

# ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

**February 2007**

<b>BUDGET ACTIVITY</b>		<b>PE NUMBER AND TITLE</b>							<b>PROJECT</b>	
<b>5 - System Development and Demonstration</b>		<b>0604647A - Non Line of Sight Cannon</b>							<b>F58</b>	
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
F58      NON LINE OF SIGHT CANNON	132223	110998	137802	89189	71906	43531	28971		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. The Army's first modernization effort in nearly four decades; FCS is the embodiment of the modular force, a modular system designed for "full spectrum" operations. It will network existing systems, systems already under development and future systems to be developed to meet the requirements of the Army's Future Force. It is adaptable to traditional warfare as well as complex, irregular warfare in various rural and urban terrains. It can also be adapted to civil support, such as disaster relief. FCS is the #1 priority acquisition program for the Army.

For FY06-FY07, the FCS program was contained in three Program Elements (PEs): Non-Line of Sight - Cannon (NLOS-C), Non-Line of Sight - Launch Systems (NLOS-LS) and Armored Systems Modernization (ASM). PE NLOS-C contains the development effort associated with NLOS-C unique work, and in FY05 some of the MGV common components. To avoid confusion about common hardware being split between both MGV and NLOS-C, beginning in FY06 the common sub components for NLOS-C and MGV will be fully funded out of Manned Ground Vehicles (MGV) Program Element 0604645 Project F57. Beginning in FY08, the current ASM projects, to include MGV, will become Program Elements, based on the Authorization Act of 2006.

The Army established NLOS-C as the lead MGV of the FCS FoS. The Army plan was to deliver eight MGV (NLOS-Cannon) Early Prototypes configurations systems for limited user and developmental testing in 2008. The MGV First Production units are NLOS-Cs and will be fielded in CY 2010, with 18 delivered by CY 2012. The full FCS Capability for NLOS-C will be fielded in FY 2014.

Due to FCS requirements changing in the last 3 years, Common MGV/NLOS-C Hardware and software have been delayed, which will delay the first fielding of the NLOS-C pre-production prototypes. Thus 5 of the prototypes will still be delivered in CY08 with the remaining 3 to be delivered in CY09. Because of the funding driven delay in deliveries, the initial 5 prototypes will be in the 24 ton configuration as previously discussed with Congress. But, in taking advantage of this delay, the 3 CY09 prototypes will be updated to the 27 Ton threshold MGV configuration allowing for more pertinent valuable test data to be obtained which, ultimately could reduce final configuration prototype testing cost.

NLOS-C provides mid to long range indirect fire support to the FCS (BCT). The Non-Line of Sight Cannon (NLOS-C) provides networked, sustained, extended-range (33km) cannon fires for precision attack of point and area targets in support of the FCS. It fires a suite of munitions that include special purpose capabilities to provide a variety of effects on demand including precision guided munitions such as the XM982 Excalibur. The NLOS-C fires 155mm caliber rounds at a rate of 6 rounds per minute. It is equipped with an on board ballistic solution computation and has an automated fuze setting. The NLOS Cannon is multi-mode transportable and will be the US Army's first fully automated howitzer. Integration within the FCS program will create a cannon that is more lethal, survivable, and maintainable and provides the FCS BCT commander the ability to generate more firepower, faster, and more accurately than ever before. The NLOS Cannon features a fully automated 155-mm howitzer, 38 caliber cannon, that provides automated, 24/7,

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all-weather, precision fire support to the FCS, BCT commander. It will be organic to and provide networked, extended-range, responsive and sustained precision attack of point and area targets in support of the FCS (BCT). The NLOS-C will provide close support and destructive fires for tactical standoff engagement during both offensive and defensive operations in concert with line-of-sight, beyond-line-of-sight and other NLOS, external and joint capabilities in combat scenarios spanning the spectrum of ground combat. The NLOS Cannon's fully automated ammunition handling system and real-time digital operating environment enables two soldiers to do the job of five. The cannon will be able to move rapidly, stop quickly, and deliver lethal first round effects on target in record time. The NLOS Cannon will have a multiple round simultaneous impact (MRSI) capability and unmatched sustained rate of fire to provide record effects on target from a smaller number of systems. The NLOS Cannon features transformational technologies that will be common to all FCS Manned Ground Vehicles, including hybrid-electric drive and drive-by-wire capabilities that enable the system to move rapidly, stop quickly and deliver lethal first round effects in record time. Integration with the FCS program allows us to provide maximum commonality between variants which impacts the maintainability and sustainability of the fleet. In fact, NLOS-Cannon will be 70 to 80 percent in common with the MGCV fleet. The cannon, like all Manned Ground Vehicle (MGV) variants, can rapidly rearm and refuel, and its system weight makes it uniquely deployable. Fully automated handling, loading, and firing will be another centerpiece of the NLOS-C. The NLOS-C balances deployability and sustainability with responsiveness, lethality, survivability, agility, and versatility. The NLOS-C will be designed to minimize its logistic and maintenance footprint in the theater of operation and to employ advanced maintenance approaches to increase availability and to support sustainability.

The FY07 funding reflected in these R-Forms does not contain FY07 SBIR/STTR reduction of \$3,124 million.

<u>Accomplishments/Planned Program:</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
INTEGRATED DESIGN - Early Prototypes will complete Design Review 2 and begin Design Review 3 which will wrap up the design of these prototype howitzers. Procurement, Integration and testing of Core Vetronics Environmental Control System, Suspension and Propulsion Cooling Subsystems. Integration of GPS/INS.	31731	20497	21013	10770
MISSION SOFTWARE - Software Build 1 Flight 1 delivered for use in the Firing Platform. Deliver Simulation Software to SoSIL (SW BLD 1).MGV/NLOS-C Software Build 1 Life Cycle Objective (LCO) Review Completed 1Q FY06. This review formalized the requirements allocation for MGV and NLOS-C Build 1 software and marks the beginning of software design.MGV/NLOS-C Software Life Cycle Assessment (LCA) Review Completed 3Q FY06.This review marked the completion of software design and the beginning of software coding and unit test for Build 1.Common Crew Station Software (CCS) LCO and LCA completed 3Q FY06.The portion of the Common Crew Station software that will be threshold path and developed IAW the Software Development Plan was subjected to LCO and LCA review in 3Q FY06. NLOS-C Build 1 Flight 1 Software Integration Testing (SIT) completed 4Q FY06. SIT is the final software test prior to delivery to the hardware system integration facility for the NLOS-C Firing Platform. FY07 -NLOS-C Build 1 Flight 1 software delivered as part of the NLOS-C Firing Platform 1Q FY07. MGV Common Software Build 1 enters Formal Qualification Testing in 3Q FY07. This is the final test event for software at the Configuration Item (CI) level for Build 1. MGV Common Software Build 1 enters Package Integration Testing (PIT) in 4Q FY07. PIT is the final software test for the common software as a package for Build 1.The MGV Software Build Definition Checkpoint (BDC) is performed for Build 2 in 4Q FY07. The BDC represents the start of requirements analysis for Build 2 and defines the incremental development goal for this software build. FY09 - Software: Build 2 initial drop for system integration, Build 3 LCO. Modeling and Simulation: Build 3 FSE available from MS&I.	10647	6347	7493	5213
PROTOTYPE VEHICLE - FY06-Fabrication of the NLOS-C Firing Platform completed. Procurement of NLOS-C Early Prototype Automotive Test Rig (ATR) begins. Prototype long lead procurement begins. Integrated Firing Platform loader and ammunition handling equipment. NLOS-C Firing Platform - Fire Mission functionality. Early Prototype - Common Subsystems, Procurement of NLOS-C Early Prototype Automotive Test Rig (ATR) (Prototype 2) Hull Structures. NLOS-C Early Prototypes - Mission Module, Installation, Assembly,	37407	50277	38981	43381

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Test and Checkout of the Firing Platform (Mission Module for early Prototype 2) - Includes Optimized Muzzle Brake and Cannon Cooling/Cleaning Tests. Common NLOS-C Early Prototype Unique Activities, Specify, Design, Procure and Begin Testing of Inc 0 Threshold Common Subsystems: Baseline Inc 0 Critical Item Development Specs, Major subsystem procurements, System Integration Labs Development Plans. Conduct DR2 and DR3 Design Rev. FY07 Prototype 1 Mission Equipment integration begins March. Prototype Chassis integration begins August. Firing Platform Available to Test FY07. ATR Hull Fabrication Start. ATR Fabrication & Assembly Start. Instrumentation Chassis Fabrication and Assembly. Firing Platform Available to Test. Continued development of the NLOS-C, Early Prototype Common Physical Architecture, in particular resolution of any physical issues between common platform hardware. FY08 The Army plan is to deliver five early prototype NLOS-C systems for limited user and developmental testing in 2008, and three additional "27 ton" configurations in FY09. All eight of these will be tested in FY09.				
SYSTEM ENGINEERING & PROGRAM MANAGEMENT -FY06-07- Sub-contracts will be awarded for the design, procurement and integration of Traction Drive System, Generator Inverter, Environmental Control System, Suspension and Propulsion Cooling Subsystems. Increment 1- NLOS-C will complete its SFR in coordination with the rest of the FCS and MGV systems allocating system requirements and baselining a concept. NLOS-C Early prototype Design Review 2 (DR2), Completed Nov 05, Reviewed and approved preliminary design of mission equipment and four major common subsystems on the threshold path (Propulsion, Suspension, Vetronics and Architecture Environmental Control System) - Received approval to begin Early Prototype detailed design. NLOS-C Firing Platform Reviews 3 & 4 Completed. Obtained decision to proceed with hardware procurement and fabrication for the surrogate chassis. Provided high level summary of the firing platform capabilities, and design & fabrication. Review state of mission equipment HW/SW development and integration. Approve FP assembly and test plans. Completed NLOS-C System Functional Review to demonstrate convergence on and achievability of the system requirements and readiness to initiate system design. Completed baseline system and software architecture. Documented baseline software requirements. Initiated Initial Interface Control Documents (ICDs) for internal and external interfaces. Received design concept approval for NLOS-C and common systems. Started preliminary design for NLOS-C. NLOS-C Early Prototype Design Review 2 and Design Review 3 (DR3). Review and approve detailed design of mission equipment and four major common subsystems on the threshold path. Environmental Control System - Approval to begin Early prototype material procurement and start of IAT&C. FY09 - CDR is complete.	49792	26574	58066	24107
SYSTEM TECH ENGINEERING - FY06 - Started preliminary design for NLOS-C Increment 1. Applied Pit Stop Engineering process to NLOS-C Concept and Design and established Pit Stop philosophies for all MGV vehicles. Integrated Design Process centers on all aspects; uses small group teams to architect the implementation of Pit Stop functions and features: Applied to various areas of NLOS-C, Lower Mission module, Turret, Sponsons, Cannon and Mount, Crew Compartment. NLOS-C lead the way for all of MGV to embrace Pit Stop philosophies. Began preliminary design for NLOS-C. NLOS-C Early Prototype Design Review 2 and Design Review 3. FY07- NLOS-C Increment 1 Preliminary Design continues. NLOS-C Increment 1 /MGV PDR planned for FY08. Complete NLOS-C Integration in Program Integration, Validation and Test Lab (PIVOT). FY09 Primary Vehicle Technical Data Packages for Main FY09 NLOS-C Weapon, Ammunition Handling, Gun Mount. INC1, Mission Module, Structure, Main Weapon, Peripherals, Design B Development complete.	2646	4179	12249	5718
Small Business Innovative Research/Small Business Technology Transfer Programs		3124		
<b>Total</b>	<b>132223</b>	<b>110998</b>	<b>137802</b>	<b>89189</b>

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<u><b>B. Program Change Summary</b></u>	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)	146271	112237	117605	90647
Current BES/President's Budget (FY 2008/2009)	132223	110998	137802	89189
Total Adjustments	-14048	-1239	20197	-1458
Congressional Program Reductions		-424		
Congressional Rescissions				
Congressional Increases				
Reprogrammings	-14048	-815		
SBIR/STTR Transfer				
Adjustments to Budget Years			20197	-1458

Change Summary Explanation: Funding - FT 2007: The above reprogramming has not yet occurred, but is reflected in the Army\_s budget database. At present, the Army does not intend to use actual appropriated funds in 0604647A as an offset for a reprogramming action, therefore, the program will be executing to a funding level of \$108.7 million for the FY07 program year. The following R2s and R3s reflect the current database position.

FY 2008: Funds increased to support the NLOS Cannon program.

<u><b>C. Other Program Funding Summary</b></u>	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	To Compl	Total Cost
0604660A FCS Manned 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
0603639A FCS MRM			44578	45733	71961	56698	107077	51079	Continuing	Continuing

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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.

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Termination Liability associated with this contract is included in PE 0604645 Project F61.

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			0604647A - Non Line of Sight Cannon									F58		
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
Integration Design	OTA/FAR	THE BOEING COMPANY, ST. LOUIS, MO. - See Remarks 1, 2, 3	40012	31731	1Q	19625	1-3Q	20411	1-3Q	10345	1-3Q		122124	
Mission Software	OTA/FAR	THE BOEING COMPANY, ST. LOUIS, MO - See Remarks 1, 2, 3	27923	10647	1Q	6329	1-3Q	7289	1-3Q	5010	1-3Q		57198	
Prototype Vehicle	OTA/FAR	THE BOEING COMPANY, -ST. LOUIS, MO., See Remarks 1, 2, 3	93881	37407	1Q	54375	1-3Q	41702	1-3Q	45170	1-3Q		272535	
System Engineering & Program Management	OTA/FAR	THE BOEING COMPANY, ST. LOUIS, MO -See Remarks 1, 2, 3		49792	1Q	26501	1-3Q	56485	1-3Q	23169	1-3Q		155947	
System Tech Engineering	OTA/FAR	THE BOEING COMPANY, ST. LOUIS, MO - See Remarks 1, 2, 3		2646	1Q	4168	1-3Q	11915	1-3Q	5495	1-3Q		24224	
Subtotal:			161816	132223		110998		137802		89189			632028	

Remarks: Remark 1 - Subcontractor: BAE Armament Systems Division - Minneapolis, MN  
 Remark 2 - BAE Ground Systems Division, Santa Clara, CA  
 Remark 3 - General Dynamics Land Systems, Sterling Heights, MI

FY06 and beyond, all common hardware and software costs are accounted for in MGV.

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
Subtotal:														

# ARMY RDT&E COST ANALYSIS (R3)

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**0604647A - Non Line of Sight Cannon**

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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 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:														
<b>Project Total Cost:</b>			<b>161816</b>	<b>132223</b>		<b>110998</b>		<b>137802</b>		<b>89189</b>		<b>632028</b>		

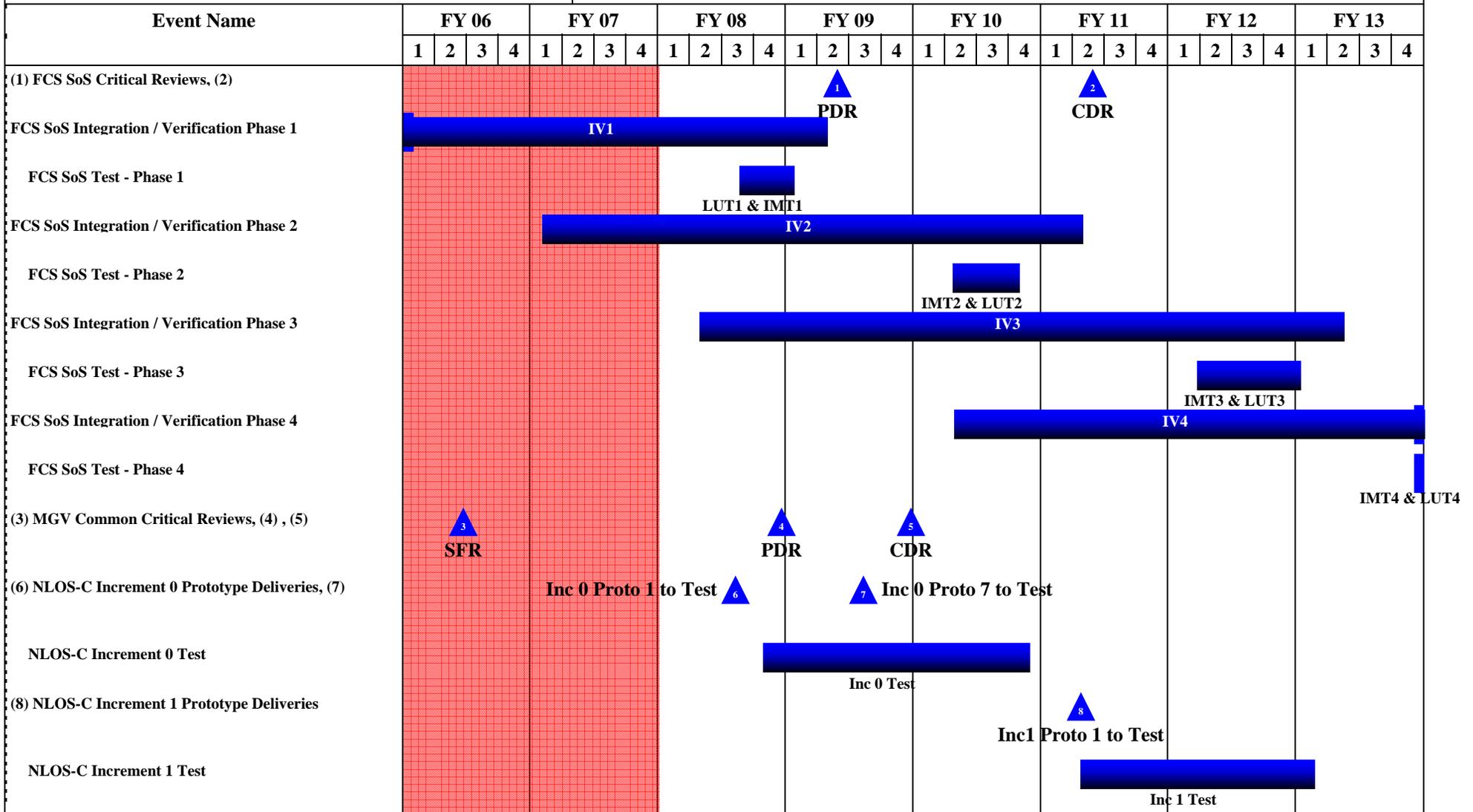
# Schedule Profile (R4 Exhibit)

February 2007

BUDGET ACTIVITY  
**5 - System Development and Demonstration**

PE NUMBER AND TITLE  
**0604647A - Non Line of Sight Cannon**

PROJECT  
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# Schedule Detail (R4a Exhibit)

February 2007

BUDGET ACTIVITY  
**5 - System Development and Demonstration**

PE NUMBER AND TITLE  
**0604647A - Non Line of Sight Cannon**

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<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
MGV Common Critical Reviews	2Q							
			4Q					
				4Q				
NLOS-C Increment 0 Prototype Deliveries			3Q					
				3Q				
NLOS-C Increment 0 Test			4Q	1Q - 4Q	1Q - 4Q			
NLOS-C Increment 1 Prototype Deliveries						2Q		
NLOS-C Increment 1 Test						2Q - 4Q	1Q - 4Q	1Q