EMD) phase.
  - Participate in contractor system and sub-system testing and evaluation.
  - Continue support and participation in Government/contractor IPTs.

Total 65487

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology

PROJECT: D441

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D441 Combat Vehicle Mobility Technology	2805	4799	8136	7502	9796	14639	16383	13607	Continuing	Continuing

Mission Description and Justification: This project demonstrates the mobility technologies (suspension , track, engines, transmissions, and auxiliaries) vital for lighter, more fuel efficient, more agile, more deployable ground combat vehicles. It funds an advanced mobility technology demonstration comprised of several independent demonstrations. The principal elements of the mobility demonstration in FY99 are active and semi-active suspension, electric drive, and lightweight track. Military requirements for vehicle mobility are unique because of (1) a need for a stable, smooth ride at high speeds (greater than 20 mph) over rough, cross country terrain, (2) a need for the mobility components to be as small and as light as to enable compact vehicle designs that are less vulnerable to detection, acquisition and attack by threat weapons, and (3) a need to protect vehicle subsystems under armor, which complicate the design of engine air intake and exhaust systems. High speed is required to accomplish the maneuver-dominant warfare envisioned in the Air-Land battle doctrine. A smooth ride is necessary for weapon targeting on the move and for crew comfort and endurance, which are features embedded in U.S. doctrine. The lighter and smaller vehicles are necessary for enhancing deployability and lessening the logistics burden (fuel), but lighter vehicles will have significantly degraded ride performance and mobility limits compared to larger, heavier vehicles without new mobility technology advances. For the next decade, the mobility thrusts required to compensate for smaller and lighter systems are: electric drive (small internal propulsion size and weight), active suspension (increased vehicle stability and higher speed on rough terrain), compact efficient transmissions and lightweight track (reduced system weight and track noise). Electric drive offers unique new capabilities, such as high torque and quiet operation; however, it presents new challenges, especially in cooling of electronic components. Work in this area is being closely coordinated with DARPA's electric drive and Combat Hybrid Power System (CHPS) programs. The latter program will transition to this Army project in FY00. The objective of the CHPS program is to design, develop and demonstrate, in a System Integration Lab (SIL), a robust electrical power architecture that can meet the requirements of future vehicles ranging from light tactical wheeled vehicles to close combat vehicles. In-house efforts are accomplished by the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC), Warren, MI and the U.S. Army Research Laboratory (ARL), Aberdeen Proving Ground, MD. Other government agencies include: Waterways Experiment Station, Vicksburg, MS; Army Research Laboratory, Adelphi MD. Major contractors include: General Dynamics Land Systems Muskegon Operations, Muskegon, MI; Pentastar Huntsville, AL; United Defense Limited Partnership, San Jose, CA; Michigan Technological University, Houghton MI; General Electric, Schenectady, NY; Cadillac Gage Textron, New Orleans, LA.

FY 1998 Accomplishments:

- 1805 - Developed and installed preview sensor algorithms into active suspension control system on a High Mobility Multipurpose Wheeled Vehicle (HMMWV) test rig.
  - Performance tested semi-active suspension and durability/performance tested band track system in support of FSCS ATD.
- 1000 - In coordination with DARPA, completed integration of hybrid electric drive components into a 30 ton hybrid electric demonstrator in preparation for test and evaluation.
  - Designed compact high efficiency mechanical transmission.

Total 2805

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603005A Combat Vehicle and Automotive Advanced Technology
	PROJECT D441

FY 1999 Planned Program:

•	3763	- In coordination with DARPA and Army Research Laboratory (ARL), test and evaluate Silicon Carbide (SiC) power devices for motor drive controller. - Field test active suspension with preview sensor and algorithms. - Test track tensioning system for medium combat vehicle application. - Fabricate compact high efficiency mechanical transmission.
•	959	- In coordination with DARPA, integrate and test CHPS architecture components into a System Integration Laboratory (SIL).
•	77	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	4799	

FY 2000 Planned Program:

•	3379	- Configure and install on HMMWV optimal preview sensor for active suspension. - Procure, install and evaluate kinetic suspension on HMMWV. - Install the electric drive components of the combat hybrid power system on a mobility tested. - Refine and demonstrate the design of SiC motor drive controller. - Perform shakedown and limited durability testing of compact, high efficiency mechanical transmission.
•	2757	- Transition the CHPS SIL and Virtual Prototype from DARPA to the Army/TARDEC. - Update the DARPA CHPS Virtual Prototype models based upon information obtained from SIL assessments. - Complete the DARPA CHPS program by demonstrating in the SIL the feasibility of a hybrid architecture.
•	2000	- Begin integration of advanced components (composite flywheels, high temperature/fast response converters and advanced high energy density batteries) in CHPS for assessment in the SIL.
Total	8136	

FY 2001 Planned Program:

•	2714	- Test and refine preview feature of an active suspension system. - Demonstrate and test the combat hybrid power system hardware on a mobility test bed. - Conduct performance and evaluation tests on compact, high efficiency transmission. - Fabricate turbocharger, high temperature tribology componentry, cold start system and fuel injection system for application to commercial diesel engines for combat vehicles.
•	3084	- Develop new system level and component level vehicle power requirements based on the next planned Army combat vehicle. - Allocate these requirements down to the vehicle hybrid electric power architecture.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603005A Combat Vehicle and Automotive Advanced Technology
	PROJECT D441

- Using the CHPS virtual prototype modeling tools, design vehicle-specific hybrid electric architecture.

FY 2001 Planned Program: (continued)

•	1704	- Complete integration and demonstration of advanced components (composite flywheels, high temperature/fast response converters and advanced high energy density batteries) in CHPS for performance assessment in the SIL.
Total	7502	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603005A Combat Vehicle and Automotive Advanced Technology
	PROJECT D497

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D497 Combat Vehicle Electronics	5813	7324	5780	3003	5628	6275	5930	11564	Continuing	Continuing

Mission Description and Justification: This project develops and demonstrates vehicle electronics hardware and software technologies that will yield increased crew efficiencies and performance or reduced crew size and advances open systems architectures for ground vehicle weapon systems. These technologies include: three-dimensional (3D) audio, voice recognition, headtrackers, advanced software architecture, reusable software Application Program Interface (API) s, embedded simulation, and indirect and semi-autonomous driving (using available robotics technologies). Investments: in embedded training, mission rehearsal, decision aids, automation of crew functions, and ergonomic crew station designs enhances training, leadership and soldier (TLS). The program will be conducted in three phases that continually build on advancing technologies into a mobile reduced crew testbed vehicle. The first phase will develop and integrate 3D audio, voice recognition, a commander's headtracker, and an initial open systems architecture/software API and embedded simulation baseline into the testbed. It will culminate in a FY00 vehicle demonstration of a 50% crew efficiency enhancement, a 15% reduction in software cost with a 5X improvement in architecture throughput and embedded simulation integration feasibility. The second phase will advance the voice recognition, architecture/API and embedded simulation baseline and develop and integrate the semi-autonomous robotics technologies into the testbed. It will culminate in an FY04 vehicle demonstration of a 100% increase in crew efficiency (or 50% reduction in crew size) by driving and commanding the vehicle from a single crew station, a 30% reduction in software cost with a 10X increase in architecture throughput, and embedded simulation capable of full mission rehearsal. This program will build on and leverage technologies from the Future Scout and Cavalry System (FSCS) Advanced Technology Demonstrator (ATD), the Joint Robotics Program Demo III Program, the Crusader and the Crewman's Associate ATD. Major contract efforts will include: DCS Corp, Alexandria, VA, for software architecture; Oasis, Troy, MI, for embedded simulation; RST, Westminster, MD, and Utah State for robotics technologies; and GDLS, Sterling Heights, MI, for testbed integration and voice recognition.

FY 1998 Accomplishments:

•	3000	- Supported FSCS for electronics requirement definition.
•	200	- Defined operating environment API and architecture baseline for reduced crew testbed.
	1200	- Demonstrated and delivered FSCS conceptual crew station simulator to Mounted Warfare Battlelab (MWBL) and Directorate of Combat Development (DCD), Ft Knox, for user evaluation.
	213	- Demonstrated three-dimensional audio technologies in crew station simulator.
	300	- Defined mobile reduced crew testbed concept and acquired vehicle.
	900	- Developed ground vehicle map server software to standard API.
Total	5813	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603005A Combat Vehicle and Automotive Advanced Technology
	PROJECT D497

FY 1999 Planned Program:

•	250	- Design vehicle test bed system electronics architecture.
	4180	- Evaluate, select, and procure 3D audio, headtracker, voice recognition, indirect vision driving, architecture and embedded simulation technologies.
	900	- Define testbed software architecture and top level software design; design and code the common software operating environment based on real time Common Object Request Broken Architecture (CORBA).
	100	- Conduct solid modeling analysis of crew station structure and positioning within testbed vehicle; define and design crew station for commander/driver.
	180	- Prepare test bed for crew station mechanical integration.
	600	- Define and design graphical operating environment and reusable combat vehicle graphics tool kit.
	700	- Define and design vehicle test bed embedded simulation system; procure embedded simulation image generation hardware.
	150	- Define and design test environment equipment and scenario.
	100	- Procure Pos/Nav and GPS system, mass memory unit, and intercom system for test bed vehicle.
•	164	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	7324	

FY 2000 Planned Program:

•	1600	- Complete and integrate crew stations into testbed.
	1800	- Complete software development, code and test of: mission rehearsal, graphics tool kit, graphics operating environment, user interface device drivers, drive by wire algorithms, commanders Graphics Usr Interface (GUI) and test simulation functions.
	650	- Complete unit test and systems integration testing of test bed vehicle systems.
	270	- Integrate and test technologies into vehicle testbed.
	200	- Prepare test site for vehicle demo.
	220	- Integrate synchronized Modular Semi-Automated Forces (MODSAF) and after action review software into embedded simulation system.
	490	- Create 3D visual terrain data base of test site and integrate database into test bed vehicle.
	550	- Demonstrate indirect vision, voice recognition, three-dimensional audio, advanced architecture and embedded simulation technologies in vehicle testbed.
Total	5780	

FY 2001 Planned Program:

•	3003	- Conduct vehicle test bed data reduction, test results analysis and identify lessons learned. - Synthesize lessons learned into Phase II test bed vehicle requirements.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603005A Combat Vehicle and Automotive Advanced Technology PROJECT D497

- Design advanced architecture and embedded simulation system.

FY 2001 Planned Program (continued)

- Define semi-autonomous driving concept and initiate design.
- Design commander/driver crew station.
- Define requirements and concept for vehicle remote control for dismounted operations.
- Define and evaluate a second crew station and define gunnery functions.

Total 3003

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE: February 1999
BUDGET ACTIVITY: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology
	PROJECT: D502

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
D502 HAECO II	0	795	0	0	0	0	0	0	0	800

Mission Description and Justification This Congressionally-directed project, that was funded in FY95 and FY97, supports continued development and Army testing of the combined diesel/turbine (giesel) prototype engine. The Army has contracted with the Hope-Anderson Engine Company (HAECO) to development one giesel engine in the 300 to 600 horsepower range for delivery to the Army for testing at the U.S. Army Tank-Automotive and Armaments Command (TACOM). The contractor is HAECO Partners Ltd., Hillsboro, Ohio.

FY 1998 Accomplishments: Project not funded in FY 1998.

FY 1999 Planned Program:

- 415 - Complete development of giesel prototype engine for Government evaluation.
- 279 - Perform government tests and evaluations at TACOM.
- 80 - Participate in Simulation Based Acquisition demonstration for the Total Life Cycle (SIM-TLC).
- 21 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 795

FY 2000 Planned Program: Project not funded in FY 2000.

FY 2001 Planned Program: Project not funded in FY 2001.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology

PROJECT: D506

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D506 Aluminum Metal Matrix Composite (NAC)	6089	3974	0	0	0	0	0	0	0	10089

Mission Description and Justification: This congressionally directed program provides funds to investigate Aluminum Metal Matrix Composite materials for military system applications. Interest in this technology stems from the Army's desire for stronger, lighter track shoes as well as other applications, such as engine components. The project addresses the technologies needed to develop manufacturable ground vehicle track components to reduce weight and life cycle costs using metal matrix composites in place of traditional metals. Cost and weight reductions may be possible in some applications.

FY 1998 Accomplishments:

- 6089 - Developed a single pin aluminum metal matrix track design that is interchangeable with the Bradley Fighting Vehicle for both Operations and Support cost reductions and weight savings of 25%.
  - Manufactured prototype ground vehicle track components.

Total 6089

FY 1999 Planned Program:

- 3472 - Complete mechanical and wear testing of silicon carbide reinforced aluminum metal matrix samples to determine material properties; complete preliminary design of single pin track shoe for Bradley vehicle; complete manufacturing development work for a single pin track shoe for the Bradley vehicle.
- 397 - Participate in Simulation Based Acquisition demonstration for the Total Life Cycle (SIM-TLC).
- 105 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 3974

FY 2000 Planned Program: Project not funded in FY 2000.

FY 2001 Planned Program: Project not funded in FY 2001.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology

PROJECT: D507

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D507 PLS Commercial Engine (NAC)	3372	2483	0	0	0	0	0	0	0	5872

Mission Description and Justification: This congressionally directed program demonstrates a heavy truck propulsion system through the leveraging and utilization of commercial engine technologies. This program supports the Program Manager for Heavy Tactical Vehicles (PM HTV) acquisition plans for heavy truck propulsion systems future pre-production contract(s) in 2002, and production contract(s) in 2004. This effort is intended to assure a complementary blend of propulsion capabilities and engine configurations based on both commercial market forces and military requirements is achieved. The Army has not budgeted any funding beyond FY99.

FY 1998 Accomplishments:

- 3372 - Initiated cooperative agreements with one major heavy diesel engine manufacturer to develop high horsepower, EPA certified engines with improved emissions for the heavy tactical truck fleet with potential applicability to medium combat vehicles.

Total 3372

FY 1999 Planned Program:

- 2169 - Conduct a competitive solicitation to upgrade the level of technology and to provide additional improvement in the reduction of harmful emissions (All major engine manufactures are being invited to submit proposals).
  - Complete engine evaluation.
- 248 - Participate in Simulation Based Acquisition demonstration for the Total Life Cycle (SIM-TLC).
- 66 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 2483

FY 2000 Planned Program: Project not funded in FY 2000.

FY 2001 Planned Program: Project not funded in FY 2001.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603005A Combat Vehicle and Automotive Advanced Technology

PROJECT: D515

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
D515 Robotic Ground Systems	0	0	0	1773	2658	4920	0	0	0	9351

Mission Description and Justification The project funds demonstrations of unmanned land systems for multiple tactical and logistics applications by the Army and, possibly, other services. The Army has evaluated concepts for robotic systems in simulations, and these systems have been shown to provide important capabilities. The near term efforts are oriented on an unmanned companion, called a robotic follower, to manned combat vehicles. The robotic follower is envisioned as a fighting vehicle that might also transport ammunition and other materiel for its manned counterparts. A robotic follower concept with great potential is armed with long range (12-16km) non-line-of-sight missiles. The advantages of using robotic platforms in this way include the capability to carry more munitions than a comparable manned systems (due to larger available interior volume) and removal of the firing signature from manned systems in most cases. The Army's approach is to build upon previous and ongoing investments, such as the Demo III program, under the Joint Robotics Program, and the Crewman's Associate ATD. In addition to the robotic follower, the Army user has interest in robotic platforms to augment manned, ground and aerial reconnaissance systems, and robotic sentries for tactical headquarters and logistics nodes. Technologies proven in any robotic demonstration are expected to be transferable to other unmanned platforms as well as manned platforms to reduce operator work load.

FY 1998 Accomplishments: Project not funded in FY 1998.

FY 1999 Planned Program: Project not funded in FY 1999.

FY 2000 Planned Program: Project not funded in FY 2000.

FY 2001 Planned Program:

•	1773	- Begin vehicle design and define technology interfaces with Army Research Laboratory and Industry; award primary vehicle integration contract.
Total	1773	

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