Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*				R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	122.418	249.948	143.840	-	143.840	124.472	106.480	131.880	32.009	Continuing	Continuing
FC4: *BCT UNMANNED GROUND VEHICLES*	122.418	249.948	143.840	-	143.840	124.472	106.480	131.880	32.009	Continuing	Continuing

Note

Change Summary Explanation: Funding: FY12: UGV program was restructured for emerging Army requirements - MM UGV

A. Mission Description and Budget Item Justification

There are two programs covered by the Unmanned Ground Vehicle (UGV) Program Element: The Multi-Mission Unmanned Ground Vehicle (MM UGV) platforms (formerly the Multi-Function Utility/Logistics and Equipment Vehicle (MULE)), the Small Unmanned Ground Vehicle (SUGV) platform.

Small Unmanned Ground Vehicle (SUGV), designated as the XM-1216, is a lightweight (32 lbs), man-portable, DC powered UGV capable of conducting Military Operations in Urban Terrain (MOUT) to include tunnels, sewers, and caves. The SUGV provides an unmanned capability for those missions that are manpower intensive or high-risk such as Urban Intelligence, Surveillance, and Reconnaissance (ISR) missions in a MOUT environment, investigating Improvised Explosive Devices and Chemical/Toxic Materials reconnaissance missions without exposing soldiers directly to the hazard. The SUGV will be used to obtain information on situational awareness at the squad level.

SUGV IBCT Increment 1 (Bde 1-6): The IBCT INC 1 SUGV is based on the Capability Production Document (CPD) threshold requirements. The SUGV IBCT INC 1 features a lightweight highly mobile SUGV platform with improved and tested reliability and an integrated Commercial off the Shelf (COTS) sensor head and radio. In early FY10 the SUGV INC 1 platform underwent an Integrated Qualification Test (IQT) at Aberdeen Test Center (ATC) that provided the basis for many of the component reliability improvements that have been incorporated and validated in the FY11 IQT. Enhancements included improved seals on the drive motors, design changes to the drive motor themselves, EMI improvements to reduce the emissions and susceptibility of the SUGV platform and operator control unit enhancements. The Mean Time Between System Aborts (MTBSA) value improved from 9.7 hrs in FY09 to 178 hrs in FY10 Limited User Test (LUT). These enhancements were incorporated into the Bde 1 SUGV INC 1 units being delivered to Ft. Bliss, TX in FY11.

SUGV Planned Product Improvements: The SUGV configuration for FY13 procurement/FY14 fielding is based on the SUGV CPD objective requirements. It will weigh 32 pounds and is capable of carrying up to 4 lbs of payload weight. The SUGV will have the following capabilities: a hardened militarized Electro Optical/Infrared (EO/IR) sensor to meet stringent day & night detection of enemy personnel & systems, an NSA compliant radio, the capability to provide grid location of the enemy, a tether payload, a manipulator arm payload, Chemical, Radiological, Nuclear (CRN).

Multi-Mission Unmanned Ground Vehicle (MM UGV): The MM UGV program is an adaptation of new emerging requirements for a 3.5-ton UGV that will support dismounted and mounted operations. This program takes advantage of development already conducted for the previous Multi-Function Utility/Logistics and Equipment Vehicle (MULE), program that consisted of three major components: Common Mobility Platform (CMP), Autonomous Navigation System (ANS), and a Lethal Mission

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*

Equipment Package (MEP). The MULE Program will transition to the MM UGV Program of Record and Acquisition Program Baseline upon MDA approval. In Nov 2010, the AAE & OSD OIPT directed the Army to continue current CMP & ANS design efforts under the current contract. After approval of the MM UGV CDD, a competitive contracting process, utilizing the TDP developed from the current effort, will be initiated for the follow-on MM UGV integrated platform development EMD Contract. The current MULE program meets the base platform mobility requirements and lethality requirements of the draft MM UGV CDD. The current draft CDD is being staffed, estimated approval is 4QFY11. The MM UGV will be CH-47 transportable and designed to maintain hard surface road-speeds of up to 65 KPH. The Counter-Improvised Explosive Device (C-IED) variant will provide the maneuver company with the capability to detect, mark, and report IEDs. This variant will deploy an array of sensors to enhance IED detection and a manipulator arm to probe suspected locations. The C-IED platform will mark and report the IED allowing follow-on units to bypass the IED. The Lethal variant includes two weapon systems: the M240 Machine Gun & two Javelin missiles and will employ a target acquisition package to include aided target recognition. This integrated package will support the dismounted infantry and mounted operations providing the capability to locate and destroy enemy platforms and positions.

Autonomous Navigation System (ANS): ANS, designated as XM-155, as a set of mission sensors and a computational package that will be integrated on the CMP to provide robotic semiautonomous capability. The ANS System will meet the requirements defined in the draft MM UGV CDD for mobility and safety of a UGV platform. The ANS primary system components are: Laser Radar (LADAR) Imaging Perception Module (LIPM), Imaging Perception Module (IPM), Millimeter Wave Radar (MMWR), Global Positioning System (GPS)/Inert

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	124.962	249.948	98.737	-	98.737
Current President's Budget	122.418	249.948	143.840	-	143.840
Total Adjustments	-2.544	-	45.103	-	45.103
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.544	-			
• Adjustments to Budget Years	-	-	45.103	-	45.103

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
FC4: *BCT UNMANNED GROUND VEHICLES*	122.418	249.948	143.840	-	143.840	124.472	106.480	131.880	32.009	Continuing	Continuing
Quantity of RDT&E Articles											

A. Mission Description and Budget Item Justification

There are two programs covered by the Unmanned Ground Vehicle (UGV) Program Element: The Multi-Mission Unmanned Ground Vehicle (MM UGV) platforms (formerly the Multi-Function Utility/Logistics and Equipment Vehicle (MULE)), the Small Unmanned Ground Vehicle (SUGV) platform.

Small Unmanned Ground Vehicle (SUGV), designated as the XM-1216, is a lightweight (32 lbs), man-portable, DC powered UGV capable of conducting Military Operations in Urban Terrain (MOUT) to include tunnels, sewers, and caves. The SUGV provides an unmanned capability for those missions that are manpower intensive or high-risk such as Urban Intelligence, Surveillance, and Reconnaissance (ISR) missions in a MOUT environment, investigating Improvised Explosive Devices and Chemical/Toxic Materials reconnaissance missions without exposing soldiers directly to the hazard. The SUGV will be used to obtain information on situational awareness at the squad level.

SUGV IBCT Increment 1 (Bde 1-6): The IBCT INC 1 SUGV is based on the Capability Production Document (CPD) threshold requirements. The SUGV IBCT INC 1 features a lightweight highly mobile SUGV platform with improved and tested reliability and an integrated Commercial off the Shelf (COTS) sensor head and radio. In early FY10 the SUGV INC 1 platform underwent an Integrated Qualification Test (IQT) at Aberdeen Test Center (ATC) that provided the basis for many of the component reliability improvements that have been incorporated and validated in the FY11 IQT. Enhancements included improved seals on the drive motors, design changes to the drive motor themselves, EMI improvements to reduce the emissions and susceptibility of the SUGV platform and operator control unit enhancements. The Mean Time Between System Aborts (MTBSA) value improved from 9.7 hrs in FY09 to 178 hrs in FY10 Limited User Test (LUT). These enhancements were incorporated into the Bde 1 SUGV INC 1 units being delivered to Ft. Bliss, TX in FY11.

SUGV Planned Product Improvements: The SUGV configuration for FY13 procurement/FY14 fielding is based on the SUGV CPD objective requirements. It will weigh 32 pounds and is capable of carrying up to 4 lbs of payload weight. The SUGV will have the following capabilities: a hardened militarized Electro Optical/Infrared (EO/IR) sensor to meet stringent day & night detection of enemy personnel & systems, an NSA compliant radio, the capability to provide grid location of the enemy, a tether payload, a manipulator arm payload, Chemical, Radiological, Nuclear (CRN).

Multi-Mission Unmanned Ground Vehicle (MM UGV): The MM UGV program is an adaptation of new emerging requirements for a 3.5-ton UGV that will support dismounted and mounted operations. This program takes advantage of development already conducted for the previous Multi-Function Utility/Logistics and Equipment Vehicle (MULE), program that consisted of three major components: Common Mobility Platform (CMP), Autonomous Navigation System (ANS), and a Lethal Mission Equipment Package (MEP). The MULE Program will transition to the MM UGV Program of Record and Acquisition Program Baseline upon MDA approval. In Nov 2010, the AAE & OSD OIPT directed the Army to continue current CMP & ANS design efforts under the current contract. After approval of the MM UGV CDD, a competitive contracting process, utilizing the TDP developed from the current effort, will be initiated for the follow-on MM UGV integrated platform development EMD

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

Contract. The current MULE program meets the base platform mobility requirements and lethality requirements of the draft MM UGV CDD. The current draft CDD is being staffed, estimated approval is 4QFY11. The MM UGV will be CH-47 transportable and designed to maintain hard surface road-speeds of up to 65 KPH. The Counter-Improvised Explosive Device (C-IED) variant will provide the maneuver company with the capability to detect, mark, and report IEDs. This variant will deploy an array of sensors to enhance IED detection and a manipulator arm to probe suspected locations. The C-IED platform will mark and report the IED allowing follow-on units to bypass the IED. The Lethal variant includes two weapon systems: the M240 Machine Gun & two Javelin missiles and will employ a target acquisition package to include aided target recognition. This integrated package will support the dismounted infantry and mounted operations providing the capability to locate and destroy enemy platforms and positions.

Autonomous Navigation System (ANS): ANS, designated as XM-155, as a set of mission sensors and a computational package that will be integrated on the CMP to provide robotic semiautonomous capability. The ANS System will meet the requirements defined in the draft MM UGV CDD for mobility and safety of a UGV platform. The ANS primary system components are: Laser Radar (LADAR) Imaging Perception Module (LIPM), Imaging Perception Module (IPM), Millimeter Wave Radar (MMWR), Global Positioning System (GPS)/Inertial Navigation System (INS), Self-Cleaning System, Precision Timing Module, and the ANS Computer System (ACS). ANS provides GPS/INS for core navigation, targeting support and timing. ANS provides the sensors and software processing for unmanned operations for day, night, all weather conditions and the platform mobility control for on/off roads, cross country, complex terrain, and dynamic, unstructured environments such as urban road networks. MMWR provides tracking in rain, smoke, or fog along with an early warning for approaching vehicles with high closing rates while the LIPM and IPMs provide obstacle avoidance, human detection, and situational awareness. ACS provides path planning, video processing, hardware sensor processing, object processing and platform speed and curvature commands. The ANS software development baseline is a phased approach consisting of two phases. Phase 1 supported simulation and early prototypes using external waypoints at limited speeds. Phase 1 will support early testing and demonstration of ANS capability with prototype operational hardware on current force platforms to reduce risk and improve performance. Phase 2 will meet all requirements for platform speed, terrain types and operational modes: Move-on-Route, leader-follower, Aided Tele-operation, and Tele-operation. ANS will provide the hardware and software for unmanned navigation required for UGV platforms to be fielded under this program element and future manned and unmanned ground vehicles.

The Government support costs includes funding for government personnel labor, travel, training, supplies, other support costs (support contractors, Automated Data Processing (ADP), communications, supplies, and equipment), and platform unique testing.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
Title: SUGV FY10 IBCT Increment 1	18.440	-	-
Articles:	0		
Description: Funding is provided for the following effort			
FY 2010 Accomplishments: SUGV FY10 IBCT Increment 1 - Successfully completed MS C for the IBCT INC 1 December 2009. Refurbished, after completion of FY09 Limited User Test (LUT), the 15 Spinout Prototype units to support the FY10 LUT. Refurbishment included upgrades to software, replacement of components in response to design changes and test/checkout to ensure the units were functional. The 15 Spinout units were used to support soldier training, and platform integration in FY10. Characterization testing was conducted on Three (3) IBCT INC 1 units at Aberdeen Proving Ground during FY10. The program built six additional Increment 1 units to support LUT and Integrated Qualification Test (IQT) testing in FY10. IBCT INC 1 utilized Build 1 software and Ruggedized			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
Personal Data Assistants (PDAs); the SUGV controller provided images to an external port that were captured by the PDA and sent to the external network. SUGV units supported testing of alternative radio solutions in 2Q10.			
Title: SUGV Product Improvement	7.662	9.429	21.000
Articles:	0	0	
Description: Funding is provided for the following effort ***FY 2010 Accomplishments:*** Developed and matured SUGV Product Improvement design of tether spooler payload, manipulator arm, militarized head and integration with the Electric Optical/Infrared (EO/IR) sensor and Handheld Manpack and Small form fit (HMS) radio. Prepared for Critical Design Review 1Q11. ***FY 2011 Plans:*** Conduct SUGV Critical Design Review 1QFY11. Complete the engineering tasks and analysis from the SUGV CDR design review to enable the contractor to proceed to the build of the SUGV platforms for CP 13/14 IQT. Complete integration, build and checkout of the EO/IR sensor. Handheld Manpack & Small form fit (HMS) radio, and payloads. Begin assessment of an NSA approved radio, improved detection capability for the EO/IR sensor and integration of the SUGV with the Common Controller. Conduct an early assessment of the SUGV, HMS radio, SRW waveform and common Controller to support the development and build of SUGV prototypes for IQT/LUT in FY12. Continue work and development of payloads to support IQT: Tether, manipulator arm, CBRN, and Embedded training. Build six SUGVprototypes for delivery in FY12. ***FY 2012 Plans:*** Complete the build, integration and delivery of six prototypes and payloads in the September 2011-February 2012 timeframe. Complete government IQT testing in the March-August 2012 timeframe. TFT/FDTE/LUT will be conducted in the September-December 2012 timeframe leading up to a Milestone C in April 2013. This effort will integrate and test SUGV product improvements that utilize a point-to-point datalink, provide increased ISR capability with the integrated militarized EO-IR head, and also provide increased functionality in the form of a modular payload system that includes the fiber optic tether datalink capability, manipulator arm, CBRN, and ETESS.			
Title: SUGV Sensor Hardware	-	4.783	-
Articles:		0	
Description: Funding is provided for the following effort ***FY 2011 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
Build, integration and checkout of seven (7) C4 sensors packages to support SUGV Platform integration.			
Title: MM UGV (MULTI-MISSION UNMANNED GROUND VEHICLE) (FORMER ARV A(L))	57.882	65.294	46.000
Articles:	0	0	
Description: Funding is provided for the following effort			
FY 2010 Accomplishments: Completed subsystems Critical Design Review (CDRs) for PPS, ITMS, Suspension and Chassis. Continued work to complete vehicle final assembly design, top level drawings and any remaining detail part drawings. Completed Engineering and Manufacturing Readiness Level (EMRL) 2 assessments and updated Industrial Capabilities Assessment (ICA) to support CDR. Completed design of BAE Power and Propulsion System, and MillenWorks suspension. Began planning for software integration and testing of C4ISR, ANS and CC software with Hardware in the Loop (HWIL). Completed Phase 1 Software Build Definition Checkpoint 1Q10. Phase 1 software functionality included vehicle control functionality such as power up, states and modes, manual and tether vehicle control.			
FY 2011 Plans: Conduct Critical Design Review for the ARV-A(L). Begin Long Lead Procurement of prototype hardware and assembly of ARV-A(L) platforms Continue the engineering effort for design and integration of all sensors payloads, battle command software, network communications and Common Controller for ARV-A(L) to support design reviews. Verify interfaces and integration of all allocated subsystems to the ARV-A(L): JTRS Radio/Waveform, ICS, Turret, M240 ROK, and Javelin. Receive initial subsystem deliverables to complete integration of BAE Power and Propulsion System, Advanced Integrated Systems M240 Remote Operating Kit, ITMS and MillenWorks suspension that will facilitate Acceptance Test Plans and the testing of detail parts and Line Replaceable Units that enables subsystem qualification testing. Continue development of operational and simulation software including the Vehicle Control Services (VCS), Mobility Control Services (MCS) and Power & Propulsion Services (PPS). Begin Modeling and Simulation integration with the ICS and Battle Command software to prepare for efficient integration of hardware and software on the ARV-A(L) Conduct CP 13/14 Phase 1 and Phase 2 Software Architecture Design and Internal and External Interface Design. Conduct CP 13/14 Software Phase 2 Build planning and allocation to support the ARV-A(L) chassis and ARV-A(L) Mission Equipment Packages to demonstrate functionality of payloads: M240, Communications Systems, Battle Command, and Common Controller. Complete Phase 1 software coding and begin CP 13/14 Phase 1 software integration and testing. Develop Prototype Pilot line to include work instruction development, and acceptance test procedures.			
FY 2012 Plans: Conduct integration, assembly and checkout of two (2) CMP prototypes to mature and validate the CMP TDP. Procure the validated CMP TDP to support the MM UGV competitive solicitation. Finalize integrated platform Acceptance Test Plans (ATPs).			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
Conduct development testing of detail parts and Line Replaceable Units (LRUs). Complete subsystem qualification testing. Complete integration of all subsystems to include ANS and surrogate controller with Hardware in the Loop (HWIL). Complete development and FQT of Phase 1 operational software, including the Vehicle Control System (VCS), Mobility Control System (MCS) and Power & Propulsion System (PPS). Begin test fix test for all software problem reports and integration issues in support of the platform IQT scheduled for completion in FY13. Complete interface definition activities for Phase 2 software. Phase 2 Software functionality includes software for autonomous waypoint planning and tele-ops, utilization and sensor alignment; Weather Data; Situational Awareness; and Anti-Tamper. Continue software coding and integration of Phase 2 software.			
Title: MM UGV Sensors/Computers/Radios ***Articles:*** ***Description:*** Funding is provided for the following effort ***FY 2011 Plans:*** Continue design/development efforts to support incorporation of 3rd Gen FLIR engine within MREO (light) sensor package. Conduct PRR for MREO ARV-A(L). Begin procurement of 8 MREOs or equivalent sensors (7 prototypes and 1 spare) for ARV-A(L).Continue the Acoustic Sensor design to support ARV-A(L) CDR milestones. Conduct PDR and CDR for ALAS. Continue development of Sensor Suite Control software code to support testing with the ARV-A(L) . ***FY 2012 Plans:*** Complete evaluation and analysis of both EO/IR and C-IED sensors to support competitive contract procurement for MM UGV.	- 0	70.857 0	5.000
Title: MULE-CM & MULE-T Special Termination Costs ***Articles:*** ***Description:*** Funding is provided for the following effort ***FY 2010 Accomplishments:*** These costs were paid to the contractor and subcontractors for MULE-CM and MULE-T terminations as per FAR 31.205 for; Severance Pay, Reasonable costs continuing after termination, Settlement of expenses, and the costs to return field service personnel from remote or liaison sites. ***FY 2011 Plans:*** Special termination costs include severance pays, settlement expenses, and return of field service representatives.	1.000 0	1.500 0	-
Title: ANS (AUTONOMOUS NAVIGATION SYSTEM) ***Articles:***	37.284 0	54.593 0	51.000

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
Description: Funding is provided for the following effort ***FY 2010 Accomplishments:*** Completed ANS CDR in March 2010. Completed final assembly and detail part drawing release and revision of the remaining 250 drawings. Completed Physical Configuration Audit (PCA) for all prototype hardware components. Finalized coordination of ICD efforts including Part II ICDs and complete review of 94 artifacts and 41 data items in preparation for closeout ANS CDR action items to obtain CDR closure. Began tooling design, fabrication and proofing. Planned for long lead-time procurement of hardware and began fabrication/assembly to support prototype builds for delivery to CMP. Implemented Manufacturing Plan for ANS Computer System (ACS), Imaging Perception Module (IPM), and Laser Radar (LADAR) Imaging Perception Module (LIPM) enclosures; internal cabling; and integration of long lead items. Conducted assembly, integration and developmental testing of detail parts. ANS Prototype environmental testing began 1Q10. Began contractor testing of prototype components. Initiated test planning and support for the IQT testing. Began development of Phase 1 software, followed by FQT of operational code scheduled for FY11. Conducted Phase 2 operational/simulation software architecture reviews in 1Q10. Performed Phase 2 Operational requirements analysis; conducted objectives and architecture reviews in 3Q and 4Q10, respectively; and began software construction in 4Q10. ***FY 2011 Plans:*** Support integration in accordance with ICDs and execution of ARV-A (L) program . Continue procurement and fabrication of prototype hardware to support delivery of prototype sets (IPMs, LIPMs, GPS/INS, and ACS) for integration and IQT. Assess performance and durability of prototype components during test evaluations in support of RAM-T development. Test and validate software performance at the system level. Support preparation for SoS testing (TFT, FDTE & LUT). Continue to provide closure of software problem reports (SPRs) and software-hardware integration with the ANS prototype (P1) and ARV-A (L) platform integration. Complete development of operational Phase 1 software followed by FQT. Continue ANS Phase 2 software construction, coding, test and integration to support CP 13/14 Phase 2. Complete Phase 2 LCA and build checkpoints. Deliver Engineering Phase 16 software. Finish CP 13/14Phase 1 Simulation software 1Q12. ***FY 2012 Plans:*** Complete development of Phase 2 Operational software 2Q12. Conduct Phase 2 Operational Test Readiness Review (TRR) 3Q12. Complete Phase 2 Simulation software build 4Q12. Conduct Phase 2 Operational software FQT 3Q12. Deliver prototypes to support CMP IQT and resolve Software Problem Reports uncovered during CMP integration and contractor testing. Complete prototype TDP release and perform prototype system acceptance testing and production pilot in FY12.			
Title: CONTRACTOR FEE	-	20.495	-
Articles:		0	

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
Description: Funding is provided for the following effort ***FY 2011 Plans:*** Moved from System of Systems Engineering; consists of prime contractor fee for remaining work in FY11.			
Title: GOVERNMENT SYSTEMS ENGINEERING/PROGRAM MANAGEMENT ***Articles:*** ***Description:*** Funding is provided for the following effort ***FY 2010 Accomplishments:*** The Comms Latency Experiment successfully demonstrated the effects of various data link latencies on the ability to effectively drive by teleoperation a medium class UGV at speeds ranging up to 20 kph. ***FY 2012 Plans:*** Funding to support the Government program management staff for salaries, travel, computers/cell phones, supplies and building/ office space. The Government program management staff consists of 50 personnel: Business, Acquisition, Engineering, Logistics, Admin & IT support. The team manages three programs: Small Unmanned Ground Vehicle, Common Mobility Platform and Autonomous Navigation System. FY11 efforts will involve three major initiatives: completing TDP, developing competitive selection criteria for follow-on contract, developing milestone documentation and analysis to support creation of APB for the Multi-Mission Unmanned Ground Vehicle. The UGV team is heavily involved in other efforts such as the potential fielding of the SUGV to units moving to theater, transfer of ANS technology to Army ATO's, investigating alternatives sensors and communications suites to reduce platform cost and weight and managing testing at government facilities.	0.150 0	-	15.840
Title: GOVERNMENT TEST AND M&S ***Description:*** Funding is provided for the following effort. ***FY 2012 Plans:*** Developmental testing and Limited User Testing will be conducted for the product improved SUGV platform at Government test sites and facilities. Testing will verify that the product improved SUGV meets requirements for the HMS/SRW radio, Militarized EO/IR Head and mission payloads (tether and manipulator arm). The Common Mobility Platform and Autonomous Navigation System (ANS) prototypes will undergo developmental testing to verify the integrated performance of the two systems for unmanned operations at government test sites. Both SUGV and CMP/ANS will require detailed test plan development, test range	-	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
support to include platform and sensor instrumentation, on-site test engineering support for testing and engineer support for data collection and analysis.			
Title: IED COUNTERMEASURE DEV ***Articles:*** ***Description:*** Funding is provided for the following effort ***FY 2011 Plans:*** Anticipate Army Guidance in 1QFY11 to proceed with the development of a Counter-IED platform. Complete preliminary and detail design of CIED Sub-components. Conduct Sub-system Prototype builds for integration with the CMP. Develop SW package to support performance and functionality of the platform.	- 	22.997 0	-
Accomplishments/Planned Programs Subtotals	122.418	249.948	143.840

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• 0604646A: *Non Line of Sight - Launch System*	88.205	81.247								0.000	169.452
• 0604660A: *FCS MGV Manned Ground Vehicles and Common Ground Vehicle Components*	231.103									0.000	231.103
• 0604661A: *FCS System of Systems Engr & Program Management*	847.011	568.711	383.872		383.872		518.188	648.502	352.069	0.000	3,808.398
• 0604662A: *FCS Reconnaissance (UAV) Platforms*	92.444									0.000	92.444
• 0604664A: *FCS Unattended Ground Sensors*	39.664	7.515	0.499		0.499					0.000	47.678
• 0604665A: *FCS Sustainment & Training R&D*	685.524	610.389					251.761	254.232	181.558	0.000	2,187.185
• G86200: *WTCV FCS Spin Out Program*	210.909									0.000	210.909
		44.206								0.000	44.206

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• A00015: *ACFT BCT Unmanned Aerial Veh (UAVs) Incr 1*											
• B00001: *OPA BCT Unattended Ground Sensor*		29.718								0.000	29.718
• B00002: *OPA BCT Network*		176.543								0.000	187.068
• B00003: *OPA BCT Network Incr 2*							229.528	187.955	179.653	0.000	768.167
• F00001: *OPA BCT Unmanned Ground Vehicle*		20.046	24.805		24.805					0.000	48.096
• F00002: *OPA BCT Unmanned Ground Vehicle Incr 2*			11.924		11.924		422.192	834.171	696.603	0.000	2,414.904
• G80001: *OPA BCT Training/ Logistics/Management*		61.581	149.308		149.308		49.792	28.259		0.000	435.142
• G00002: *OPA BCT Training/ Logistics/Management Incr 2*			57.103		57.103		441.250	347.466	273.354	0.000	1,308.265

D. Acquisition Strategy

A 23 June 2009 Acquisition Decision Memorandum (ADM) directed the cancellation of the FCS (BCT) acquisition program. It also instructed the Army to transition to an Army modernization plan consisting of a number of integrated acquisition programs. At that time, the SO E-IBCT was designated a pre-MDAP, with a Milestone C decision scheduled for the first quarter FY 2010. A follow-on ADM was issued 9 July 2009. In it, the Army was directed to continue efforts to improve the brigades beyond the Early Infantry Brigade Combat Team acquisition until a standalone program(s) is defined later in 2010. An Army BCT Modernization Defense Acquisition Board (DAB) was then held on October 16, 2009 to review the Army's plans for the post-Future Combat Systems efforts and confirm the Army brigade modernization acquisition plans were consistent with the Secretary of Defense's guidance. An ADM issued after this DAB stated: "The approach, for Increment 1 (Early-Infantry Brigade Combat Team (E-IBCT)) and the Ground Combat Vehicle (GCV) effort, is consistent with the Secretary's guidance and each is being positioned for more in-depth review and acquisition decisions later in 2009." The Increment 1 E-IBCT Milestone C took place 22 December 2009 and was approved in an ADM dated 24 December 2009. The Program Executive Officer-Integration (PEO-I) has modified the existing contract to be compliant with the aforementioned ADMs. This budget justification reflects the Dec 2009 Milestone C approved Increment 1 (E-IBCT) program and the follow-on IBCT modernization program planned by the Army. On 12 Jan 2011 an E-IBCT DAB took place. The results of this DAB are not yet public, thus any programmatic/funding impacts are not currently reflected.
Also as a result of the 23 June 2009 ADM, the MM UGV (formerly MULE/ARV program) was established as a pre-MDAP. The MULE Program will transition to the MM UGV Program of Record and Acquisition Program Baseline upon MDA approval. In Nov 2010, the AAE & OSD OIPT directed the Army to continue current CMP & ANS design efforts under the current contract. After approval of the MM UGV CDD, a competitive contracting process, utilizing the TDP developed from the current effort, will be initiated for the follow-on MM UGV integrated platform development EMD Contract. The current MULE program meets the base platform mobility requirements and lethality requirements of the draft MM UGV CDD. The current draft CDD is being staffed, estimated approval is 4Q11.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	FY 2011 Cost	FY 2011 Award Date	FY 2012 Base Cost	FY 2012 Base Award Date	FY 2012 OCO Cost	FY 2012 OCO Award Date	FY 2012 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MULE-CM & MULE-T SPECIAL TERMINATION	Various	The Boeing Company:Various	-	1.500		-		-		-	Continuing	Continuing	0.000
		Subtotal	-	1.500		-		-		-			0.000

Remarks

All Management Services costs for this project are included in 0604661 FC2 SoS Engineering and Program Management project.

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	FY 2011 Cost	FY 2011 Award Date	FY 2012 Base Cost	FY 2012 Base Award Date	FY 2012 OCO Cost	FY 2012 OCO Award Date	FY 2012 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Small Unmanned Ground Vehicle (SUGV)	Various	The Boeing Company:St Louis, MO	-	17.048		21.000		-		21.000	Continuing	Continuing	Continuing
Autonomous Navigation System - Software	Various	The Boeing Company:St. Louis, MO	-	70.900		51.000		-		51.000	Continuing	Continuing	Continuing
MM UGV, (former ARV-A (L))	Various	The Boeing Company:St. Louis, MO	-	160.500		51.000		-		51.000	Continuing	Continuing	Continuing
		Subtotal	-	248.448		123.000		-		123.000			

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 - Westminister, MD

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	FY 2011 Cost	FY 2011 Award Date	FY 2012 Base Cost	FY 2012 Base Award Date	FY 2012 OCO Cost	FY 2012 OCO Award Date	FY 2012 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GOVERNMENT SEPM	Various	PEO GCS:Warren, MI	-	-		15.840		-		15.840	Continuing	Continuing	Continuing
		Subtotal	-	-		15.840		-		15.840			

Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	FY 2011 Cost	FY 2011 Award Date	FY 2012 Base Cost	FY 2012 Base Award Date	FY 2012 OCO Cost	FY 2012 OCO Award Date	FY 2012 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GOVERNMENT TEST & EVALUATION M&S	Various	PEO GCS:Warren, MI	-	-		5.000		-		5.000	Continuing	Continuing	0.000
		Subtotal	-	-		5.000		-		5.000			0.000

Remarks

All Test & Evaluation costs for this project are included in 0604661 FC2 SoS Engineering and Program Management project.

	Total Prior Years Cost	FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	249.948		143.840		-		143.840			

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	**R-1 ITEM NOMENCLATURE** PE 0604663A: *FCS Unmanned Ground Vehicles*	**PROJECT** FC4: *BCT UNMANNED GROUND VEHICLES*

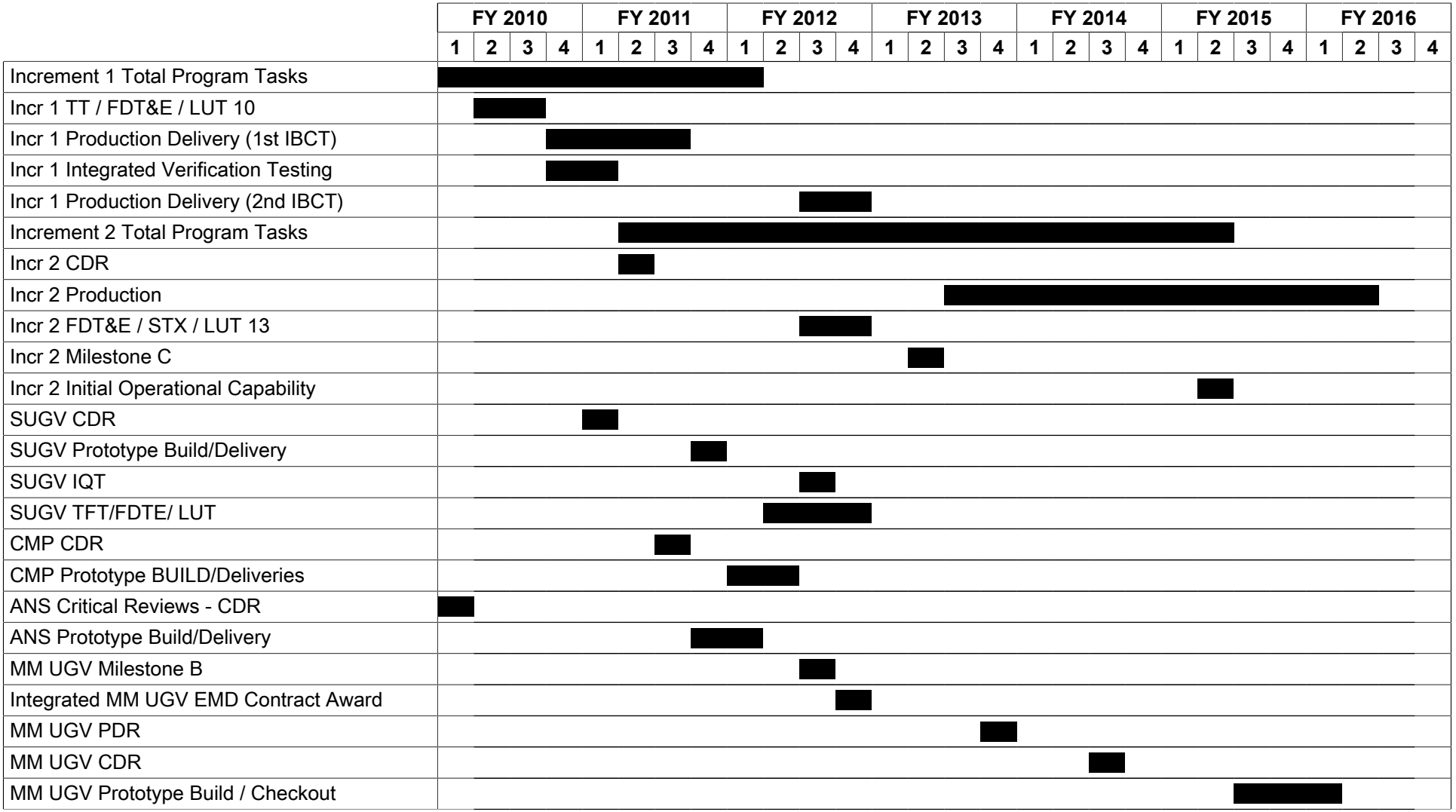

Exhibit R-4, RDT&E Schedule Profile: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

	FY 2010				FY 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016			
	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
MM UGV Qual Test / TFT / FDTE / LUT																												

Exhibit R-4A, RDT&E Schedule Details: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	**R-1 ITEM NOMENCLATURE** PE 0604663A: *FCS Unmanned Ground Vehicles*	**PROJECT** FC4: *BCT UNMANNED GROUND VEHICLES*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Increment 1 Total Program Tasks	1	2010	1	2012
Incr 1 TT / FDT&E / LUT 10	2	2010	3	2010
Incr 1 Production Delivery (1st IBCT)	4	2010	3	2011
Incr 1 Integrated Verification Testing	4	2010	1	2011
Incr 1 Production Delivery (2nd IBCT)	3	2012	4	2012
Increment 2 Total Program Tasks	2	2011	2	2015
Incr 2 CDR	2	2011	2	2011
Incr 2 Production	3	2013	2	2016
Incr 2 FDT&E / STX / LUT 13	3	2012	4	2012
Incr 2 Milestone C	2	2013	2	2013
Incr 2 Initial Operational Capability	2	2015	2	2015
SUGV CDR	1	2011	1	2011
SUGV Prototype Build/Delivery	4	2011	4	2011
SUGV IQT	3	2012	3	2012
SUGV TFT/FDTE/ LUT	2	2012	4	2012
CMP CDR	3	2011	3	2011
CMP Prototype BUILD/Deliveries	1	2012	2	2012
ANS Critical Reviews - CDR	1	2010	1	2010
ANS Prototype Build/Delivery	4	2011	1	2012
MM UGV Milestone B	3	2012	3	2012
Integrated MM UGV EMD Contract Award	4	2012	4	2012
MM UGV PDR	4	2013	4	2013

Exhibit R-4A, RDT&E Schedule Details: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604663A: *FCS Unmanned Ground Vehicles*	PROJECT FC4: *BCT UNMANNED GROUND VEHICLES*

	Start		End	
Events	Quarter	Year	Quarter	Year
MM UGV CDR	3	2014	3	2014
MM UGV Prototype Build / Checkout	3	2015	1	2016
MM UGV Qual Test / TFT / FDTE / LUT	3	2015	3	2016