

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2007

BUDGET ACTIVITY		PE NUMBER AND TITLE							PROJECT	
5 - System Development and Demonstration		0604663A - FCS Unmanned Ground Vehicles							FC4	
COST (In Thousands)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total Cost
FC4 FCS UNMANNED GROUND VEHICLES			90667	96666	65206	43912	27038	3603	Continuing	Continuing

A. Mission Description and Budget Item Justification: The Army's Future Combat System (Brigade Combat Team) (FCS (BCT)) is a joint system of systems consisting of a network and a combination of manned and unmanned systems that use an advanced network architecture to enable levels of joint connectivity, situational awareness and understanding, and synchronized operations previously unachievable. It is designed to interact with and enhance the Army's most valuable weapon - the Soldier. When fully operational, FCS will provide the Army and the joint force unprecedented capability to see the enemy, engage him on our terms, and defeat him on the 21st Century battlefield. It is adaptable to traditional warfare as well as complex, irregular warfare in various rural and urban terrains. FCS is the #1 priority acquisition program for the Army.

This FCS project includes contractor developmental and engineering efforts for requirement analysis, specification development, and detail design packages for integration of common and mission equipped Unmanned Ground Vehicles. Also included are subsystem prototypes, models, and/or simulations to support development, tests, and demonstrations. Unmanned platforms include: Armed Robotic Vehicles-Reconnaissance (ARV-RSTA) and ARV-Assault (ARV-A), Small Unmanned Ground Vehicle (SUGV), Multi-function Utility/Logistics Equipment-Transport (MULE-T), MULE-Countermine (CM), and ARV-Assault Light (ARV-A-L). In addition to the UGV platforms, this project includes the development of the hardware and software for the Autonomous Navigation System (ANS) required for operation of the UGVs and leader-follower capability for the Manned Ground Vehicles (MGV).

Small Unmanned Ground Vehicle (SUGV)

The Small Unmanned Ground Vehicle (SUGV) is a small, lightweight, manportable, DC powered UGV capable of conducting military operations in urban terrain tunnels, sewers, and caves. The SUGV enables the performance of manpower intensive or high-risk functions (i.e. urban Intelligence, Surveillance, and Reconnaissance (ISR) missions, chemical/Toxic Industrial Chemicals/Toxic Industrial Materials, reconnaissance, etc.) without exposing soldiers directly to the hazard. Weighing less than 30 pounds, it is capable of carrying up to six pounds of payload weight. The SUGV will have the following capabilities: tether payload, manipulator arm, CBRN capabilities and the potential for integrating future technologies for Sense Through the Wall and Mine/UXO/IED detection ability. The SUGV can operate up to six hours on a single charge.

Multifunctional Utility/Logistics and Equipment (MULE) Vehicle is a 2.5-ton Unmanned Ground Vehicle (UGV) that will support dismounted operations. It is comprised by the integration of four major components: Common Mobility platform, Autonomous Navigation System (ANS), Centralized Controller (CC) and three mission equipment packages/variants.

The MULE platform's centerpiece is the common mobility platform providing superior mobility built around an articulated suspension system to negotiate obstacles and gaps that a dismounted squad might encounter. The MULE has three variants sharing the common mobility chassis: Transport, Countermine and the Armed Robotic Vehicle (ARV)-Assault-Light (ARV-A-L). The Transport MULE (MULE-T) will carry 1,900-2,400 pounds of equipment and rucksacks for dismounted infantry squads with the mobility needed to follow squads in complex terrain. The Countermine MULE (MULE-CM) will provide the capability to detect, mark and neutralize individual anti-tank mines by integrating a mine detection mission equipment package from the Ground Standoff Mine Detection System (GSTAMIDS) program to support force mobility. The ARV-Assault-Light (ARV-A-L) is a mobility platform with an integrated weapons and target acquisition package to support the dismounted infantry's efforts to locate and destroy enemy platforms and positions. The ARV-A-L includes the M240 machine gun, JAVELIN missile and medium range EOIR sensors to engage and destroy the enemy in dismounted operations. The

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2007

BUDGET ACTIVITY 5 - System Development and Demonstration	PE NUMBER AND TITLE 0604663A - FCS Unmanned Ground Vehicles	PROJECT FC4
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MULE platforms are UH-60 transportable.

Autonomous Navigation System (ANS) is the mission payload package that will be integrated on both the MULE and ARVs to provide robotic semiautonomous capability. ANS provides Global Positioning System (GPS)/IPS core navigation, targeting support and timing. It also detects obstacles and provides alternate routes. The ANS primary system components are: the LADAR Imaging Perception Module (LIPM), the Imaging Perception Module (IPM), the Millimeter Wave Radar (MMWR), the Global Positioning System/Inertial Navigation System (GPS/INS) and the ANS Computer System (ACS). ANS provides for day and night capability in all weather and mobility control for on/off roads, cross country and complex terrain. MMWR provides tracking in rain, smoke or fog along with an early warning for approaching vehicles with high closing rates. ACS provides SoSCOE interface, path planning, video processing, hardware sensor processing object processing and speed and curvature commands. As part of the Army Budget Constraints contain in the 08-13 POM decision, the leader follower MGv mission is being deferred and made an objective requirement.

Armed Robotic Vehicle (ARV)

The Armed Robotic Vehicle (ARV) has two variants: the Assault variant (ARV-A) and the Reconnaissance, Surveillance and Target Acquisition variant (ARV-RSTA). The two variants share a common chassis. The ARV-A and ARV-RSTA will have different mission payloads mounted on a common chassis capable of staying with MGVs. These two variants are being deferred and made an objective requirement as part of the Army budget Constraints contained in the 08-13 POM.

The ARV-A will be utilized to maneuver forward of the mounted and dismounted elements in the attack or within the defense. The Assault variant will support the mounted and dismounted forces in the assault providing Line-of-Sight (LOS) and overwatching fires with direct fire and anti-tank (AT) weapons to destroy enemy platforms and fortified positions; remotely occupies key terrain providing ISR/TA reconnaissance capability in MOUT and other battlespace; remotely deploy sensors; locate or by-pass threat obstacles; remotely assess battle damage, employ non-lethal munitions; remotely provide limited reconnaissance capability and acts as a communications relay.

The ARV-RSTA accompanies mounted and reconnaissance units and fills the role of an additional "scout", gathering information forward of the MGVs. The ARV-RSTA consists of a common chassis platform with payloads that provide video capability, digital communications/audio relay modules (plug in/out), and advanced sensors/mission modules. The ARV-RSTA variant will provide Reconnaissance, Surveillance and Target Acquisition for the FCS (BCT). The ARV-RSTA will provide reconnaissance capability in Urban Military Operations in Urban Terrain and other battlespace; deploy sensors, highlight targets, locate or by-pass threat obstacles in buildings, bunkers, tunnels, and other urban areas and act as a communications relay and perform battle damage assessment.

<u>Accomplishments/Planned Program:</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
SUGV - FY08 - Conduct Technology and Integration Risk Reduction Activities. Develop Integrated UGV Platform Simulations. Update and deliver simulations for SUGV to SoSIL. Begin procurement of SUGV prototype hardware.FY09 SUGV - 1Q FY09: SUGV Build 2 Software to SIDB. 4Q FY09: First SUGV Prototype delivered. Conduct Technology and Integration Risk Reduction Activities			7390	5709
MULE - FY08 -Complete Preliminary Design Reviews MULE-Transport, MULE-Countermine, ARV-Assault-Light 1Q FY08: 1Q FY08: Update and deliver simulations for MULE to SoSIL. 3Q FY08: Update and deliver ANS simulation to MULE and MGv. 4Q FY08: Update and deliver simulations for MULE to SoSIL. Conduct Technology and Integration Risk Reduction Activities. FY09 MULE - 1Q FY09 MULE CDR. 1Q FY09: MULE Build 2 LCO & BPC. 2Q FY09: MULE Build 3 LCA & BRC. 4Q FY09: Finish Fabrication, Integration and Assembly of MULE Common Mobility Platform. Conduct Technology and Integration Risk Reduction Activities.			46716	50777

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2007

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - System Development and Demonstration	0604663A - FCS Unmanned Ground Vehicles	FC4
ANS FY08 - Prepare documentation and artifacts for upcoming CDR. Update and deliver ANS simulation to MULE, 3Q FY08. Conduct Technology and Integration Risk Reduction Activities. Complete Critical Design Reviews for Autonomous Navigation System in 4Q FY08. FY09 ANS - 1Q FY09 ANS Build 3 Life Cycle Objective (LCO). 3Q FY09 ANS Build 3 Life Cycle Architecture (LCA). 4Q FY09 ANS First Article Development. 4Q FY09 Initial ANS Prototype Fabrication (13 in FY09). Conduct increasingly difficult experiments and demonstrations of ANS capabilities. Conduct Technology and Integration Risk Reduction Activities. The CDR for ANS completed in 1Q FY09.		36561 40180
Total		90667 96666

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2007

BUDGET ACTIVITY 5 - System Development and Demonstration	PE NUMBER AND TITLE 0604663A - FCS Unmanned Ground Vehicles	PROJECT FC4
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<u>B. Program Change Summary</u>	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)				
Current BES/President's Budget (FY 2008/2009)			90667	96666
Total Adjustments			90667	96666
Congressional Program Reductions				
Congressional Recissions				
Congressional Increases				
Reprogrammings				
SBIR/STTR Transfer				
Adjustments to Budget Years			90667	96666

Change Summary Explanation: Pursuant to National Defense Authorization Act for Fiscal Year 2006 - Section 214: Separate Program Elements for Significant Systems Development and Demonstration Projects for Armored Systems Modernization Program, the PM FCS (BCT) established this Program Element (0604663A Project FC3) for Unmanned Ground Vehicles SDD efforts.

This budget request is a continuation of the previous SDD efforts funded in FY07 under Program Element 0604645A Project F53; therefore, this budget request should not be construed as a new start program nor should it be constrained by "new start" program requirements and funding allocation (i.e. CRA) restrictions.

<u>C. Other Program Funding Summary</u>	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	To Compl	Total Cost
0604660A FCS M060anned Grd Vehicles & Common Grd Vehicle Components			696333	772458	791186	361201	215665	103885	Continuing	Continuing
0604661A FCS System of Systems Engr & Program Management			1589466	1407410	1888349	1929853	1299062	1034307	Continuing	Continuing
0604662A FCS Reconnaissance (UAV) Platforms			41164	34220	14398	9301	4587	1344	Continuing	Continuing
0604663A FCS Unmanned Ground Vehicles			90667	96666	65206	43912	27038	3603	Continuing	Continuing
0604664A FCS Unattended Ground Sensors			10999	12942	19103	16874			Continuing	Continuing
0604665A FCS Network Hardware & Software			678781	536387	336471	367894	292770	170602	Continuing	Continuing
0604646A Non Line of Sight - Launch System	216668	320650	253410	199064	40329	6000			Continuing	Continuing
0604647A Non Line of Sight - Cannon	132223	110998	137802	89189	71906	43531	28971		Continuing	Continuing
0604666A FCS Spin Outs			64796	32442	65000	50000	50000	10000	Continuing	Continuing

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2007

BUDGET ACTIVITY	PE NUMBER AND TITLE							PROJECT		
5 - System Development and Demonstration	0604663A - FCS Unmanned Ground Vehicles							FC4		
0603639A FCS MRM			44578	45733	71961	56698	107077	51079	Continuing	Continuing
0604715A STRICOM/NAWCTSD Support			381	391	401	409	418	429	Continuing	Continuing
WTCV G86100 FCS Core Program			79483	155838	149367	683788	2194625	5795292	Continuing	Continuing
WTCV G86200 FCS Spin Out Program			20123	172746	373790	557060	779742	958060	Continuing	Continuing
0604645 F52 UAV Recon & Sensors	50692	26360							Continuing	Continuing
0604645 F53 UGV	121528	106516							Continuing	Continuing
0604645 F54 UGS	31242	10612							Continuing	Continuing
0604645 F55 SUSTAINMENT	139389	106517							Continuing	Continuing
0604645 F57 MANNED GROUND VEHICLES	499469	563946							Continuing	Continuing
0604645 F61 SoS Engineering and Program Management	2027766	2142970							Continuing	Continuing

Comment:

D. Acquisition Strategy Fiscally constrained Budgets, coupled with the fiscal challenge to meet the Army's reset and modernization requirements, have caused the Army to implement FCS program adjustments. These adjustments maintain the Army's focus on FCS-equipped Brigade Combat Team development and minimize the efforts on operational requirements. The adjustments to the FCS Program acquisition strategy fall into the following categories:

1. Defer the following platforms from the FCS(BCT): ARV-A, ARV-RSTA, UAV Class II, UAV Class III
2. Refine the schedules for the development of the Core and Spin Out capabilities so that the Army can benefit from the savings realized with concurrent testing.
3. Increase the rate of fielding of FCS technologies to the current force.
4. Fully fund the Spin Out technology Insertion program and development and fielding of the Mid-Range Munitions (MRM) and Advanced Kinetic Energy (AKE) munitions.
5. Revise platform configurations to decrease the production cost of a single Core FCS BCT from \$6.2 billion to \$5.9 billion (FY03 Constant dollars) by deferring/deleting selected sensors and other associate hardware (such as the XM307 machine gun).

The following is a history of the LSI SDD Contract.

	Contract Award	Definitization Date
Original Contract Award	30 May 2003	10 Dec 2003
Modified for POM 06-11 Changes	6 Aug 2004	2 Mar 2005
Conversion to FAR Base Contract	23 Sep 2005	28 Mar 2006
Modification for POM 8-13 Adjustments	Feb 2007	May 2007

The R forms are based on estimated effects of the Army adjustment. Upon completion of negotiation of the contract modification, caused by this adjustment, reprogramming actions may be required to realign the funding buckets to the contract.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)**February 2007**

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

5 - System Development and Demonstration**0604663A - FCS Unmanned Ground Vehicles****FC4**

Termination Liability associated with this contract is included in PE 0604661A Project FC2.

IAW Section 214 of the FY2006 National Defense Authorization Act, this project was converted to a stand alone Program Element (0604662A Project FC3) commencing with the FY2008 President's Budget submission to Congress.

ARMY RDT&E COST ANALYSIS (R3)

February 2007

BUDGET ACTIVITY			PE NUMBER AND TITLE									PROJECT		
5 - System Development and Demonstration			0604663A - FCS Unmanned Ground Vehicles									FC4		
I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2006 Cost	FY 2006 Award Date	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Small Unmanned Ground Vehicle (SUGV)	FAR	The Boeing Company, St Louis, MO see remark 1						7091	1-3Q	5489	1-3Q		12580	
Autonomous Navigation System - Software	FAR	The Boeing Company, St Louis, MO see remark 3						35055	1-3Q	38631	1-3Q		73686	
MULE	FAR	The Boeing Company, St Louis, MO see remark 2						44827	1-3Q	48827	1-3Q		93654	
Subtotal:								86973		92947			179920	
Remarks: Remark 1: Subcontractor: iRobot Corp. - Burlington, MA Remark 2: Subcontractor: Lockheed Martin Missile and Fire Control - Grand Prairie, TX Remark 3: Subcontractor: General Dynamics Robotic Systems - Westminster, MD														
II. Support Costs	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2006 Cost	FY 2006 Award Date	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Government Statutory Reductions	Direct	OSD						3694	1Q	3719	1Q		7413	
Subtotal:								3694		3719			7413	
III. Test And Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2006 Cost	FY 2006 Award Date	FY 2007 Cost	FY 2007 Award Date	FY 2008 Cost	FY 2008 Award Date	FY 2009 Cost	FY 2009 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal:														
IV. Management Services	Contract	Performing Activity &	Total	FY 2006	FY 2006	FY 2007	FY 2007	FY 2008	FY 2008	FY 2009	FY 2009	Cost To	Total	Target

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February 2007

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5 - System Development and Demonstration			0604663A - FCS Unmanned Ground Vehicles									FC4		
	Method & Type	Location	PYs Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Complete	Cost	Value of Contract
Subtotal:														
Project Total Cost:								90667		96666			187333	

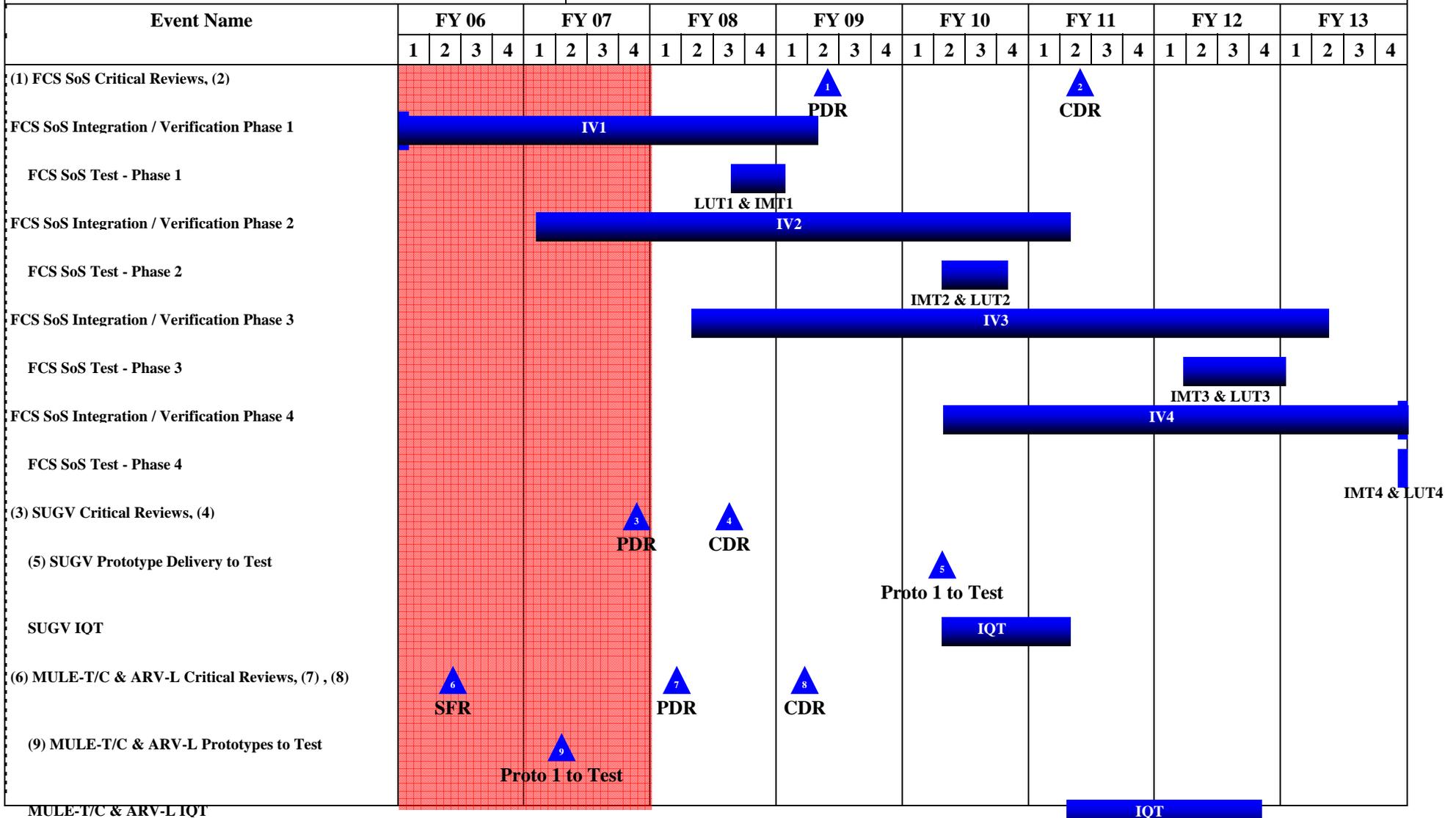
Schedule Profile (R4 Exhibit)

February 2007

BUDGET ACTIVITY
5 - System Development and Demonstration

PE NUMBER AND TITLE
0604663A - FCS Unmanned Ground Vehicles

PROJECT
FC4



Schedule Profile (R4 Exhibit)

February 2007

BUDGET ACTIVITY
5 - System Development and Demonstration

PE NUMBER AND TITLE
0604663A - FCS Unmanned Ground Vehicles

PROJECT
FC4

Event Name	FY 06				FY 07				FY 08				FY 09				FY 10				FY 11				FY 12				FY 13			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(10) ANS Critical Reviews, (11) , (12)																																
ANS Prototvpe Deliveries			SFR				PDR				CDR																					

Schedule Detail (R4a Exhibit)

February 2007

BUDGET ACTIVITY
5 - System Development and Demonstration

PE NUMBER AND TITLE
0604663A - FCS Unmanned Ground Vehicles

PROJECT
FC4

<u>Schedule Detail</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>
FCS SoS Critical Reviews				2Q				
						2Q		
FCS SoS Integration / Verification Phase 1	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 2Q				
FCS SoS Test - Phase 1			3Q - 4Q	1Q				
FCS SoS Integration / Verification Phase 2		1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 2Q		
FCS SoS Test - Phase 2					2Q - 4Q			
FCS SoS Integration / Verification Phase 3			2Q - 4Q	1Q - 2Q				
FCS SoS Test - Phase 3							1Q - 4Q	1Q
FCS SoS Integration / Verification Phase 4					2Q - 4Q	1Q - 4Q	1Q - 4Q	1Q - 4Q
FCS SoS Test - Phase 4								4Q
SUGV Critical Reviews		4Q						
			3Q					
SUGV Prototype Delivery to Test					2Q			
SUGV IQT					2Q - 4Q	1Q - 2Q		
MULE-T/C & ARV-L Critical Reviews	2Q							
			1Q					
				1Q				
MULE-T/C & ARV-L Prototypes to Test		2Q						
MULE-T/C & ARV-L IQT						2Q - 4Q	1Q - 4Q	
ANS Critical Reviews	3Q							
		4Q						
				1Q				
ANS Prototype Deliveries					3Q - 4Q	1Q - 2Q		