Exhibit R-2, RDT&E Budget Item Justification						Date: February 2003		
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Total PE Cost-	12.558	19.943	11.515	11.791	11.921	12.164	11.832	12.124
JOINT SERVICE EOD	2.680	2.100	0.790	0.810	0.820	0.840	0.814	0.814
JAUS	0.800	1.000	0.901	0.876	1.029	1.115	1.203	1.339
GLADIATOR	1.120	2.105	1.140	1.140	1.152	1.220	1.090	1.211
RCSS	2.040	2.318	1.058	1.060	1.100	1.120	1.094	1.120
MPRS	1.108	2.020	1.058	1.065	1.100	1.123	1.090	1.120
INTELLIGENT MOBILITY	1.010	1.200	1.148	1.120	1.139	1.420	1.261	1.230
RACS	3.800	5.200	5.220	5.520	5.310	5.326	5.280	5.290
COTS	0.000	4.000	0.200	0.200	0.200	0.000	0.000	0.000

A. Mission Description and Budget Item Justification:

This program is a budget activity level 4 based on the concept/technology development activities ongoing within the program. This PE was established in response to Congressional guidance to consolidate DoD robotic programs on unmanned ground systems and related robotic technologies in order to increase focus of the Services' robotic programs on operational requirements. The program ensures coordination between the Services and provides for interoperability and commonality among unmanned ground systems. The Joint Robotics Program (JRP) will develop and field a family of affordable and effective mobile ground robotic systems; develop and transition technologies necessary to meet evolving user requirements, and serve as a catalyst for insertion of robotic systems and technologies into the force structure. Unmanned Ground Systems are now realizing the often foreseen potential to provide our service men and women with the leap-ahead warfighting capability they need to reduce risk levels to our personnel. The war on terrorism has created urgent and compelling requirements for UGVs. The JRP has responded by deploying unmanned countermine and reconnaissance systems to Bosnia and Kosovo and in support of Operation Enduring Freedom. The JRP continues to support UGV deployments around the globe providing the Services with unmanned force protection and countermine capabilities. Increasing Service UGV demand and positive feedback from users in the field have validated the JRP mission.

B. Program Change Summary:

	FY 2002	FY 2003	FY 2004	FY 2005
Previous President's Budget	11.302	11.305	11.515	11.791
Current BES/President's Budget	12.558	19.943		
Total Adjustments				
Congressional program reductions				
Congressional rescissions				
Congressional increases	1.500	9.100		
Reprogrammings				
SBIR/STTR Transfer	(0.244)	(0.462)		

C. Other Program Funding Summary:

Not Applicable

D. Acquisition Strategy:

This program's acquisition strategy continues to maintain two tracks: (1) to develop and field first generation UGVs with current technologies, and (2) pursue advanced technologies critical to semi-autonomous mobility that can be inserted into first generation systems in an evolutionary manner.

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Joint Service EOD	2.680	2.100	0.790	0.810	0.820	0.840	0.814	0.814

A. Mission Description and Budget Item Justification:

This program office is responsible for the lifecycle management of EOD equipment for all four military Services. This particular project will conduct Concept and Technology Development efforts to determine maturity of existing technology and exploration of new concepts to meet EOD requirements. This effort continues the work done on the Basic UXO Gathering System (BUGS), a prototype system of small, semi-autonomous platforms operating as teams that can search large areas and detect, pick-up, and carry away multiple UXO's. The Joint EOD community also has a requirement for a small Man Transportable Robotic System that can conduct EOD tasks to include the use of a manipulator arm to render safe or neutralize unexploded ordnance in confined areas that current systems have difficulty accessing. Also, the Joint EOD community needs increased autonomy in its robotic platforms, and cooperative control of the different classes of robots, and these needs are addressed in this project. The acquisition strategy for Joint Service EOD Robotics includes the conduct of an Analysis of Alternatives by the Joint users, development of a requirements document by the Joint Users, competitive solicitation of a development contract, with built-in options for production, upgrades, support and spare parts. Each Service individually funds for their production, upgrade, support, and spares.

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	2.680			
RDT&E Articles Quantity * (as applicable)				

- Completed prototype development and testing and of both Basic UXO Gathering System (BUGS) concepts. Collected data to feed into the Multiple UXO Neutralization System (MUNS) Analysis of Alternatives study.
- Performed solicitation, proposal evaluation, and awarded development contracts (with options for production and support) for the EOD Man Transportable Robotic System (MTRS).
- Initiated development of semi-autonomous capabilities for the Remote Ordnance Neutralization System (RONS). Specific capability is improved manipulation for EOD operations.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost		2.100	0.790	0.810
RDT&E Articles Quantity * (as applicable)				

- Take delivery of MTRS Performance Specification Verification Models and conduct government testing.
- Order MTRS Production Representative Models and conduct final government testing..
- Achieve Production Decision for the MTRA AAP, and transition to Production Phase for the four Services.
- Initiate block upgrade development inaccordance with the MTRS evolutionary acquisition approach.
- Demonstrate improved manipulation capability on prototype Semi-Autonomous RONS.
- Complete RONS Continous Improvement Program project for PC-based electronics and develop additional Semi-Autonomous RONS capabilities.
- Execute user-prioritized RONS Continous Improvement projects.

C. Other Program Funding Summary:

Not Applicable

D. Acquisition Strategy:
Not Applicable

E. Major Performers:
Not Applicable

Exhibit R-3 Cost Analysis (page 1)								Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4		Program Element PE 0603709D8Z						Joint Service EOD					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total 2002 Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development				0.500		0.250		0.250				
Ancilliary Hardware Development												
Systems Engineering				0.210		0.250		0.250				
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development				0.710		0.500		0.500				
Remarks:												
Development Support				0.100		0.100		0.100				
Software Development				0.500		0.100		0.100				
Training Development												
Integrated Logistics Support				0.300								
Configuration Management												
Technical Data												
GFE												
Subtotal Support				0.900		0.200		0.200				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)								Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4		Program Element PE 0603709D8Z						Joint Service EOD					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
DT				0.100		0.090		0.110				
IOT&E												
Initial Verification Testing												
Subtotal T&E				0.100		0.090		0.110				
Remarks:												
Contractor Engineering Support												
Government Engineering Support				0.200								
Program Management Support				0.190								
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Miscellaneous												
Subtotal Management				0.390		0.000		0.000				
Remarks:												
Total Cost				2.100		0.790		0.810				
Remarks:												

Exhibit R-4, Schedule Profile																																			
																																			Date: February 2003	
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4													Program Element Number and Name PE 0603709D8Z – Joint Robotics Program																Project Number and Name Joint Service EOD							
Fiscal Year	2001				2002				2003				2004				2005				2006				2007				2008				2009			
	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	1	2	3	4	1	2	3	4
MUNS AOA																																				
MTRS Contract Awards																																				
MTRS AAP PROD IPR																																				
RONS CIP																																				

R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail		Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4	Program Element Number and Name PE 0603708DZ Joint Robotics Program	Project Number and Name Joint Service EOD

	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
MUNS AOA		1-4Q						
MTRS Contract Award		3Q						
MTRS AAP Production Decision					1Q			
RONS Continuous Improvement Program			Cont.	Cont.	Cont.			

R-4a Schedule Profile - Item No. 20-4 of 20-4

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
JAUS	0.800	1.000	0.901	0.876	1.029	1.115	1.203	1.339

A. Mission Description and Budget Item Justification:

The intent of this program is to develop common open software architecture to ensure unmanned systems' interoperability and evolution with resultant cost savings. JAUS will specify the interfaces between software modules to allow for rapid technology transfer. Continue to develop JAUS such that it attains clear objectives and maintains a consistent philosophy while promoting JAUS as the domain architecture for Unmanned Systems. We will educate the Unmanned Systems community on JAUS to support acquiring, developing, testing, and manufacturing organizations' incorporation of JAUS into their products and services and pursue the adoption of JAUS as a commercial and military standard.

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	0.800			
RDT&E Articles Quantity * (as applicable)				

- Released Version 3.0 of the Reference Architecture Specification, and Version 1.3 of the JAUGS Working Group Standard Operating Procedure.
- Drafted Version 1.0 of the JAUS Strategic Plan.
- Conducted three JAUS Working Group meetings.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost		1.000	0.901	0.876
RDT&E Articles Quantity * (as applicable)				

- Plans for FY2003-2005 are to demonstrate and validate dynamic registration and expansion port capabilities.
- The compliance suite will be completed.
- Examine the feasibility of moving JAUGS into the commercial standards arena, with a view towards adoption by Institute of Electrical and Electronic Engineers (IEEE) or American National Standards Institute (ANSI).
- Release Version 3.0 of the Domain Model.

C. Other Program Funding Summary:

Not Applicable

D. Acquisition Strategy:
Not Applicable

E. Major Performers:
Not Applicable

Exhibit R-3 Cost Analysis (page 1)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4			Program Element PE 0603709D8Z				JAUS					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total 2002 Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development												
Ancilliary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development												
Remarks:												
Development Support												
Software Development				0.500		0.401		0.376				
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support				0.500		0.401		0.376				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4			Program Element PE 0603709D8Z				JAUS					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
DT												
IOT&E												
Initial Verification Testing				0.200		0.200		0.200				
Subtotal T&E				0.200		0.200		0.200				
Remarks:												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support				0.100		0.100		0.100				
Program Management Personnel				0.050		0.050		0.050				
Travel				0.025		0.025		0.025				
Labor (Research Personnel)												
Miscellaneous				0.125		0.125		0.125				
Subtotal Management				0.300		0.300		0.300				
Remarks:												
Total Cost				1.000		0.901		0.876				
Remarks:												

Exhibit R-4, Schedule Profile																																	Date: February 2003			
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4									Program Element Number and Name PE 0603709D8Z – Joint Robotics Program																				Project Number and Name JAUS							
Fiscal Year	2001				2002				2003				2004				2005				2006				2007				2008				2009			
	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	1	2	3	4	1	2	3	4
Acquisition Milestones																																				
Reference Architecture Specification									▲																											
Domain Model								Version 3.0			▲																									
JAUGS Working Group SOP										Version 3.0																										
Demonstration & Validation							▲																													
Commercial Standards							Version 1.3		▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬												
									▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬

R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail								Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4	Program Element Number and Name PE 0603708DZ Joint Robotics Program					Project Number and Name JAUS		
Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
SOP			1Q					
RA V3.0			1Q					
DM V3.0			3Q					
Developmental Evaluation			Cont.	Cont.	Cont.			

R-4a Schedule Profile - Item No. 20-4 of 20-4

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
GLADIATOR	1.120	2.105	1.140	1.140	1.152	1.220	1.090	1.211

A. Mission Description and Budget Item Justification:

The Gladiator Program is a USMC initiative based on the Joint Army-Marine Corps Tactical Unmanned Vehicle (TUV) ORD originated by the U.S. Army Infantry School. Mission Need Statement (MNS) INT 12.1.1 (dated 4 November 1993) validated the need for a tactical unmanned ground vehicle system, and the ORD was approved by the Army in August 1995 and by the Marine Corps in May 1996. Changes in Service deficiencies and required capabilities have led both Services to reevaluate the existing ORD and to initiate efforts to revise it or to approve new requirements documents for robotic systems supporting the tactical commander. The Marine Corps has drafted the Gladiator ORD to support the dismounted infantry of the Marine Ground Combat Element (GCE) with the organic unmanned capability to remote combat tasks including scout/surveillance. The system will reduce risk and neutralize threats to Marines across the full spectrum of conflict and military operations. Gladiator formal requirement document is in final staffing within the Marine Corps. The Gladiator is a teleoperated/semi-autonomous, small-to-medium sized, highly mobile UGV with, initially, the basic capability to conduct scout/surveillance missions and to carry various mission payloads for specific tasks. It will be inherently simple, durable, multi-functional, and easily transported. In the conduct of Operational Maneuver From The Sea (OMFTS), Ship To Objective Maneuver (STOM), Sustained Operations Ashore (SOA), and Operations Other Than War (OOTW), the Gladiator will enhance the ability to accomplish assigned missions. Operating just forward of the GCE units, Gladiator will perform basic scouting/surveillance, obstacle breaching, and NBC reconnaissance tasks while permitting the operator to remain covered or concealed. The basic Marine Corps system will consist of a mobile base unit (MBU), an OCU, and specific mission payload modules (MPMs). Initial MPMs will include Joint Chemical Agent Detector (JCAD), Anti-Personnel Obstacle Breaching System (APOBS), and direct fire (lethal and non-lethal) weapons.

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	1.120			
RDT&E Articles Quantity * (as applicable)				

- Awarded four (4) BAA contracts for Gladiator Technology Demonstration Models (TDMs).
- Integrated non-lethal payloads and obscurant dispenser.
- Integrated improved OCU functions including map display.
- Completed safety testing.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost		2.105		
RDT&E Articles Quantity * (as applicable)				

- Complete TDM evaluation and down-select to two contractors.
- Integrate NBC module on Concept Validation Models (CVMs).
- Complete early user evaluation of CVMs.

- Coordinate Gladiator requirements and program plans with the Future Combat System Program.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost			1.140	
RDT&E Articles Quantity * (as applicable)				

- Complete Detailed Design of Gladiator.
- Complete Future Naval Capability demonstrations.
- Prepare Milestone B documentation.
- Obtain Milestone B approval, initiate System Design and Development (SDD).

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost				1.140
RDT&E Articles Quantity * (as applicable)				

- Complete Log Demo.
- Initiate and complete Development Test.
- Begin Operational Test

C. Other Program Funding Summary:
Gladiator is a cooperative program of the Office of Naval Research and the DoD Joint Robotics Program. The ONR is responsible for funding the major portion of the technology demonstration, while the JRP continues to manage the Gladiator program through SDD to production in support of Marine Corps requirements. FNC funding, under Autonomous Operations is:
FY2002 5.0million
FY2003 2.5million
FY2004 1.5million

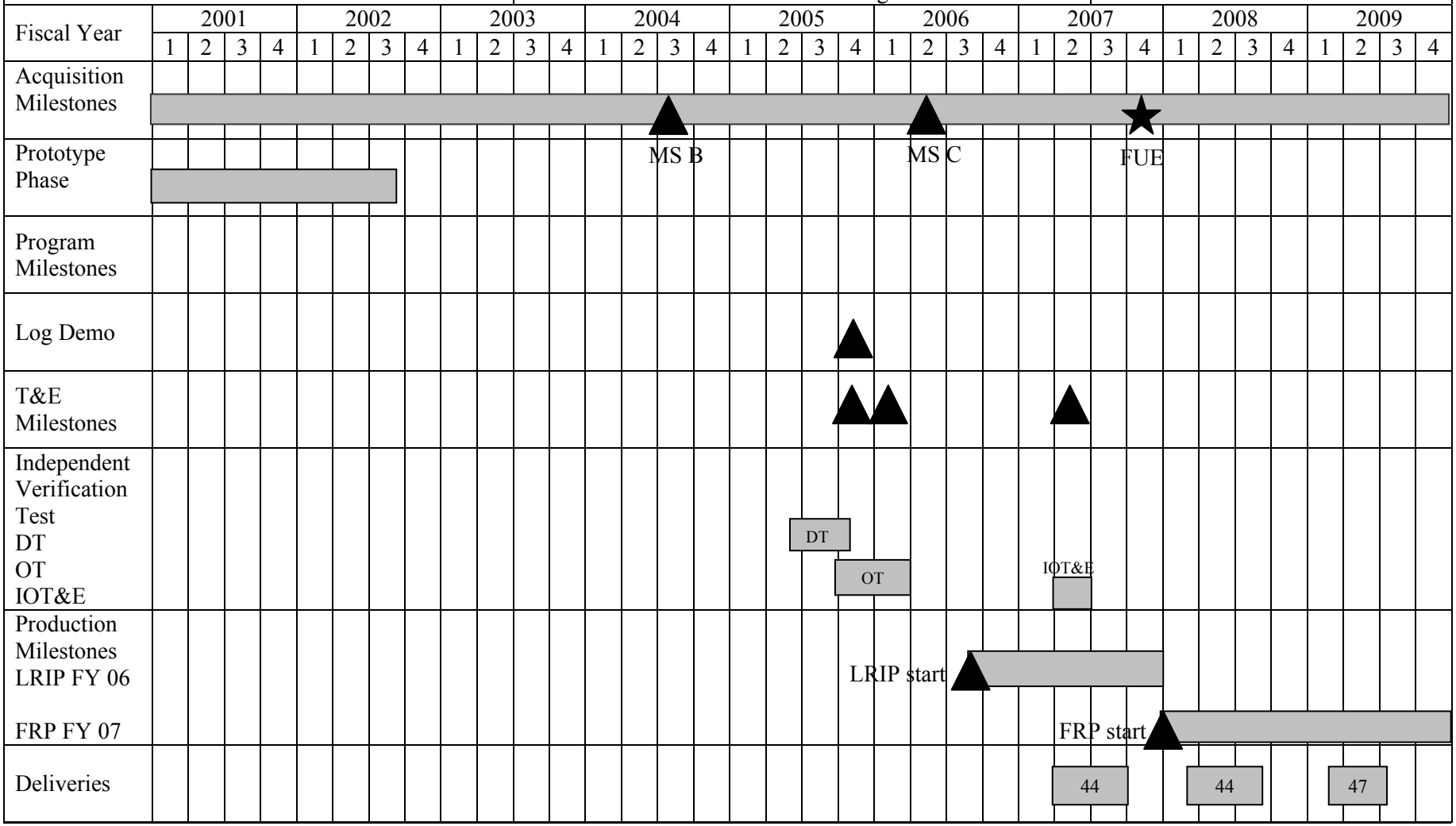
D. Acquisition Strategy:
Not Applicable

E. Major Performers:
Not Applicable

Exhibit R-3 Cost Analysis (page 1)								Date:	February 2003				
DEFENSE-WIDE			Program Element					GLADIATOR					
BUDGET ACTIVITY 4			PE 0603709D8Z										
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development				0.315		1.373		0.373				
Ancilliary Hardware Development												
Systems Engineering				0.148		0.095		0.095				
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development				0.463		1.468		0.468				
Remarks:												
Development Support				0.040		0.172		0.172				
Software Development				0.075								
Training Development				0.050		0.095		0.095				
Integrated Logistics Support				0.025								
Configuration Management				0.055								
Technical Data												
GFE												
Subtotal Support				0.245		0.267		0.267				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4			Program Element PE 0603709D8Z				GLADIATOR					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
DT												
IOT&E												
Initial Verification Testing				0.130		0.135		0.135				
Subtotal T&E				0.130		0.135		0.135				
Remarks:												
Contractor Engineering Support				0.067		0.070		0.070				
Government Engineering Support				0.120		0.120		0.120				
Program Management Support				0.080		0.080		0.080				
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Miscellaneous												
Subtotal Management				0.267		0.270		0.270				
Remarks:												
Total Cost			1.320	2.105		1.140		1.140				
Remarks:												

Exhibit R-4, Schedule Profile			Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #5		Program Element Number and Name PE 0603709D8Z – Joint Robotics Program	Project Number and Name GLADIATOR



R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail		Date: February 2003
Appropriation/Budget Activity Research, Development, Test & Evaluation, Defense-Wide, Budget Activity 4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program	Project Number and Name Gladiator

Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Milestone A								
Contract Preparation		1-2Q						
CTD Contract Award		2Q						
CTD		2-4Q	1-4Q					
Milestone B				3Q				
Contract Preparation				2-4Q				
SDD Contract Award				4Q				
SDD				3-4Q	1-4Q			
Developmental Test					3-4Q			
Log Demo					4Q			
Operational Test					4Q	1Q		
Milestone C						2Q		
Low Rate Initial Production						2Q		
IOT&E							2Q	
Full Rate Production							4Q	
First Unit Equipped							4Q	

R-4a Schedule Profile - Item No. 20-4 of 20-4

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
RCSS	2.040	2.318	1.058	1.060	1.100	1.120	1.094	1.120

A. Mission Description and Budget Item Justification:

The Robotic Combat Support System (RCSS) Program is an upgrade approach from the Product Improved Mini-Flail (PIMF). The PIMF has proven effective in Bosnia and Kosovo, as well as in current operation in Afghanistan, as a contingency asset. RCSS threshold requirements include anti-personnel mine clearing and neutralization, improved reliability and human-machine interface, Anti-Personnel wire obstacle breaching, remotely deployed smoke and obscurants, and the capability to carry soldier loads. P3I requirements include advanced controls, remotely delivered special munitions to support dismounted operations, hands-free control using dismounted soldier leader-follower technology, and mechanical devices that will be used to emplace demolitions and special breeching systems. The RCSS Mission Need Statement (MNS) and Operational Requirements Document (ORD) have been approved by Army Training and Doctrine Command (TRADOC).

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	2.040			
RDT&E Articles Quantity * (as applicable)				

- Managed the two RCSS competitive contracts.
- Conducted Initial Verification Testing (IVT) on systems delivered under Concept and Technology Development (CTD) phase.
- Delivered six (6) Product Improved Mini-Flails (RCSS prototype systems) for support to Operation Enduring Freedom. (Army contingency operation funds).
- Began preparation of Milestone B documentation.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost		2.318		
RDT&E Articles Quantity * (as applicable)				

- Complete evaluation of CTD contract efforts.
- Obtain Milestone B approval, initiate System Design and Development (SDD).
- Award SDD contract.
- Begin delivery of Developmental Test (DT) assets.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost			1.055	
RDT&E Articles Quantity * (as applicable)				

- Initiate Block Upgrade program for increased autonomy.
- Initiate new mission payload integration.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost				1.065
RDT&E Articles Quantity * (as applicable)				

- Continue autonomous enhancement Block Upgrade program.
- Continue Mission Payload Integration program.

C. Other Program Funding Summary:
Funding for procurement of prototype (Mini-Flail) systems in response to Operation Enduring Freedom requirements.

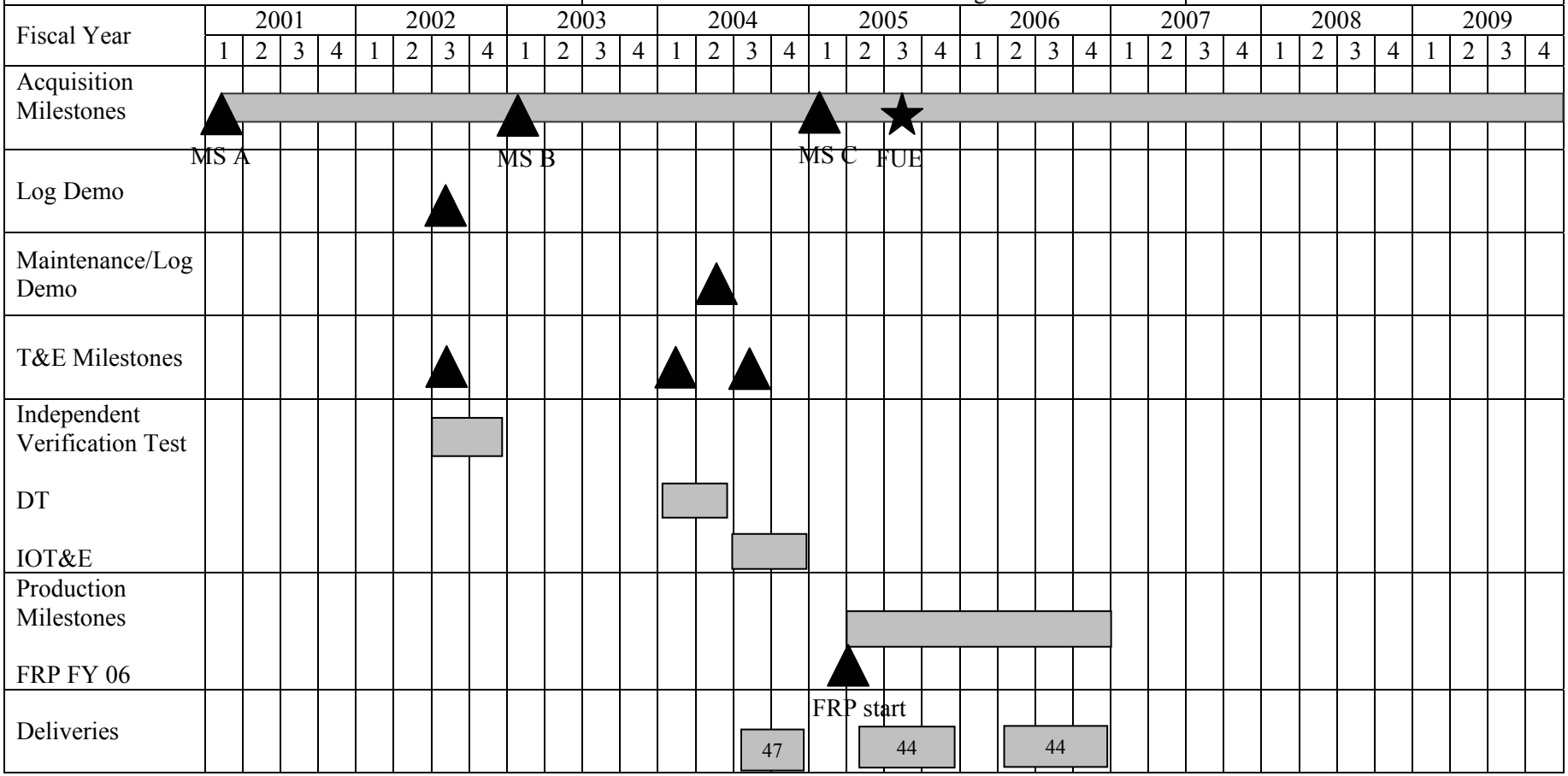
D. Acquisition Strategy:
Not Applicable

E. Major Performers:
- Science & Engineering Services, Inc. (SESI) $3.579million
- MESA Associates, Inc.$1.778million

Exhibit R-3 Cost Analysis (page 1)								Date:	February 2003				
DEFENSE-WIDE			Program Element					RCSS					
BUDGET ACTIVITY 4			PE 0603709D8Z										
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development				1.230		0.284		0.284				
Ancilliary Hardware Development												
Systems Engineering				0.446		0.142		0.142				
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development				1.676		0.426		0.426				
Remarks:												
Development Support				0.040		0.002		0.002				
Software Development				0.075		0.062		0.062				
Training Development				0.050		0.030		0.030				
Integrated Logistics Support				0.025		0.025		0.025				
Configuration Management				0.055		0.025		0.025				
Technical Data												
GFE												
Subtotal Support				0.245		0.144		0.144				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4			Program Element PE 0603709D8Z				RCSS					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
DT						0.288		0.288				
IOT&E												
Initial Verification Testing				0.130								
Subtotal T&E				0.130		0.288		0.288				
Remarks:												
Contractor Engineering Support				0.067		0.063		0.065				
Government Engineering Support				0.120		0.074		0.074				
Program Management Support				0.080		0.063		0.065				
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Miscellaneous												
Subtotal Management				0.267		0.200		0.202				
Remarks:												
Total Cost			2.040	2.318		1.058		1.060				
Remarks:												

Exhibit R-4, Schedule Profile			Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4		Program Element Number and Name PE 0603709D8Z – Joint Robotics Program	Project Number and Name RCSS



R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail		Date: February 2003
Appropriation/Budget Activity Research, Development, Test & Evaluation, Defense-Wide, Budget Activity 4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program	Project Number and Name Robotic Combat Support System (RCSS)

Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Milestone A	1Q							
Contract Preparation	1-4Q	1-4Q	1-4Q					
CTD Contract Award	4Q		1Q					
CTD	4Q	1-4Q	1Q					
Milestone B			1Q					
Contract Preparation		4Q	1Q					
SDD Contract Award			1Q					
SDD			1-4Q	1-4Q				
Developmental Test				1-2Q				
Maintenance/Log Demo				2-3Q				
IOT&E				3-4Q				
Milestone C					1Q			
Full Rate Production					1Q			
First Unit Equipped					3Q			

R-4a Schedule Profile – Item No.

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
MPRS	1.108	2.020	1.058	1.065	1.100	1.123	1.090	1.120

A. Mission Description and Budget Item Justification:

Man-Portable Robotic Systems (MPRS) is an Army program involving the U.S. Army Maneuver Support Center (MANSCEN), U.S. Army Infantry Center (USAIC), and the U.S. Army Special Operations Command (SOCOM). A Joint Operational Requirements Document (ORD) is being developed to provide small, man-portable, unmanned ground vehicles to support mission needs in the following areas: Building Reconnaissance, Route Reconnaissance, Vehicle Inspection, Forward Observation/Listening Post, Trip Wire/Booby Trap Detection, Remote Resupply, Move/Carry Equipment, Personnel Evacuation, and Door/Wall Breaching. These mission needs will be typical during Military Operations in Urban Terrain (MOUT). MPRS is a low risk acquisition program which leverages existing UGV technologies as an integral part of the development process to mitigate performance risk. The MPRS program is coordinating its efforts to meet the goal of the Future Combat Systems (FCS). Prototype MPRS systems have been provided for contingency operations to support urgent requirements. MPRS has also been provided to the National Guard to support the Civil Support Teams (CST) as contingency assets. The CSTs are first responders during weapons of mass destruction threats.

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	1.108			
RDT&E Articles Quantity * (as applicable)				

- Supported the Army Maneuver Support Center (MANSCEN), the Army Infantry Center (USAIC), and the Special Operations Command (SOCOM) develop the Joint MPRS ORD.
- Conducted simulation for requirements determination and characterization of small UGVs at Ft. Benning Simulation Center.
- Completed the Cybernet Phase II SBIR on a Wearable Operator Control Unit. Awarded Phase II extension.
- Continued to support the deployment of MATILDA (prototype systems) to CSTs.
- Procured 20 prototype systems for support to Operation Enduring Freedom. (Army contingency operation funds)
- Formally transferred the DARPA Tactical Mobile Robot (TMR) program technologies and assets into the JRP. Established a Small Robot Pool to enable technology development.
- Completed the fiber optic dispenser technology for small UGVs.
- Completed Analysis of Alternatives (AoA) simulation and analysis.
- Initiated a teaming concept with the Future Combat System (FCS) Lead System Integrator (LSI).
- Completed Time Domain Systems Phase I SBIR for “Wireless RF Datalink for Small UGVs”.
- Awarded Time Domain Systems Phase II SBIR for “Wireless RF Datalink for Small UGVs”.
- Completed development / integration of a chemical, biological, radiological, nuclear (CBRN) sensor on MPRS prototypes.
- Supported development of the Future Combat Systems (FCS) Soldier UGV (SUGV) Operational Requirements Document (ORD).

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost		2.020		
RDT&E Articles Quantity * (as applicable)				

- Complete AoA, to include Baseline Cost Estimate.
- Complete CTD.
- Prepare MPRS Milestone A documentation.
- Complete user requirements determination.
- Obtain Milestone A approval, initiate Concept Technology Development (CTD).
- Support TMR assets, and User experimentation with robot pool.
- Prepare Milestone B documentation.
- Coordinate SUGV requirements for FCS.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost			1.058	
RDT&E Articles Quantity * (as applicable)				

- Obtain Milestone B approval, initiate System Design and Development (SDD).
- Begin Independent Verification Tests.
- Begin Developmental Tests.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost			-	1.065
RDT&E Articles Quantity * (as applicable)				

- Complete Independent Verification Tests.
- Begin Developmental Tests.
- Begin Initial Operational Test and Evaluation.

C. Other Program Funding Summary:
Funding for procurement of prototype systems in response to Operation Enduring Freedom requirements.

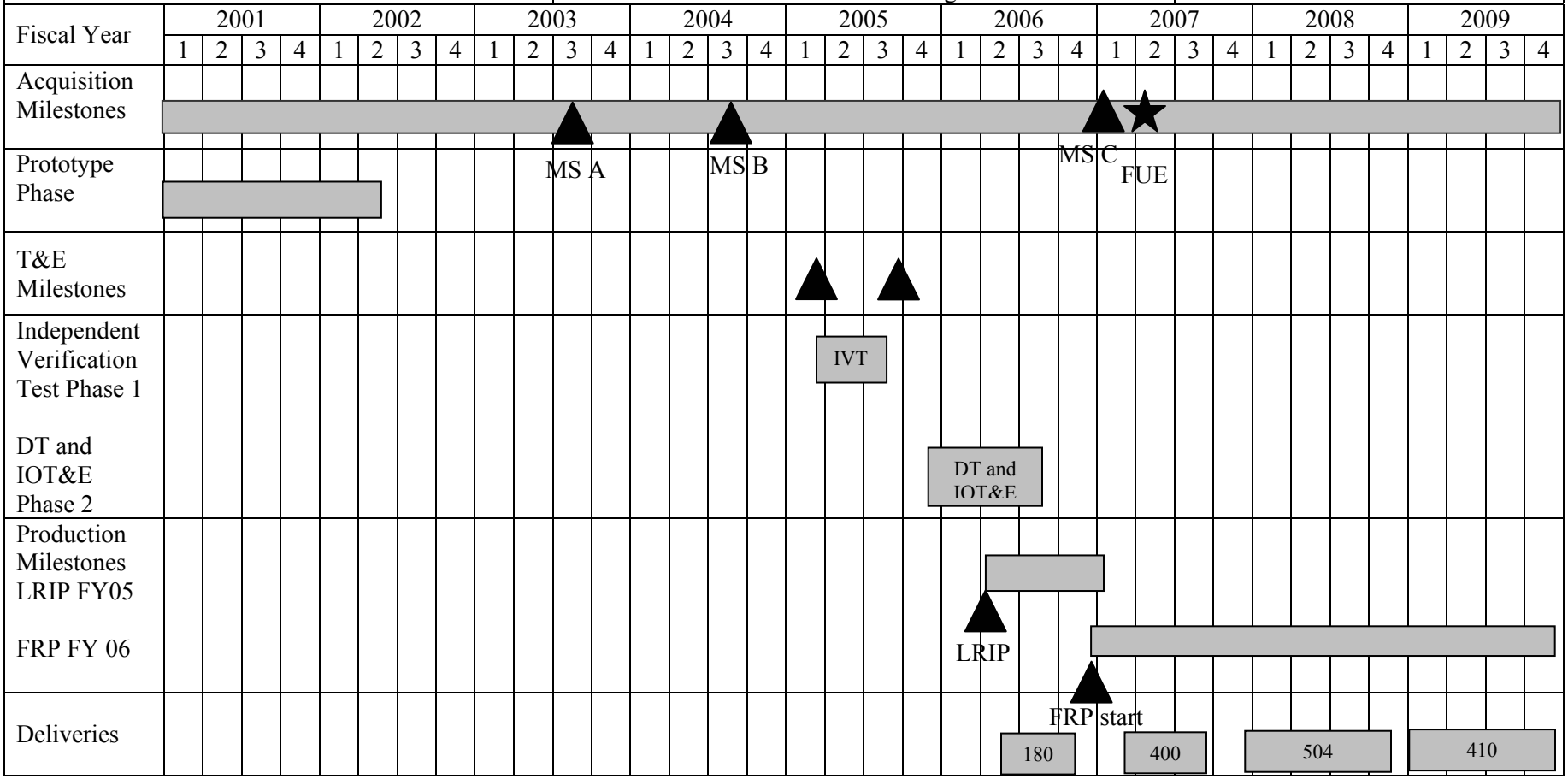
D. Acquisition Strategy:
Not Applicable

E. Major Performers:
Not Applicable

Exhibit R-3 Cost Analysis (page 1)								Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4			Program Element PE 0603709D8Z					MPRS					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development				1.239		0.228		0.235				
Ancilliary Hardware Development												
Systems Engineering				0.144		0.140		0.140				
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development				1.383		0.368		0.375				
Remarks:												
Development Support				0.040		0.045		0.045				
Software Development				0.070		0.086		0.086				
Training Development				0.050		0.050		0.050				
Integrated Logistics Support				0.025		0.035		0.035				
Configuration Management				0.055		0.055		0.055				
Technical Data												
GFE												
Subtotal Support				0.240		0.271		0.271				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)								Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4			Program Element PE 0603709D8Z					MPRS					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
DT												
IOT&E												
Initial Verification Testing				0.130		0.145		0.145				
Subtotal T&E				0.130		0.145		0.145				
Remarks:												
Contractor Engineering Support				0.067		0.070		0.070				
Government Engineering Support				0.120		0.124		0.124				
Program Management Support				0.080		0.080		0.080				
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Miscellaneous												
Subtotal Management				0.267		0.274		0.274				
Remarks:												
Total Cost			10.558	2.020		1.058		1.065				
Remarks:												

Exhibit R-4, Schedule Profile			Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4		Program Element Number and Name PE 0603709D8Z – Joint Robotics Program	Project Number and Name MPRS



R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail		Date: February 2003
Appropriation/Budget Activity Research, Development, Test & Evaluation, Defense-Wide, Budget Activity 4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program	Project Number and Name Manportable Robotics System (MPRS)

Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Milestone A			3Q					
Contract Preparation			2-3Q					
CTD Contract Award			4Q					
CTD		4Q	4Q	1-2Q				
Milestone B				3Q				
Contract Preparation				2-3Q				
SDD Contract Award				3Q				
Independent Verification Test					2-3Q			
Down Select					4Q			
Developmental Evaluation						1-3Q		
IOT&E						1-3Q		
LRIP						2Q		
Milestone C							1Q	
Full Rate Production							1Q	

R-4a Schedule Profile – Item No.

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Intelligent Mobility Program	1.010	1.200	1.148	1.120	1.139	1.420	1.261	1.230

A. Mission Description and Budget Item Justification:

The Intelligent Mobility program is an effort under the U.S. Army Tank-Automotive Research Development and Engineering Center (TARDEC) Intelligent Mobility (IM) Program. Mobility Enhancement will improve the mobility of small unmanned ground vehicles (UGVs) to operate on both improved surfaces and off-road terrain in support of urban warfare, physical security and force protection missions for military police and engineering operations. The Intelligent Mobility program has worked closely with the Center for Self-Organizing and Intelligent Systems (CSOIS) at Utah State University to develop a family of omni-directional vehicles where steering, speed and height of each wheel can be controlled independently maximizing vehicle stability and negotiation of obstacles.

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	1.010	1.200	1.148	1.120
RDT&E Articles Quantity * (as applicable)				

C. Other Program Funding Summary:

Not Applicable

D. Acquisition Strategy:

Not Applicable

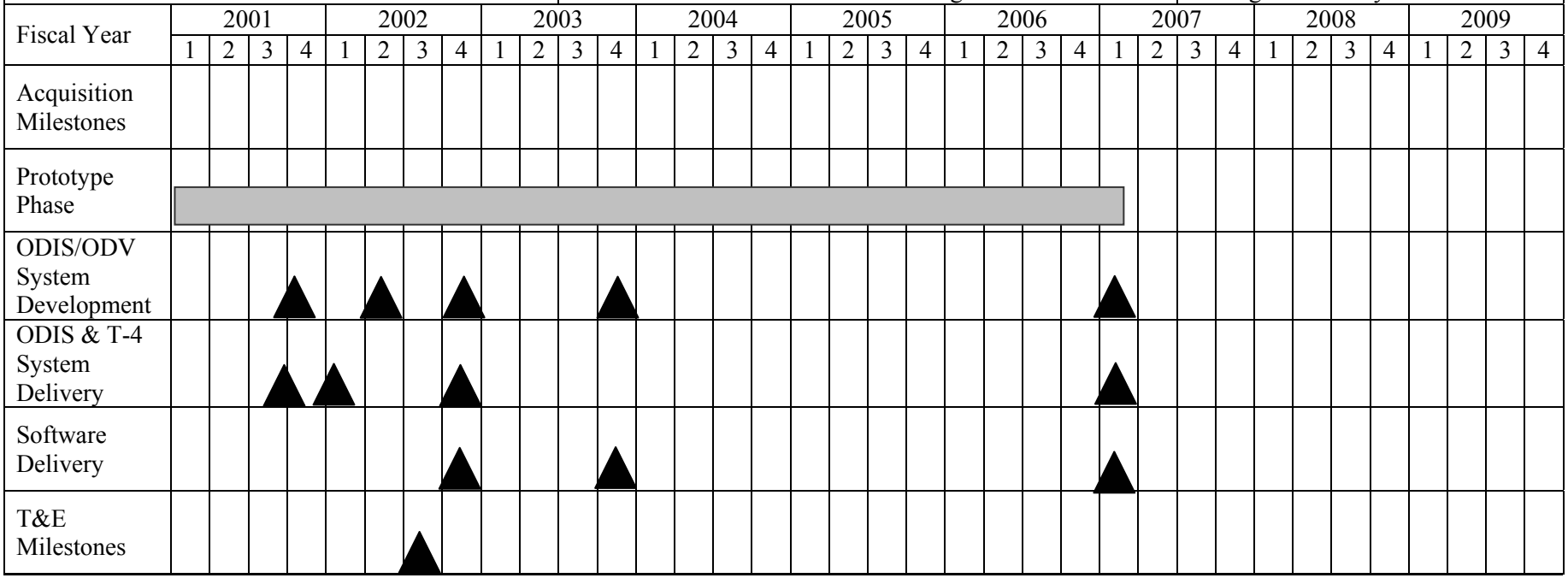
E. Major Performers:

Not Applicable

Exhibit R-3 Cost Analysis (page 1)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4		Program Element PE 0603709D8Z					Intelligent Mobility					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development				0.220		0.223		0.147				
Ancilliary Hardware Development				0.047		0.063		0.049				
Systems Engineering				0.070		0.063		0.033				
Licenses												
Tooling								0.033				
GFE												
Award Fees												
Subtotal Product Development				0.337		0.349		0.262				
Remarks:												
Development Support				0.140		0.063		0.065				
Software Development				0.187		0.089		0.022				
Training Development				0.047		0.062		0.033				
Integrated Logistics Support				0.033		0.032		0.033				
Configuration Management				0.033		0.032		0.065				
Technical Data						0.032		0.131				
GFE												
Subtotal Support				0.440		0.310		0.349				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4		Program Element PE 0603709D8Z					Intelligent Mobility					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
DT												
IOT&E												
User Appraisal				0.150		0.094		0.094				
Subtotal T&E				0.150		0.094		0.094				
Remarks:												
Contractor Engineering Support				0.070		0.063		0.065				
Government Engineering Support				0.045		0.052		0.053				
Program Management Support				0.045		0.052		0.053				
Program Management Personnel				0.045		0.052		0.053				
Travel				0.023		0.052		0.053				
Labor (Research Personnel)				0.045		0.063		0.069				
Miscellaneous						0.061		0.069				
Subtotal Management				0.273		0.395		0.415				
Remarks:												
Total Cost			9.700	1.200		1.148		1.120				

Exhibit R-4, Schedule Profile			Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4	Program Element Number and Name PE 0603709D8Z – Joint Robotics Program		Project Number and Name Intelligent Mobility



R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail		Date: February 2003
Appropriation/Budget Activity RDT&E, Defense Wide, Budget Activity 4	Program Element Number and Name PE 0603709D8Z	Project Number and Name Intelligent Mobility

Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Contract Preparation	1Q	2Q	1Q	1Q	1Q	1Q	1Q	
System Development	2-4Q	3-4Q	2-4Q	3Q	4Q	3Q	3Q	
Quality Design and Build	4Q	1Q	4Q	4Q	3Q	4Q	4Q	
Developmental (PD&RR) Technical Testing		4Q	1Q		2Q		4Q	
Developmental Evaluation			1Q		3Q		4Q	
Etc.								

R-4a Schedule Profile - Item No. 20-4 of 20-4

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
RACS	3.800	5.200	5.220	5.520	5.310	5.326	5.280	5.290

A. Mission Description and Budget Item Justification:

The Robotics for Agile Combat Support (RACS) is a USAF effort to advance the robotic state-of-the-art capability for counter-terrorism and force protection technologies. RACS programs include the following: Advancements for the All-purpose Remote Transport System (ARTS), Advanced Systems and Control, Active Range Clearance, Force Protection Robotics, and the Next Generation Explosive Ordnance Disposal Remote Control Vehicle (NGEODRCV). The basic platform for the ARTS has been formally transitioned to a Systems Program Office (SPO) for production and sustainment. Future improvements and advancements will enhance the control and payload capabilities for this system. This technology has been applied to Formerly Used Defense Sites (FUDS) and active range clearance for cleanup/disposal.

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	3.800	5.200	5.220	5.520
RDT&E Articles Quantity * (as applicable)				

Advancements for ARTS

- Remote Water Cutting System – In cooperation with OST, designed and integrated a commercial water cutting tool as an ARTS deployable asset to aid EOD troops ability to access and attack Weapons of Mass Destruction. Transitioned technology to AAC/WMO. In response to the threat of Weapons of Mass Destruction (WMD), this research effort involves the integration of a high pressure, water-cutting system onto a robotic platform. The system will allow EOD technicians to remotely cut into and gain access through several different types of materials. Research consists of: (1) investigating the compatibility of commercially available water-cutting technology with existing robotic systems; (2) determining water-cutter parameters against identified target materials: assessing the capability of recovering test ordnance, and (4) addressing robotic integration issues including power, control, and water capacity. These systems are capable of 30 minutes of cutting time delivering a water jet at between 5,000 – 7,500 PSI combined with a sand aggregate that can penetrate several inches of metal. These systems are operated via the ARTS RF link giving the operator a standoff of up to 3 miles. Completed a limited operational user evaluation. Planned integration of a smaller system with a higher PSI. Planned transition of both systems to System Program Office in FY2004 with production scheduled for FY 2005-2006.
- Alternate Control System (ACS) – An alternative to RF broadcasting was required for fielded ARTS within the Pacific Air Force Bases due to restrictions posed by the host countries of Japan and Korea. The ACS provides a one-mile fiber optic control tether between the operator control station and the ARTS. Six ACS systems were developed for distribution to 5 overseas locations. A technology transition package has been delivered to the SPO for production to the fleet. Leveraged from JPO, developed and transitioned a 1-mile fiber optic system for deployment to Pacific Air Forces (PACAF) ARTS fleet to answer urgent and compelling need to operate the ARTS with a non-radio frequency communication package.
- Deployed Nozzle – This effort integrated and demonstrated an articulated fire-fighting nozzle mounted and controlled on the ARTS to aid fire fighter in crash/rescue mission for large aircraft fires. This tool allows a link between a fire fighting support vehicle or a stationary supply of firefighting agent to this remotely operated platform. This gives an operator the ability to bring 500 gallons per minute to aid in fire fighting

applications from a safe standoff distance. The platform utilizes a pan/tilt function to aim the nozzle while fighting the fire rather than moving the robotic platform. AFRL has, on several occasions, successfully demonstrated this capability. Future efforts will integrate infrared (IR) and other sensor technologies.

- ARMS (Articulated Remote Manipulation System – Sponsored in cooperation with the Combating Terrorism Technology Support Office, Technical Support Working Group (TSWG), this effort is a joint research project between AFRL and the Bureau of Alcohol, Tobacco and Firearms (ATF). Research efforts are envisioned to design an unmanned manipulator system capable of remotely excavating, recovering, and dismantling Weapons of Mass Destruction (WMD), and providing defense against counter-terrorism measures. This effort is based on the lessons learned from the ARMS I program which provided a prototype capability to 96 CEG/CED, Eglin AFB, FL. AFRL and AAC/WMO are currently supporting an Operational Utility Evaluation of a prototype ARMS II by the 436 Civil Engineering Squadron, Dover AFB, DE, for use in Port Mortuary support operations, specifically the elimination of explosive hazards associated with the processing of human remains through the Port Mortuary. This evaluation began in December 2002 and will continue for one year.

Active Range Clearance

- Automated Ordnance Excavator (AOE) – This research effort is to develop technologies that can be integrated into an autonomous excavator. To accomplish this goal, technologies must be developed that address the essential mission elements. The development path for this technology is a four-step process: 1. automated digging, 2. independent boom/stick motion, 3. independent machine mobility, and 4. independent work planning and analysis. A contract has been awarded to Caterpillar, Inc. to develop the 1st stage technology, an Auto-dig Mission Planning Module (AMPM) for the AOE. The AMPM is a JAUS compatible electronics module that will take telemetry data from the AOE, process the data to calculate the boom, stick, and bucket motion paths, and return the motion commands to the AOE for execution. Future efforts will concentrate on the completion of stage 2-4 technologies.
- Remote Standoff Munitions Disruption System (SMUD) – Sponsored in cooperation with the Office of Special Technology EOD Low Intensity Conflict Office, this effort is for EOD personnel of the Air Force and Marines. This research effort consists of integrating a Telepresent Rapid Aiming Platform (TRAP) from Precision Remotes to the ARTS platform to provide EOD personnel the remote capability of detonating, disrupting, or deflagrating small ordnance at safe distances, thereby taking the EOD technician out of harms way. This effort will provide two prototype systems, one for the USMC that incorporates the Barrett .50 caliber and 7.62 mm Designated Marksmanship Rifle (DMR) and another to the USAF with the Barrett .50 caliber and 5.56mm rifles. These systems provide remote capability to bring to bear 7.62mm or .50 caliber rifle against surface scatterable munitions. Integrating visual optics and current pan/tilt technology, this technology removes the EOD technician out-of-harms way to perform clearance of high threat submunitions currently being validated on CONUS ranges while practice for wartime clearance procedures. A low cost laboratory demonstrator version of a AR-10, 7.62mm rifle has been developed and limited testing performed. Transition planned late FY03. Tele-operated Remote Aiming Platform: TRAP is a future P^3I effort that is contained in the CE Readiness Modernization Roadmap and is scheduled to undergo system design and development (SDD) in FY2004 with production to follow in FY2005.
- Charge Setting System (CSS) – An alternative to the SMUD technique where a downrange hazard might not allow the shooting of projectiles, the CSS provides a remote placement capability of C-4 explosive charges. This is an evolutionary development to improve speed. Planned testing of prototype in FY03 to include global positioning add-ons. Draft TTP submitted to SPO. AFRL has completed initial design studies and fabricated a prototype for field evaluation. The Air Force recently approved a temporary modification to an operational ARTS for development of a Concept of Operations (CONOP) and further evaluation of this capability. A Technology Transition Plan is in draft and AAC/WMO is coordinating with AFRL to fabricate two test articles to support the field evaluation.
- J-LONS (Joint Laser Ordnance Neutralization System) – This effort is to develop and validate a remotely operated modular laser system for standoff UXO/IED neutralization capability. Laser technology has been identified as a viable method of clearing areas clear of UXO by

rapidly heating the explosive filler to point of detonation. It may also prove to be a method to gain access and disposal to IEDs. Phase I investigated two similar CO2 types of lasers: (1) a radial array prototype to reduce weight and power requirements, and (2) a commercial slab laser with application to a mobile platform. Phase II (Concept Demonstration) will validate laser effectiveness in neutralizing ordnance, while integrating commercial off-the-shelf technologies. Phase III (Prototype Demonstration) will integrate the optimal laser system onto a mobile unmanned platform.

- Power Rake – This effort is sponsored in cooperation with HQ ACC/CEX for the Air Force Airborne Engineer initiative. The Power Rake is a military munitions clearance tool developed for use on the ARTS robot. The Power Rake will remove or detonate sub-munitions and anti-personnel mines for the purpose of small area-clearance, lane proofing, and active range clearance. The research goals for this effort are: 1. Investigate the available COTS equipment that is capable of performing this task. 2. Develop and integrate a lightweight armor package for the Power Rake attachment. 3. Characterize the system performance including: explosives resistance, operational capabilities, and system reliability. This effort will provide two proof-of-concept systems for testing and evaluation.

Advanced Robotics System

- The primary effort is to develop common architecture designs for autonomous vehicle technologies that focus on vehicle mobility, speed, and control, as well as multi-vehicle operations and marsupial control. This program seeks to develop and document these modular designs within the evolving JAUS Standards. Specifically the program addresses: (1) vehicle position; (2) sensors; (3) path planning; (4) path execution; (5) vehicle control, and (6) obstacle detection and avoidance. Multi-vehicle and marsupial control technologies are described below. Technologies being investigated are position/mapping (GPS/INS, Dual antenna GPS, dead-reckoning), Advanced Operator Control Unit (laptop/PDA), obstacle detection and avoidance, mobile communications (droppable repeaters) and support for the OSD Joint Architecture for Unmanned Systems (JAUS).

Next Generation Explosive Ordnance Disposal Remote Control Vehicle (NGEODRCV)

- This development is a cradle-to-grave endeavor to produce the next EOD robotic system. Today there are several independent robotic systems (OCU and VCU) throughout DOD, other government agencies and local law enforcement communities. A joint-led effort with the Technical Support Working Group (TSWG), this effort will cumulate all requirements from all participants, develop identified/prioritized modular technologies, and culminate into final production systems.

Force Protection Robotics

- REDCAR (REmote Detection Challenge And Response system) – The Remote Detection, Challenge, and Response System (REDCAR) is an Air Force, Force Protection Battlelab (AFFB) Initiative to demonstrate the benefits of unmanned systems for the security force mission. The program focuses on the application of mobile unmanned ground systems to support and augment security force personnel in the perimeter defense of Air Force installations and forward deployed units. The AFRL REDCAR system will consist of a network of robotic platforms integrated with existing security force sensors and Tactical, Area Security System (TASS). The REDCAR system will have limited simulation and modeling capabilities to interact with the current AFFPB modeling systems. All components and platforms in the REDCAR system will be capable of communication using JAUS (Joint Architecture for Unmanned Systems) for system interoperability and control.
- Defense Threat Reduction Agency (DTRA) – DTRA's Integrated Technology Demonstration puts to use Department of Defense (DoD) technology and Federal Emergency Management Agency (FEMA) training exercises to provide possible real-world terrorist scenarios. One such scenario is the CHER-CAP Exercise, which is scheduled for February 2003 in Northwest Florida. With the close location of many area DoD laboratories and their missions within the DoD, existing priorities and funding will be leveraged with the FEMA exercise scenario. The DTRA Combating Terrorism Program will benefit greatly from this opportunity as it will be able to test DoD technologies that are relevant to

a variety of threats to DoD forces and assets in the US and abroad. Participating agencies and organizations include: (1) Defense Threat Reduction Agency Technology Directorate (DTRA/TD); (2) Air Force Research Laboratory Airbase Technologies Division (AFRL/MLQ); (3) Naval Coastal Systems Station (CSS); (4) Air Force Civil Engineer Support Agency (AFCESA); (5) Florida State University Panama City (FSU-PC); (6) Local Emergency Planning Committee, Florida District 1 (LEPC); and (7) Federal Emergency Management Agency (FEMA). Northwest Florida's Comprehensive HAZMAT Emergency Response Capability Assessment Program (CHER-CAP Exercise), will be demonstrating and integrating the following technologies: (1) Port Occurrence Response Training System (PORTS) for exercise planning and documentation tools; (2) Networked Sensor/C2 System for a deployable sensor network; (3) Common Command and Control for Unmanned Systems for unmanned vehicle/platform utilization; and (4) Underwater Forensic Protocol for Forensic and investigation procedure development.

- STORK – The STORK Initiative is a program being developed to (1) outfit an Unmanned Aerial Vehicle (UAV) with a communications suite needed to remotely control an Unmanned Ground Vehicle (UGV) and its sensors beyond current system ranges of UGV Ground Control Station; (2) to prove a UAV can deliver a UGV into an area needed during urban operations; and (3) to show UAV/UGV integration can provide persistent target information for Intelligence Preparation of the Battlespace. The STORK Initiative will include the following robotic platforms a Matilda UGV and EEL UGV's and a Sentry HP UAV. Demonstration of these capabilities will occur in March 2003.

C. Other Program Funding Summary:

Not Applicable

D. Acquisition Strategy:

Technology transition plans are developed when concept demonstration phases begin. The TTP identifies how and when the technology will transfer from AFRL/MLQ to AAC/WMO (or some other EMD/fielding office). This is the same for every initiative under development. The primary user (typically Air Combat Command) allocates AF POM funding in anticipation/coordination of the TTP for transition to 6.4 and production dollars. Some projects are leveraged with other sponsoring agencies (e.g. Technical Support Working Group) that have their own technology transition office that offers a secondary avenue for an acquisition strategy to reach other federal agencies. A third strategy involves the documentation and drawings that can be offered to industry as a build-to-print option as was the case with the All-purpose Remote Transport System

E. Major Performers:

Not Applicable

Exhibit R-3 Cost Analysis (page 1)							Date:	February 2003				
DEFENSE-WIDE			Program Element				RACS					
BUDGET ACTIVITY 4			PE 0603709D8Z									
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development				0.870		0.530		0.610				
Ancilliary Hardware Development				0.370		0.620		0.640				
Systems Engineering				0.370		0.620		0.640				
Licenses												
Tooling												
GFE												
Award Fees				0.130		0.130		0.130				
Subtotal Product Development				1.740		1.890		2.030				
Remarks:												
Development Support				0.440		0.230		0.270				
Software Development				0.440		0.230		0.270				
Training Development				0.060		0.100		0.100				
Integrated Logistics Support												
Configuration Management												
Technical Data				0.130		0.220		0.230				
GFE												
Subtotal Support				1.070		0.780		0.860				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4			Program Element PE 0603709D8Z				RACS					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
DT				0.480		0.370		0.320				
IOT&E												
Initial Verification Testing												
Subtotal T&E				0.480		0.370		0.320				
Remarks:												
Contractor Engineering Support				0.670		0.110		0.170				
Government Engineering Support				0.250		0.420		0.440				
Program Management Support				0.310		0.520		0.540				
Program Management Personnel				0.230		0.380		0.400				
Travel				0.230		0.380		0.400				
Labor (Research Personnel)				0.110		0.180		0.190				
Miscellaneous				0.110		0.180		0.180				
Subtotal Management				1.910		2.180		2.310				
Remarks:												
Total Cost			33.900	5.200		5.220		5.520				
Remarks:												

Exhibit R-4, Schedule Profile																																	Date: February 2003			
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4									Program Element Number and Name PE 0603709D8Z – Joint Robotics Program																				Project Number and Name RACS – Advancements for ARTS			
Fiscal Year	2001				2002				2003				2004				2005				2006				2007				2008				2009			
	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	1	2	3	4	1	2	3	4
Acquisition Milestones			MS A				MS B				MS A				MS B				MS A	MS C							MS C										
Prototype Phase																																				
User Evaluation																																				
EMD																																				
Production																																				

R-4 Schedule Profile – Item No. 20-3 of 20-4

Main Programs in Advancements for ARTS

- Remote Water Cutting System
- Alternate Control System
- Deployed Nozzle
- Articulated Remote Manipulation System

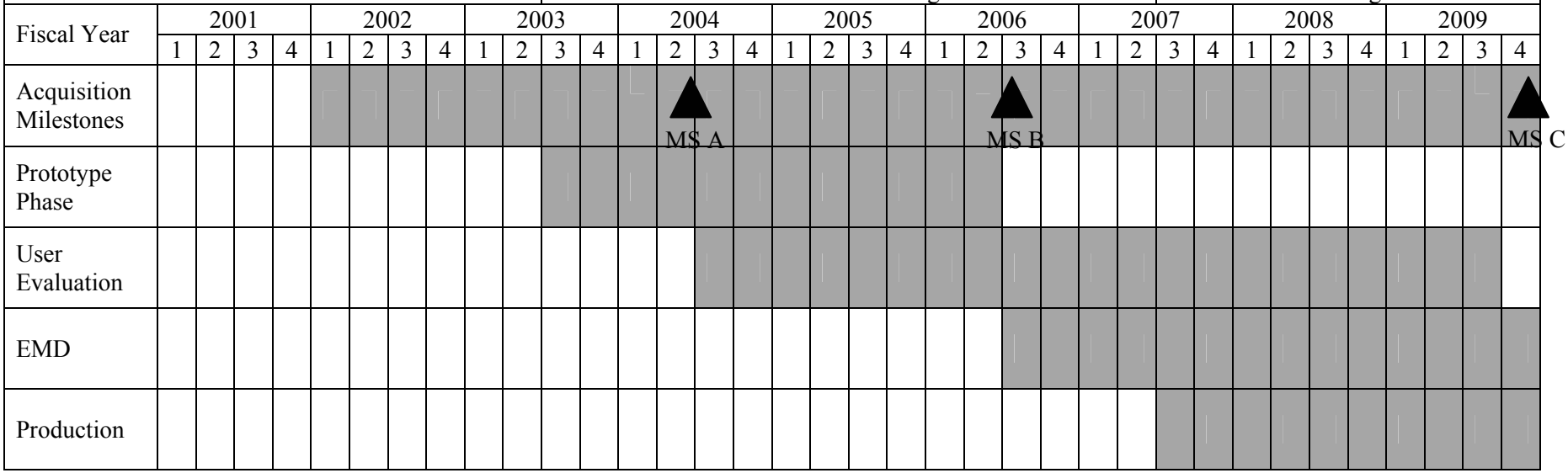
Exhibit R-4a, Schedule Detail		Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E BA #4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program	Project Number and Name RACS – Advancements for ARTS

Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Concept Design	1Q							
Hardware Procurement	2Q							
Quality Design and Build	3Q							
Developmental (PD&RR) Technical Testing	3Q							
Transition to System Program Office		4Q						
Developmental (User) Evaluation		4Q						
EMD				4Q				
Production						1Q		

Main Programs in Advancements for ARTS

- Remote Water Cutting System
- Alternate Control System
- Deployed Nozzle
- Articulated Remote Manipulation System

Exhibit R-4, Schedule Profile			Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4	Program Element Number and Name PE 0603709D8Z – Joint Robotics Program		Project Number and Name RACS – Active Range Clearance



R-4 Schedule Profile – Item No. 20-3 of 20-4

Main Programs within Active Range Clearance

- Automated Ordnance Excavator
- Remote Standoff Munitions Disruption System
- Charge Setting System
- Joint Laser Ordnance Neutralization System
- Power Rake

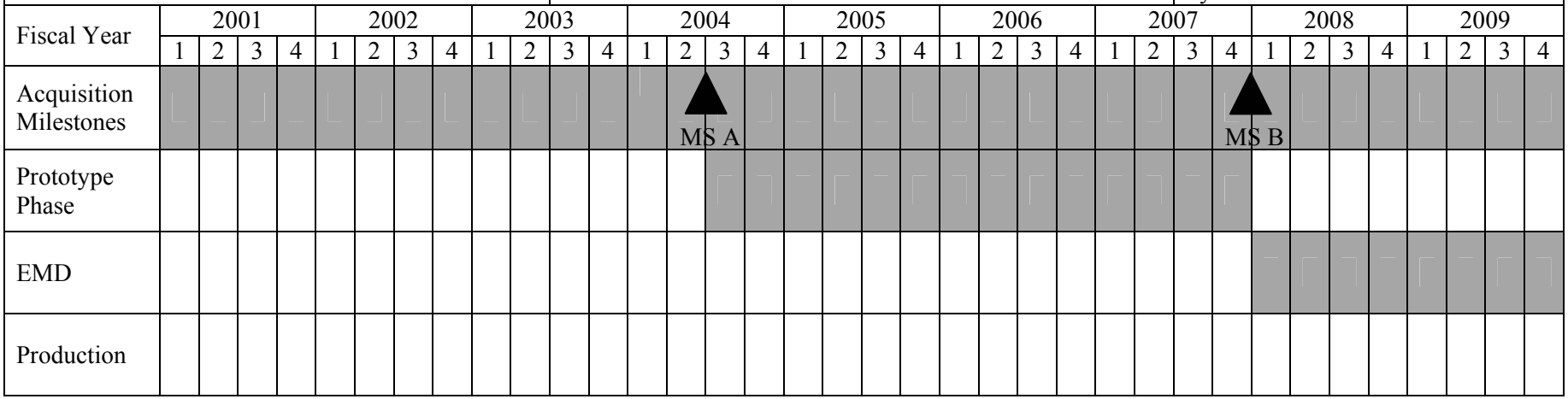
Exhibit R-4a, Schedule Detail								Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E BA #4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program					Project Number and Name RACS – Active Range Clearance		
Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Concept Design		1Q						
Hardware Procurement		2Q						
Quality Design and Build			3Q					
Developmental (PD&RR) Technical Testing			4Q					
Transition to System Program Office				2Q				
Developmental (User) Evaluation				3Q				
EMD						3Q		
Production							3Q	

R-4a Schedule Profile - Item No. 20-4 of 20-4

Main Programs within Active Range Clearance

- Automated Ordnance Excavator
- Remote Standoff Munitions Disruption System
- Charge Setting System
- Joint Laser Ordnance Neutralization System
- Power Rake

Exhibit R-4, Schedule Profile			Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4	Program Element Number and Name PE 0603709D8Z – Joint Robotics Program		Project Number and Name RACS – Advanced Robotics Systems



R-4 Schedule Profile – Item No. 20-3 of 20-4

Main Programs include

- Advanced Navigation capabilities
- Object Detection/Avoidance
- Multi-vehicle control
- Marsupial Control
- Path Planning/Execution
- JAUS Compliance, Testing, and Evaluation

Exhibit R-4a, Schedule Detail								Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E BA #4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program				Project Number and Name RACS – Advanced Robotics Systems			
Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Concept Design	1Q							
Hardware Procurement			1Q					
Quality Design and Build					1Q			
Developmental (PD&RR) Technical Testing							1Q	
Transition to System Program Office								1Q
EMD								1Q
Production								

R-4a Schedule Profile - Item No. 20-4 of 20-4

Main Programs include

- Advanced Navigation capabilities
- Object Detection/Avoidance
- Multi-vehicle control
- Marsupial Control
- Path Planning/Execution
- JAUS Compliance, Testing, and Evaluation

Exhibit R-4, Schedule Profile																																	Date: February 2003			
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4													Program Element Number and Name PE 0603709D8Z – Joint Robotics Program																				Project Number and Name RACS – NGEODRCV			
Fiscal Year	2001				2002				2003				2004				2005				2006				2007				2008				2009			
	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	1	2	3	4	1	2	3	4
Acquisition Milestones																								MS B								MS C				
Proto. Phase Evolutionary Development																																				
EMD																																				
Production/ Authorization																																				

R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail		Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E BA #4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program	Project Number and Name RACS – Next Generation Explosive Ordnance Disposal Remote Control Vehicle (NGEODRCV)

Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Concept Design		1Q						
Hardware Procurement			1Q					
Quality Design and Build				1Q				
Developmental (PD&RR) Technical Testing					1Q			
Transition to System Program Office						4Q		
EMD							1Q	
Production								>>

R-4a Schedule Profile - Item No. 20-4 of 20-4

Exhibit R-4, Schedule Profile																																		
																																	Date: February 2003	
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4											Program Element Number and Name PE 0603709D8Z – Joint Robotics Program																Project Number and Name RACS – Force Protection Robotics							
Fiscal Year	2001				2002				2003				2004				2005				2006				2007				2008				2009			
	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	1	2	3	4	1	2	3	4
Acquisition Milestones											MS A																	M$ B								
Prototype Phase																																				
EMD																																				
Production																																				

R-4 Schedule Profile – Item No. 20-3 of 20-4

Main Programs include

REDCAR
DTRA
STORK

Exhibit R-4a, Schedule Detail								Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E BA #4	Program Element Number and Name PE 0603709D8Z Joint Robotics Program				Project Number and Name RACS – Force Protection Robotics			
Schedule Profile	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Concept Design		1Q						
Hardware Procurement			3Q					
Quality Design and Build			4Q					
Developmental (PD&RR) Technical Testing		4Q		1Q				
Transition to System Program Office					4Q			
EMD							3Q	
Production								

R-4a Schedule Profile - Item No. 20-4 of 20-4

Main Programs include

REDCAR
DTRA
STORK

Exhibit R-2a, RDT&E Budget Item Justification							Date: February 2003	
APPROPRIATION/BUDGET ACTIVITY DEFENSE WIDE RDT&E BA 4				R-1 ITEM NOMENCLATURE JOINT ROBOTICS PROGRAM PE 0603709D8Z				
COST ($ in millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
COTS	0.000	4.000	0.200	0.200	0.200	0.000	0.000	0.000

A. Mission Description and Budget Item Justification:

The Commercial-off-the-Shelf (COTS) program is new for the JRP. Its purpose is to create a pool of small, mobile robots that will be made available on loan to government agencies, laboratories and universities. The goal of COTS is to assist agencies in defining their requirements, modifying their operational practices, and to make more appropriate acquisitions of unmanned systems. The robots that populate the pool will be COTS systems currently available from several manufacturers. The evaluations and experiments conducted with COTS robots will provide valuable feedback for future small robot developments. In requesting the loan of small robots from COTS, priority will go to Department of Defense, Homeland Security, and Emergency Response users.

B. Accomplishments/Planned Program

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost	0.000			
RDT&E Articles Quantity * (as applicable)				

- No JRP funding was applied to COTS in FY2002.

	FY 2002	FY 2003	FY 2004	FY 2005
Accomplishment/Effort/Subtotal Cost		4.000	0.200	0.200
RDT&E Articles Quantity * (as applicable)				

- Plans for FY2003-2005 are to procure off-the-shelf small robots for loan to government agencies, laboratories, and universities. Several configurations will be procured.
- Provide advice, maintenance, and training to the requesting agencies.
- Continue maintenance, upgrades, and support as required.

C. Other Program Funding Summary:

Not Applicable

D. Acquisition Strategy:

Not Applicable

E. Major Performers:

Not Applicable

Exhibit R-3 Cost Analysis (page 1)							Date:	February 2003				
DEFENSE-WIDE BUDGET ACTIVITY 4		Program Element PE 0603709D8Z					COTS					
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total 2002 Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract
COTS System Procurement				4.000								
Ancilliary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development				4.000		0.000		0.000				
Remarks:												
Development Support												
Software Development												
Training Development												
Integrated Logistics Support						0.200		0.200				
Configuration Management												
Technical Data												
GFE												
Subtotal Support				0.000		0.200		0.200				
Remarks:												

Exhibit R-3 Cost Analysis (page 2)													
DEFENSE-WIDE			Program Element								Date:	February 2003	
BUDGET ACTIVITY 4			PE 0603709D8Z								COTS		
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	2003 Cost	2003 Award Date	2004 Cost	2004 Award Date	2005 Cost	2005 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
DT													
IOT&E													
Initial Verification Testing													
Subtotal T&E				0.000		0.000		0.000					
Remarks:													
Contractor Engineering Support													
Government Engineering Support													
Program Management Support													
Program Management Personnel													
Travel													
Labor (Research Personnel)													
Miscellaneous													
Subtotal Management				0.000		0.000		0.000					
Remarks:													
Total Cost				4.000		0.200		0.200					
Remarks:													

Exhibit R-4, Schedule Profile																																		
																																	Date: February 2003	
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4									Program Element Number and Name PE 0603709D8Z – Joint Robotics Program																				Project Number and Name COTS						
Fiscal Year	2001				2002				2003				2004				2005				2006				2007				2008				2009			
	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	1	2	3	4	1	2	3	4
Procure COTS Systems																																				
Perform Maintenance, Training Support & Upgrades																																				

R-4 Schedule Profile – Item No. 20-3 of 20-4

Exhibit R-4a, Schedule Detail								Date: February 2003
Appropriation/Budget Activity DEFENSE WIDE RDT&E/B.A. #4	Program Element Number and Name PE 0603709DZ Joint Robotics Program				Project Number and Name COTS			
	FY 2001	FY 2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Procure COTS Systems			1-4Q					
Maintenance, Training, Support			Cont.	Cont.	Cont.	Cont.		

R-4a Schedule Profile - Item No. 20-4 of 20-4