

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

February 2002

**BUDGET ACTIVITY**  
**5 - Engineering and manufacturing development**

**PE NUMBER AND TITLE**  
**0604854A - Artillery Systems - EMD**

COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	19006	61961	251376	466434	424971	498756	199260	62500	1990447
2KT CRUSADER OPERATIONAL TEST	218	197	397	1188	199	3288	5370	30200	41167
503 CRUSADER-ED	1	39120	228747	452838	424772	495468	193890	32300	1867136
509 LIGHTWEIGHT 155M HOWITZER	16726	18048	22032	12408	0	0	0	0	74839
516 PALADIN/FAASV	2061	4596	200	0	0	0	0	0	7305

**A. Mission Description and Budget Item Justification:** This program element supports the Joint Light Weight 155mm Howitzer (LW155), the Crusader, and the Paladin/FAASV Improvement programs.

The LW155, a joint program with the Marine Corps, provides the replacement for the current 1970's vintage M198, 155mm Towed Howitzer. The LW155 provides significant improvement in strategic and tactical mobility over the M198. The Army portion of the joint development is the Towed Artillery Digitization (TAD). TAD is the digital fire control system for the LW155. TAD provides increased accuracy, survivability, and lethality for Army and USMC 155mm Towed Artillery. This system supports both the Legacy and Interim transition paths of the Army Transformation Campaign Plan (TCP).

The Crusader system is the Army's next generation self-propelled howitzer (SPH) and artillery resupply vehicles (RSVs) and is the first installment of the Objective Force in the Army Transformation. Crusader will displace the M109A6, Paladin, 155mm Self-Propelled Howitzer and its accompanying resupply vehicle, the M992, Field Artillery Ammunition Support Vehicle (FAASV). Crusader has significantly increased capabilities in the areas of lethality, mobility, survivability, resupply, command and control, and sustainability by capitalizing on mature, state-of-the-art technologies. The combination of Crusader's unique capabilities, including vehicle speed, rate of fire, range, and exploitation of computers and communications yield unparalleled fire support capabilities. The Crusader vehicles have been designed specifically to facilitate air transportability -- combination of any two vehicles air transportable in either a C5 or C17 aircraft. The mix of resupply vehicles (tracked RSV-T and wheeled RSV-W) allows the Commander additional flexibility in responding to the situations presented by the threat by adjusting the employment of the tracked and wheeled resupply vehicles. The Crusader program transitions from Program Definition and Risk Reduction (PDRR) to System Development and Demonstration (SDD) in 3Q FY03. This system supports the Legacy to Objective transition path of the Army Transformation Campaign Plan (TCP).

The Paladin/FAASV project integrates several system improvements that provide for: stowage and automated dispensing of M231/M232, Modular Artillery Charge System (MACS), that is displacing the current propelling charges; replacement of M82 cartridge primer with a laser propellant ignition system; and upgrading components of the Automated Fire Control System to avoid obsolescence. These system improvements provide significantly improved mission effectiveness, increased reliability, maintainability and supportability, as well as reduce life cycle costs. This system supports the Legacy transition path of the Army Transformation Campaign Plan (TCP).

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<u><b>B. Program Change Summary</b></u>	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2002 PB)	19920	62481	239689
Appropriated Value	20105	62481	0
Adjustments to Appropriated Value	0	0	0
a. Congressional General Reductions	0	-520	0
b. SBIR / STTR	-578	0	0
c. Omnibus or Other Above Threshold Reductions	0	0	0
d. Below Threshold Reprogramming	-338	0	0
e. Rescissions	-183	0	0
Adjustments to Budget Years Since FY2002 PB	0	0	11687
Current Budget Submit (FY 2003 PB )	19006	61961	251376

FY03 LW155 program increased to align Army's portion of the joint program with the United States Marine Corps (USMC) LW155 program.

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COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
503 CRUSADER-ED	1	39120	228747	452838	424772	495468	193890	32300	1867136

**A. Mission Description and Budget Item Justification:** This project supports the Crusader Program. The Crusader system is the Army's next generation self-propelled howitzer (SPH) and artillery resupply vehicles (RSVs) and is the first installment of the Objective Force in the Army Transformation. Crusader has significantly increased capabilities in the areas of lethality, mobility, survivability, resupply, command and control, and sustainability by capitalizing on mature, state-of-the-art technologies. The combination of Crusader's unique capabilities, including vehicle speed, rate of fire, range, and exploitation of computers and communications yield unparalleled fire support capabilities for US forces. The Crusader vehicles have been designed specifically to facilitate air transportability - with a minimum of a combination of any two vehicles air transportable in either a C5 or C17 aircraft. The mix of resupply vehicles (tracked RSV-T and wheeled RSV-W) also gives the Commander in theater additional flexibility in responding to the threat, by adapting his Tactics, Techniques and Procedures with the most appropriate utilization and interaction of the tracked and wheeled resupply vehicles. The Crusader program transitions from PDRR to SDD in 3Q FY03. This system supports the Legacy-to-Objective transition path of the Transformation Campaign Plan (TCP).

**FY 2001 Accomplishments:**

- 1 Project management/support
- Total 1

**FY 2002 Planned Program**

- 39120 Product Development: Order SDD Long Lead Items for prototype vehicles.
- Total 39120

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**503****FY 2003 Planned Program**

- 214642 Product Development: Initiate manufacturing of SDD prototypes (7 SPH, 5 RSV-T, 4 RSV-W). Initiate SDD/Low Rate Initial Production (LRIP) design update.
- 9298 Support and management: Initiate SDD Project Management efforts to include engineering analysis, product development team support and engineering management activities. Initiate coordination and development of Milestone C activities in accordance with approved Acquisition Program Baseline (APB) and Acquisition Strategy.
- 4807 Test and evaluation: Initiate testing of SPH 1 and XM297 Cannon at Yuma Proving Ground (YPG) under SDD contract phase. Test full-up powerpack in propulsion test lab.

Total 228747

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<u>B. Other Program Funding Summary</u>	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	To Compl	Total Cost
RDTE, BA5, Army, PE 0603854, D505	341765	444091	246465	0	0	0	0	0	1594902
Procurement, WTCV, Army, G83500	0	0	0	24702	94221	258300	641564	3347760	4366547
Procurement, WTCV, Army, G83600	0	0	0	13237	52933	116103	250563	1222518	1655354
RDTE, BA5, Army, PE 0604854, D2KT	218	197	397	1188	199	3288	5370	30200	41142
Procurement, Ammo, Army, ER8021	39565	71910	122411	108802	99327	80070	184940	Continuing	Continuing
Procurement, WTCV, Army G83601	0	0	0	5876	23462	53043	115285	585458	783124
Procurement, OPA, Army, D16500*	0	0	0	0	0	3697	10170	80594	94461

\*Funding summary represents a portion of the overall funding in D16500, Other Procurement, Army. This funding is associated with the Resupply Vehicle - Wheeled (RSV-W).

**C. Acquisition Strategy:** There will be a seamless transition from Program Development Risk Reduction (PDRR) to System Development and Demonstration (SDD) that eliminates inefficiencies in ramping down/up during the milestone decision. During the period of Oct-Dec 1999, Crusader went through a redefinition effort for reduced weight and increased transportability. A revised program schedule and budget was developed to support this effort. Additionally, in June 2000, a revision to the Crusader Acquisition Strategy was signed to support this path forward. Due to this restructure of both cost and schedule, an adjustment to the Acquisition Program Baseline (APB) was required and approved in December 2000. The strategy for development of the lightweight Crusader is to build on the successful development to date on major subsystems; e.g. continue development and testing of the XM297 cannon, exercise the resupply subsystem and software in the Systems Integration Facility (SIF), and continue electronics and software development. The strategy is to continue these efforts without a break, develop weight reduction technologies and initiatives, and re-design the system with the current contractor team.

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<u>D. Schedule Profile</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>
Initiate the order of SDD Long Lead Items (LLI)		2Q					
Initiate Manufacturing of SDD Prototypes			3Q				
Initiate BH&T Testing				2Q			
Initiate Deliveries of SDD Prototypes					1Q		
Initiate PQT SDD Testing					1Q		
Order LRIP LLI					3Q		
Milestone C IPR						2Q	
FDTE							1Q
Delivery of LRIP Prototypes							2Q

## ARMY RDT&E COST ANALYSIS(R-3)

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I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . Systems Contractor	SS/CPIF	UDLP, Minneapolis, MN	0	1		35548	1Q	190800	1Q	1387787	1614136	0
b . Systems Development Engineering	PO	PM Crusader, Picatinny Arsenal, NJ	0	0		0		4664	1Q	37615	42279	0
c . Systems Development Engineering	PO	ARDEC, Picatinny Arsenal, NJ	0	0		0		6880	1Q	7790	14670	0
d . Systems Development Engineering	PO	TACOM, Warren, MI	0	0		0		345	1Q	2763	3108	0
e . Systems Development Engineering	PO	ARL, Adelphi, MD	0	0		0		478	1-2Q	705	1183	0
f . Systems Development Engineering	PO	Various OGAs	0	0		0		4675	1-2Q	7514	12189	0
g . Systems Development Engineering	Various	Various Contracts	0	0		3572	1-2Q	6800	1-2Q	7800	18172	0
Subtotal:			0	1		39120		214642		1451974	1705737	0

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II. Support Cost	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . Development Support	PO	ARDEC, Picatinny Arsenal, NJ	0	0		0		5160	1Q	38583	43743	0
b . Integrated Logistics Support	PO	RIA, Rock Island, IL	0	0		0		111	1Q	814	925	0
c . Development Support	PO	TACOM, Warren, MI	0	0		0		1336	1Q	9871	11207	0
d . Development Support	PO	ARL, Adelphi, MD	0	0		0		285	1Q	1582	1867	0
e . Development Support	PO	Various OGAs	0	0		0		628	1-2Q	4431	5059	0
f . Development Support	Various	Various Contracts	0	0		0		206	1-2Q	643	849	0
Subtotal:			0	0		0		7726		55924	63650	0

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III. Test and Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . Development Test and Evaluation	PO	TECOM (YPG, AZ; APG, MD)	0	0		0		3775	1-2Q	64751	68526	0
b . Ammunition and Propellant	PO	Various sources	0	0		0		1032	1-3Q	16218	17250	0
Subtotal:			0	0		0		4807		80969	85776	0

IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . Project Management Support	SS/FP	Vector Research, Inc., MI	0	0		0		175	1Q	885	1060	0
b . Project Management Support	SS/FP	System Research & Integration, Inc., VA	0	0		0		74	1Q	479	553	0
c . Project Management Support	SS/FP	PRC, VA	0	0		0		70	1Q	635	705	0
d . Project Management Support	SS/FP	SAIC, VA	0	0		0		401	1Q	2662	3063	0

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IV. Management Services (continued)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
e . Systems Engineering Support	SS/FP	Camber, Inc, NJ	0	0		0		100	1Q	478	578	0
f . Systems Engineering Support	SS/FP	PRC, VA	0	0		0		93	1Q	857	950	0
g . Systems Engineering Support	SS/FP	LMI, VA	0	0		0		75	1Q	0	75	0
h . Systems Engineering Support	SS/FP	TBD	0	0		0		36	1Q	0	36	0
i . Software Development Support	SS/FP	Camber Inc, NJ	0	0		0		100	1Q	612	712	0
j . Software Development Support	SS/FP	Mitre Corporation, VA	0	0		0		131	1Q	1147	1278	0
k . Software Development Support	SS/FP	High Performance Technology Inc, HPTI, VA	0	0		0		213	1Q	1736	1949	0
l . Software Development Support	SS/FP	Averstar Inc, OK	0	0		0		104	1Q	910	1014	0
Subtotal:			0	0		0		1572		10401	11973	0

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Project Total Cost:

0

1

39120

228747

1599268

1867136

0

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COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
509      LIGHTWEIGHT 155M HOWITZER	16726	18048	22032	12408	0	0	0	0	74839

**A. Mission Description and Budget Item Justification:** The Lightweight 155mm (LW155) Towed Howitzer, a joint program with the Marine Corps, will provide the replacement for the M198, 155mm Towed Howitzer. It will provide significant strategic and tactical mobility improvements. Project supports Towed Artillery Digitization (TAD), a digital fire control system for the XM777 Towed Howitzer (base model of LW155), making it an XM777E1. TAD will increase the accuracy, survivability, and lethality of Army and USMC 155mm Towed Artillery. This system supports both the Legacy and Interim transition paths of the Transformation Campaign Plan (TCP).

**FY 2001 Accomplishments:**

- 3561      Funded matrix engineering support for various Integrated Product Teams (IPTs), System Requirements Review and System Design Review. Other tasks included work on the Test and Evaluation Master Plan, Software Development Plan, and other program documents. An initial Tri-Service Assessment was also conducted.
- 1003      Funded core program management personnel, facilities, business management, and other technical and administrative tasks.
- 10049      Funded the FY01 increment of the TAD SDD Contract. Efforts included review and refinement of system requirements, system hardware and software baselines, preliminary allocations, component trade studies and preliminary integration analysis. Includes first Award Fee.
- 1545      Funded eight long lead cannon assembly performs for SDD. Also provided partial funding for the manufacture of a pilot production howitzer, which will be used in TAD technical and operational testing.
- 568        Funded trade studies and design work required to integrate the TAD System onto the XM777 lightweight howitzer.

Total 16726

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**509****FY 2002 Planned Program**

- 5057 Funds matrix engineering support for IPTs; system reviews including System Software Review; Preliminary Design Review; Detailed Design Review; software test planning; and other SDD tasks.
- 8450 Funds FY02 increment of the TAD SDD contract. Includes software development and component level development. Test Articles funded under this contract appear below.
- 2450 Funds the initial fabrication of TAD developmental test articles for component and system level technical testing.
- 500 Funds the remainder of the pilot production gun, to be used in TAD technical and operational testing.
- 500 Funds software reuse for the XM777E1.
- 1091 Funds core program management personnel, facilities, business management, and other technical and administrative tasks.

Total 18048

**FY 2003 Planned Program**

- 11392 Funds continuation of TAD SDD contract. Includes build and delivery of TAD developmental test articles.
- 1900 Funds continued software development, software test planning and component level tests.
- 3000 Funds Technical Testing.
- 1323 Funds core program management, business management, facilities, and other administrative and technical support.
- 4417 Funds matrix engineering support.

Total 22032

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<b><u>B. Other Program Funding Summary</u></b>	<b><u>FY 2001</u></b>	<b><u>FY 2002</u></b>	<b><u>FY 2003</u></b>	<b><u>FY 2004</u></b>	<b><u>FY 2005</u></b>	<b><u>FY 2006</u></b>	<b><u>FY 2007</u></b>	<b><u>To Compl</u></b>	<b><u>Total Cost</u></b>
RDTE, Navy LW155 Towed How 060363M	14125	13203	11700	6000	0	0	0	0	71373
Procurement, Marine Corps LW155 Towed Howitzer with TAD Prod, BLIN 218500	11004	0	63054	112371	181017	183329	76400	0	627175
Procurement, WTCV, Army, LW155 with TAD G01700	0	1099	0	21011	58327	104038	139142	138500	462117

**C. Acquisition Strategy:** The overall XM777E1 Acquisition Strategy/Plan is to execute a CPIF contract, where the prime contractor has Total System Performance Responsibility (TSPR). TSPR includes the development and testing of TAD, as well as integrating the final TAD hardware onto the XM777 lightweight howitzer for a final integrated XM77E1 system. The Marine Corps will retrofit their LW155 howitzers with TAD.

<b><u>D. Schedule Profile</u></b>	<b><u>FY 2001</u></b>	<b><u>FY 2002</u></b>	<b><u>FY 2003</u></b>	<b><u>FY 2004</u></b>	<b><u>FY 2005</u></b>	<b><u>FY 2006</u></b>	<b><u>FY 2007</u></b>
TAD Design	1-4Q	1-4Q	1-2Q				
TAD Technical Testing			2-4Q				
Begin Technical Testing and Conduct Logistics Demonstration				1-2Q			
TAD Multi-service Operational Test				3Q			
TAD Milestone C				4Q			

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I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . XM777E1 SDD Contract	CPIF	General Dynamics	2906	10049	1Q	8450	3Q	11392	1Q	5000	37797	37797
b . Matrix Engineering Support	MIPR	ARDEC, Picatinny Arsenal, NJ	2127	3561	1-4Q	5057	1-4Q	4417	1-4Q	2432	17594	0
c . Integration of TAD onto XM777 Howitzer (Trade Study and Design Effort)	CPIF	BAE Barrow-in-Furness, UK	0	568	4Q	0		0		0	568	0
d . Software Modification for Reuse	MIPR	ARDEC, Picatinny Arsenal, NJ	0	0		500	1-4Q	0		0	500	0
e . Software Development and Software Test Planning	MIPR	ARDEC, Picatinny Arsenal, NJ	0	0		0		1900	1-4Q	0	1900	0
Subtotal:			5033	14178		14007		17709		7432	58359	37797

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II. Support Cost	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . Program Management	Allotment	JPMO LW155, Picatinny Arsenal, NJ	592	1003	1-4Q	1091	1-4Q	1323	1-4Q	800	4809	0
Subtotal:			592	1003		1091		1323		800	4809	0

III. Test and Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a . SDD Test Articles	CPIF	General Dynamics	0	1545	1-4Q	2950	1-4Q	0		0	4495	4495
b . Technical Testing	MIPR	Yuma Proving Grounds, AZ	0	0		0		3000	1-4Q	0	3000	0
c . Operational Testing	MIPR	Yuma Proving Grounds, AZ	0	0		0		0		4176	4176	0
Subtotal:			0	1545		2950		3000		4176	11671	4495

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IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2001 Cost	FY 2001 Award Date	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
			0	0		0		0		0	0	0
Subtotal:												
Project Total Cost:			5625	16726		18048		22032		12408	74839	42292