PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

Program Executive Office Ground Combat Systems (PEO GCS) manages the development, systems integration, acquisition, testing, fielding, modernization, and sustainment of the U.S. Army's ground combat systems to provide world-class, affordable and relevant capabilities to our soldiers and marines. Systems include the Abrams main battle tank, Bradley family of vehicles (FoV), self-propelled howitzers, Armored Knight FoV, M113 armored personnel carrier, M88 Hercules, armored multi-purpose vehicle, Stryker FoV, ground combat vehicle, robotics and unmanned ground systems. PEO GCS operates with a multibillion-dollar annual budget and retains more than 1,200 military and civilian employees including three board-selected Army project managers and one Marine Corps joint project manager.

Project Manager Heavy Brigade Combat Team (PM HBCT)

The **Project Manager Heavy Brigade Combat Team (PM HBCT)** serves as the life-cycle manager for the Army's heavy combat vehicles including the Abrams tank, M88 Hercules, Bradley fighting vehicle, M113 armored personnel carrier, Paladin, field artillery ammunition supply vehicle (FAASV), armored multi-purpose vehicle, and Armored Knight FoV.

Product Manager Abrams

The **Abrams Tank** provides soldiers with the mobility, firepower and shock effect to successfully close in and destroy enemy forces on the complex, integrated battlefield. It is the only weapon system that can withstand the impact of high-energy warheads and remain lethal in full spectrum operations. The 120 mm main gun on the M1A1 and M1A2 SEPv2, combined with the powerful 1,500-hp turbine engine and special armor, make the Abrams tank suitable for attacking or defending against large concentrations of heavy armor forces on a highly lethal battlefield and for roles that require shock effect, wide-area surveillance, combined arms maneuver, and mobile direct firepower to support Army mission requirements.

Advanced improvements in lethality, survivability and fighting ability enable the M1A2 SEPv2 tank to remain lethal against future threats. The M1A2 SEPv2 has a digital command-and-control system that provides situational awareness updates to other tanks within the unit. Vetronics architecture ties all electronic components in the tank together and provides increased survivability and supportability. The commander's independent thermal viewer (CITV) provides a hunter-killer capacity, allowing the M1A2 SEPv2

M1A2 Abrams tank

to engage one target while simultaneously tracking another. Improved onboard diagnostics allow the tank to self-diagnose faults without any additional special tools or equipment. The M1A2 SEPv2 also has integrated C4ISR capabilities, which incorporate Force XXI Battle Command Brigade and Below (FBCB2) to provide real-time command and control and situational awareness. The sights use the latest second-generation forward-looking infrared [FLIR] thermal-imaging system for increased lethality and survivability. The SEPv2 package also includes a computerized mass-memory unit and color maps and displays. A thermal management system increases electronic reliability and decreases crew fatigue.

The **Tank Urban Survival Kit (TUSK)** was added as an Operation Iraqi Freedom (OIF) upgrade on the Abrams to improve force protection, lethality, survivability and situational awareness. The inclusion of reactive armor tiles, gun shields, a mine-resistant driver seat, a stabilized commander's weapon station, counter-sniper/anti-materiel mount and loader's thermal weapon sight, and underbelly armor provide enhanced capabilities for the urban fight.

Production deliveries of the M1A2 SEPv2 tank began in February 2005, when these vehicles were used extensively during OIF, in which they were proven to be capable of handling full spectrum operations.

The **Abrams Integrated Management (AIM) Program** is the recapitalization program for the M1A1 tank. Under AIM, M1A1 tanks are completely disassembled and many of the components are refurbished at the Anniston Army Depot, Ala. The assemblies are then shipped to the Joint Systems Manufacturing Center (JSMC) in Ohio, where General Dynamics Land Systems reassembles the tanks to a zero-time/zero-miles standard.

AIM also serves as the venue to apply modifications and upgrades to the tank including embedded diagnostics, improved line-replaceable units, and redesigned hull and turret network boxes.

U.S. Marine Corps Abrams tanks are actively engaged in supporting Operation Enduring Freedom in Afghanistan. Upgraded, digitized M1A2 SEPv2 tanks are being fielded to the active Army, and upgraded M1A1 SA tanks are being fielded to the National Guard.

Product Manager Bradley

Product Manager Bradley manages approximately 6,452 M2/3A2, M2/3A2 ODS, and M2/3A3, as well as 361 M7A3 Bradley fire-support team (BFIST) vehicles and the M707/M1200 Knight family of vehicles**.**

Bradley Family of Vehicles. The **Bradley M2A3 Infantry/M3A3 Cavalry Fighting Vehicle (IFV/CFV)** facilitates enhanced command-and-control capabilities, provides mobile protected transport of infantry to critical points on the battlefield, and performs cavalry scout and other essential missions. Upgrades in this program include advanced technology in the areas of command and control, lethality, survivability, mobility and sustainability, required to defeat current and future threat forces while remaining operationally compatible with the main battle tank. The M2/3 vehicle armament includes the 25 mm M242 Bushmaster cannon, the TOW II missile systems and a 7.62 mm M240C machine gun.

M2A3 Bradley Fighting Vehicles

The M2A3/M3A3 provides overwatching fires to support dismounted infantry and to suppress and defeat enemy tanks, reconnaissance vehicles, IFVs, armored personnel carriers, bunkers, dismounted infantry and attack helicopters. The IFV version (M2) of the A3 Bradley fighting vehicle is used most often to close with the enemy by means of fire and maneuver. The primary tasks performed by the CFV version (M3) as part of a troop and/or squadron are reconnaissance, security and guard missions.

The A3 is a digitized platform with core electronics architecture and an improved target acquisition system that includes a full ballistic fire-control package with hunter-killer functionality via a commander's independent viewer. Optical improvements include two second-generation FLIRs and day television cameras, which display information to the soldiers in the back of the vehicle and significantly improve the real-time situational awareness for the entire dismounted or mounted crew.

The A3 integrated command-and-control package incorporates the Army's digital command-and-control suite of automated messages, overlays and friend-or-foe graphics that meet the Army's objectives for a fully digitized force. This same digital command-and-control capability was incorporated into the A2 Operation Desert Storm.

The A3 variants reflect the latest iterations of a fighting vehicle family that includes the Bradley M2/M3A0, A1, A2, A2 ODS, IFV/CFV, BFIST vehicles and M2A2 ODS engineer vehicle. Additional Bradley variants, based on the associated tracked M993A1 multiple-launch rocket systems (MLRS) chassis, range from command-and-control systems to armored medical treatment vehicles.

The Bradley Operation Desert Storm-Situational Awareness (ODS-SA) M2/M3A2 conversion implements a digital architecture to mitigate obsolescence and provide commonality. The M2/3 A2 ODS-SA system consists of a modified A2 ODS turret and chassis. The two-man turret consists of a gun/turret stabilization system, a 25 mm gun, a coaxial 7.62 mm machine gun, ammunition feed/storage systems, a dual-tube TOW missile launcher with a launcher erection mechanism/drive and TOW launcher elevation drive, gunner's and commander's stations and sight systems, and a turret processor with associated subsystems and sensors. The chassis contains the power train, suspension systems, the driver's station and squad compartment. The A2 ODS-SA electronic architecture is based on a dual redundant serial data bus. All major turret system units are linked through this bus for signal and data transfer. Sight imagery and graphics data are routed as RS-170 video signals to the operators.

The A2 ODS-SA systems have the im-

proved Bradley acquisition subsystem (IBAS) for the gunner that replaces the Bradley eyesafe laser rangefinder (BELRF) integrated sight unit in the A2 ODS. The sight has a day television and a FLIR channel, both with a narrow and wide field of view. The sight images are displayed as video images to the gunner and commander on cathode ray tube-based biocular virtual image displays. The IBAS also has a gunner's monocular direct-view optics port for the day view channel and a laser range finder for target ranging. The line of sight is inertially stabilized. The M7 BFIST SA (M7 SA) vehicle is the fire support team (FIST) version of the Bradley ODS-SA and was first unit equipped to the 81st Brigade Combat Team, Washington National Guard, in October 2010.

M7A3 Bradley Fire Support Team (BFIST). The BFIST program is executing to the Army Campaign Plan and will complete modularization of the force in fiscal year (FY) 2012 with 20 heavy brigades of A3 BFISTs and seven heavy brigades of M7 BFIST SA. BFIST vehicles are required to conduct various mission scenarios including reconnaissance and surveillance, reporting of enemy activity in the area of operations, reporting of hazards and obstacles to movement, and the coordination of indirect fire support. Both versions have equivalent mobility, survivability, signature and night-vision capability and use common repair parts with the maneuver force they support. Target designation for all available laser-guided munitions is required, including those delivered by mortars and airborne platforms. Dismounted operations are required under some conditions. Extensive and real-time communications with other members of the force and rear-area command posts are required for mission success. Interoperability in the network-centric array of other systems demands full compatibility with the newest C4ISR equipment and procedures.

The **M7 SA BFIST** is one of the two models that replaced all of the M981 (FISTVs). The M7 SA integrates both existing and improved FIST mission equipment packages (MEPs) onto a M3A3 chassis. Features incorporated from the M3A3 chassis include the 25 mm gun, 7.62 mm coaxial machine gun, precision lightweight defense advanced global positioning system (GPS) receiver (DAGR) and the Bradley eyesafe laser rangefinder. The current M7 SA BFIST uses the standalone computer unit (SCU), the ruggedized handheld computer (stowed) and the forward observer system with full interoperability with advanced field artillery tactical data system (AFATDS) fire support networks. The inertial navigation system (INS) provides navigational capability based on a blended inertial/GPS solution.

M1200 Armored Knight

The second model BFIST is the A3 BFIST. It incorporates the FIST MEP with a digitized M3A3 chassis. Features incorporated from the M3A3 chassis include the commander's independent viewer with 360-degree traverse and the IBAS, both second-generation FLIRs, to improve target acquisition and engagement; the 25 mm gun; the 7.62 mm coaxial machine gun; DAGR; and digital command-and-control enhancements. The first unit equipped for the M3A3 BFIST was the 4th Infantry Division.

In addition to the improved features of the M3A3, the A3 BFIST will allow the fire support team to detect, identify and designate targets for precision munitions at greater ranges while remaining protected by the vehicle's armor. The new ranges meet the soldier's needs and allow for laser-guided smart munitions, laser-guided bombs, and missiles for rotary- and fixed-wing aircraft. The first unit equipped with the A3 BFIST with FS3 was the 42nd Infantry Division in August 2011.

M1200 Armored Knight. The Armored Knight family of vehicles assist heavy brigade combat teams (HBCTs) and infantry brigade combat teams (IBCTs) in performing terrain surveillance, target acquisition and location, and fire support for combat observation lasing team (COLT) missions.

Fielded to both IBCTs and HBCTs, the Knight family of vehicles consist of a laser designator and rangefinder, thermal imager, digital command-and-control system,

blended inertial/GPS navigation and targeting capability, and a self-defense weapon. Combat observation lasing teams use the Knight precision targeting systems, along with the forward observer systems software, to provide precise far-target location and laser designation for conventional ordnance, laser-guided munitions and precision-guided projectiles such as Excalibur.

First fielded in 2008, the M1200 Armored Knight provides improved survivability for the COLTs and precision strike capability by locating and designating targets for both ground- and air-delivered laser-guided ordnance and conventional munitions. The M1200 Armored Knight adds 360-degree continuous cupola rotation, CREW II, high-frequency radio capability, and M2 .50-caliber capability.

The Armored Knight program continues to evaluate ways to increase the level of protection of the Armored Knight platform. More than 300 M1200 Armored Knights have been fielded to support operations in Iraq and Afghanistan.

The procurement, production and fielding of 465 M1200 Knights is scheduled through FY 2013. To increase force protection, the design, integration and validation of the targeting under armor (TUA) capability will be complete in FY 2012. TUA incorporates a common remotely operated weapon system II (CROWS II) and a common remote stabilized sensor system (CRS3) onto the Armored Knight. This capability will put the soldier under armor for operations—with no degradation in capability—and add an optional fourth crew member station. Additional efforts are under way to upgrade the mission equipment package (MEP) and software to a more open architecture. The program is currently funded for 65 upgraded TUA Knights and will begin fielding in late FY 2013.

Product Manager Armored Multi-Purpose Vehicle (AMPV)

The **Armored Multi-Purpose Vehicle (AMPV)** is the proposed program to replace the M113 series family of vehicles in heavy brigade combat teams including the M113, M577, M1068, and M1064 vehicles currently performing general purpose, medical evacuation, medical treatment, command-and-control and mortar carrier roles.

Potential alternatives to meet AMPV mission requirements include Stryker, mine-resistant ambush-protected (MRAP), Bradley derivatives, and other nondevelopmental systems, and/or variants of DoD development programs such as the ground combat vehicle. A subsequent decision will address replacement of M113 vehicles in other than HBCT formations.

AMPV will integrate current M113-series MEPs and provide for integration of future radio and network systems as well as improved medical equipment packages fielded on MRAP ambulances.

AMPV is aimed to provide production vehicles and be first unit equipped no later than FY 2017.

Product Manager Mounted Maneuver

The **M113 Family of Vehicles** (FoV) provides a highly mobile, survivable and reliable tracked-vehicle platform that, with upgrades, is able to keep pace with Abrams- and Bradley-equipped units and is adaptable to a wide range of current and future battlefield tasks through the integration of specialized mission modules. Although not presently in production, the more than 10,000 M113 FOV systems in Army vehicle inventories constitute a significant percentage of present and future heavy division assets.

The latest A3 models provide various derivatives within the FoV with major performance improvements in mobility, reliability and survivability through installation of a 275-hp 6V53T engine with an X-200-4A transmission. Coupled with reconfiguration of the driver's station and several other vehicle subsystems, these improvements provide battlefield mobility commensurate with the supported Abrams/Bradley maneuver force and permit a range of enhanced survivability options.

The **M88A2 Heavy Equipment Recovery Combat Utility Lift and Evacuation System** (HERCULES) is a fully tracked, heavy armored vehicle developed to accomplish safe, effective and independent battlefield recovery operations. It implements swift and effective combat evacuations through the battlefield recovery operations of towing, winching and lifting. The Hercules is the primary recovery support for the 70-ton M1 Abrams tank, the Wolverine and other heavy combat vehicles.

The M88A2 includes a 1,050-hp engine; a 35-ton boom; overlay armor; a 140,000-pound, single-line, constant-pull main winch; and a 3-ton auxiliary winch for deploying the main winch cable. When compared with the M88A1, these upgrades improve towing power by 25 percent, lifting capability by 40 percent and winching ability by 55 percent. The system is in full-rate production and deployment. Fielding began in July 1997.

Product Manager Self-Propelled Howitzer Systems

Product Manager Self-Propelled Howitzer Systems manages approximately 1,934 platforms, including the **M109A6 Paladin/M992A2 Field Artillery Ammunition Supply Vehicle (FAASV)** system, the Paladin/Carrier Ammunition Tracked (CAT) and Paladin Integrated Management (PIM) program vehicles.

Paladin/FAASV. The M109A6 Paladin 155 mm self-propelled howitzer provides the primary indirect fire support to modular HBCTs and armored cavalry regiments. Like the earlier M109 models, the M109A6 Paladin is a fully tracked, armored vehicle. The enhanced Paladin configuration is achieved through extensive modifications to existing M109A2/A3 vehicle hulls and the subsequent introduction of an entirely new turret structure.

The Paladin includes an onboard Paladin Digital Fire-Control System (PDFCS), a vehicle location/navigation system, secure radio communications systems, an improved M284 cannon and M182A1 gun mount, automotive improvements, improved ballistic and nuclear-biological-chemical protection, driver's night-vision capability, and built-in test equipment. Additional chassis upgrades include a remotely actuated travel lock (for quicker site occupation and displacement), longer torsion bars (to help

M1064 Self-propelled 120 mm Heavy Mortar Carrier

M109A6 Paladin Howitzer

support the new turret) and a low-heat rejection engine with an improved cooling system. The Paladin has improved responsiveness, survivability, lethality and reliability compared with the earlier M109s.

A parallel U.S. Army recapitalization effort was seen in the **M992A2 FAASV**. The basic M992A0 FAASV emerged from an industry research and development project designed to provide self-propelled field artillery units with a ballistically protected vehicle capable of performing critical resupply and support functions. The FAASV system was type classified and entered production in 1983. It was based on an M109 howitzer chassis that provided the resupply asset with mobility and survivability characteristics commensurate with the supported cannon element. The system is paired on a one-for-one basis with the Army's M109A6 Paladin self-propelled howitzer.

Paladin/FAASV Integrated Management (PIM/CAT). The PIM program is a modernization program engineered to improve readiness, avoid components' obsolescence and increase sustainability of the M109A6 Paladin and the M992A2 FAASV platforms through the year 2050. PIM will leverage fleet commonality for key components including the Bradley engine, transmission, final drives and suspension. PIM uses the existing M109A6 main armament and recently designed cab structure while replacing outmoded chassis components with advanced components from the Bradley fighting vehicle to increase sustainability and commonality across the HBCT. PIM also incorporates select technologies from the non-line-of-sight cannon (NLOS-C), including a (modified electric) projectile rammer and modern electric-gun drive systems to replace the current hydraulically operated elevation and azimuth drives that were designed in the early 1960s.

The M109 FoV platforms will be fitted with Blue Force Tracker capability to ensure compatibility with future architectures. These upgrades and better communications technology will significantly improve operational awareness on the battlefield and reduce the logistics footprint within the HBCT. The new electric-gun drives and rammer components, as well as a microclimate air conditioning system, will be powered by the common modular power system (CMPS). Once delivered to the field, the PIM vehicles will give HBCT commanders a more sustainable vehicle, providing commanders with increased confidence in their artillery fleet.

Project Manager Stryker Brigade Combat Team

The **Project Manager Stryker Brigade Combat Team (PM SBCT)** develops, produces and sustains the full range of safe, reliable, supportable and effective Stryker vehicle systems—a diverse fleet of medium-weight vehicles capable of being rapidly deployed to trouble spots around the world.

Stryker Family of Vehicles. The Stryker FoV consists of 10 unique mission equipment packages incorporated into the eight-wheeled, common combat vehicle platform configurations.

The Army's responsibility to satisfy 21st-century requirements for effective full spectrum operations required an improved capability for the rapid deployment of highly integrated combined arms forces, possessing overmatch capabilities, exploiting the power of information and human potential, and combining the advantages of both light and mechanized forces across the full range of military and nonmilitary operations. As a result, the Army invested in the Stryker FoV.

In 2000, the Stryker became the first new combat vehicle to be acquired by the Army in more than 20 years. The procurement of

the Stryker emerged following the challenge presented in 1999 by then-U.S. Army Chief of Staff GEN Eric K. Shinseki: "We must provide early entry forces that can operate jointly without access to fixed forward bases, but we still need the power to slug it out and win decisively."

Strykers have accumulated more than 30 million combat miles in Operation Enduring Freedom and Operation Iraqi Freedom. There are 10 Stryker variants.

The M1126 infantry carrier vehicle (ICV) is a troop transport vehicle capable of carrying nine infantry soldiers and their equipment and requires a crew of two—a driver and a vehicle commander. The ICV is armed with a remote weapons station that supports the M2 .50-caliber machine gun or the Mk 19 automatic grenade launcher, the M6 countermeasure device (smoke grenade launcher) and an integrated thermal weapon sight. The other nine variants consist of the M1130 commander's vehicle, the M1127 reconnaissance vehicle (RV), the M1131 A1 fire support vehicle, the M1129 A1 mounted mortar carrier, the M1134 antitank guided missile vehicle, the M1132 engineer squad vehicle, the M1133 medical evacuation vehicle and the M1135 nuclear-biological-chemical reconnaissance vehicle. The M1128 mobile gun system is based on the ICV but modified to incorporate a 105 mm turreted gun, an autoloader system and a crew of three.

The addition of the double-V hull (DVH) provides improved blast protection for the Stryker crew and is currently being fielded in Afghanistan. Based on the unique operating environment encountered in Afghanistan, DVH ICVs (ICVVs) were provided in lieu of DVH RVs because the ICVV's remote weapon station afforded greater protection and lethality and carried more personnel. To continue to perform scout missions, a kit was developed that will facilitate the installation of the RV's unique mission equipment package into ICVVs.

The Stryker supports communications suites that integrate the single-channel ground-and-air radio system (SINCGARS) radio family; enhanced position location reporting system (EPLRS); Force XXI Battle Command Brigade and Below (FBCB2) or Blue Force Tracker (BFT); GPS; high-frequency (HF) and multiband very high frequency and ultrahigh frequency (VHF/UHF) radio systems; and computer workstations using Command Post of the Future software.

U.S. Navy/MC1 Daniel N. Woods

M1126 Stryker Infantry Carrier Vehicle (ICV)

Ground Combat Vehicle Project Management Office (GCV PMO)

The **Ground Combat Vehicle**, managed by PM GCV, is part of the Army's combat vehicle modernization strategy, second only to the Network. The GCV Program's objective is to develop and deliver an affordable and effective infantry fighting vehicle by focusing on affordability and program risk reduction through the use of mature technology and prudent performance trades. The Army is executing a three-pronged strategy, now in the technology development phase, that uses contractor-developed, best-value designs; technical and operational studies of existing vehicle platforms; and continued analysis of existing alternatives to assess GCV requirements against cost and schedule. An update to the analysis of alternatives, informed by contractor design work, will be ongoing during the technology development phase. This prong will enable the Army to make informed, timely requirements trades. The Army is conducting a technical and operational analysis of existing nondevelopmental vehicles. The effort from this prong will validate existing capabilities against the ground combat vehicle requirements and further inform potential design trade-offs. As the Army approaches milestone B, the assessments of technical achievability, existing vehicle platform capabilities, refined cost estimates and potential affordability tradeoffs will significantly inform potential adjustments to the GCV's requirements.

The need for GCV is driven by compelling current and emerging threats and a critical need for better force protection. Soldier input, informed by 10 years of war, clearly identifies an ever emerging threat and requirement for an infantry fighting vehicle that can deliver a full, nine-soldier squad to the battlefield in an improvised explosive device (IED) environment under armor. No single vehicle that is available today can provide that combination of capabilities.

Robotic Systems Joint Project Office (RS JPO)

The Robotic Systems Joint Project Office takes a joint Army and Marine Corps perspective in managing the development, acquisition, testing, systems integration, product improvement and fielding of robotic systems that will form the backbone of the Combat Force of the Future. RS JPO manages the MARCbot, the M160 Anti-Personnel Mine Clearing System, the PackBot family of systems, the TALON family of systems, and the small unmanned ground vehicle (SUGV) family of systems, which includes the mini-explosive ordnance disposal (EOD) and the XM1216.

The **Multi-function, Agile, Remote Controlled Robot (MARCbot)** is a commercial off-the-shelf (COTS) manportable, relatively low-cost, tele-operated, wheeled robotic platform. The system includes a mast-mounted color video camera, a radio transmitter and an operator control unit. The camera mast can be raised up to 45 inches. The four-wheel-drive independent suspension allows maneuverability over relatively rough terrain including curbs up to 4 inches tall. In 2008, the system was upgraded to replace the separate control and video radios with a single digital radio. The custom suitcase-sized controller was replaced with a common, ruggedized notebook personal computer and game-style handheld controller. The MARCbot has been fielded since 2004 with more than 850 robots deployed.

The **M160 Anti-Personnel Mine Clearing System, Remote Control**, is a 6-ton, tracked robot designed for tele-operation

from either mounted or dismounted positions to perform area clearance of antipersonnel mine-sown areas. The M160 detonates or destroys antipersonnel mines in a 66-inch wide path through the action of a rotating chain and hammer flail system. It fills the light flail mission in the area clearance family of systems.

Because it's a program-of-record robot, system improvements are implemented via an engineering change process. Multiple engineering change proposals have been approved and integrated into the M160 design to enhance the robot's utility for the soldier or marine. These improvements include transportability certification, software version updates to allow vehicle maintainers to troubleshoot and isolate causes of failures at the vehicle control panel, and updated marking requirements.

The M160 was originally procured as a COTS item but has made the transition to a program of record and is currently in production.

The **PackBot** is a COTS, small, tele-operated, tracked robotic platform. The system is modular and easily reconfigured. Basic mission packages include an articulated arm with a gripper, a color surveillance camera with ultra low-light and zoom capabilities, and a rugged game-style controller for the common, ruggedized laptop operator control unit. Two different styles of manipulator arms are available within the PackBot family. The first is a small arm manipulator with 42-inch extension and a lifting capacity of 5 pounds throughout the full range of motion. The second is a three-link arm that can extend 80 inches and lift 30 pounds close to the chassis and 10 pounds at full extension.

Multiple variants of the PackBot have been fielded, including the PackBot 500 explosive ordnance disposal, PackBot 500 FIDO chemical sniffer, and PackBot 510 FasTac. A recent software upgrade on the PackBot 510 platform enhances plug-and-play interoperability of all 500 and 510 series payloads on the FasTac chassis.

More than 1,900 PackBot family robots have been supporting operations in theater.

The **TALON Family of Systems** is a COTS, vehicle-transportable, tele-operated, multi-terrain tracked system that has the operational flexibility for a variety of missions. The TALON provides standoff protection during remote reconnaissance and surveillance. The gripper attached to the control arm can support explosive ordnance disposal as well as additional engineer support activities that may not involve interrogation of improvised explosive devices. The systems include three cameras and a modular design that allows for plug-and-play upgrades.

The TALON family of systems has undergone various improvements through user feedback to enhance operator protection, system endurance, camera resolution, situational awareness, radio communication, and mission data storage. Additional improvements being developed and evaluated include an increase in manipulator arm dexterity, improved communication range in urban and covert scenarios, and increased drive motor torque to improve system mobility.

XM1216 Small Unmanned Ground Vehicle

The TALON family is supporting soldiers and marines with explosive ordnance disposal, route clearance engineer support, and reconnaissance and surveillance missions. Approximately 800 TALON systems were fielded to Operation Enduring Freedom and Operation New Dawn. Approximately 450 systems are supporting various training requirements in the United States and abroad.

The **XM1216 Small Unmanned Ground Vehicle (SUGV)** is a program of record, tele-operated, manportable, tracked robotic vehicle capable of conducting six-hour missions in urban areas, tunnels and caves. The SUGV provides situational awareness, intelligence, surveillance and reconnaissance to dismounted soldiers, enabling the performance of manpower-intensive or high-risk functions without exposing soldiers directly to threats. The SUGV can climb stairs, negotiate 10-inch vertical obstacles, and traverse slopes and austere terrain. The modular design allows multiple payloads to be integrated in a plug-and-play fashion.

During FY 2010, 52 design improvements were implemented. Final XM1216 SUGV baseline configuration increased capabilities include: enhanced radio for secure communications at greater distances; improved electro-optical and infrared cameras in the head assembly for improved long-range night-vision performance; laser rangefinder to provide target location by grid coordinates; enhanced manipulator arm; fiber optic tether spooler; chemical, biological, radiological and nuclear detector; and an embedded tactical engagement simulation system.

The SUGV is currently in low-rate initial production.

The **Mini-EOD** (SUGV310) is a COTS, lightweight, manportable, tracked robotic vehicle. The Mini-EOD is composed of a manipulator arm with camera, lights, and a chassis with four drive cameras. The user wears a monocle over one eye to see what the robot sees and operates the vehicle with a small handheld device similar to that used in common gaming systems, both attached to a wearable operator control unit.

The Mini-EOD can navigate over various types of terrain including rocky, sandy and uneven surfaces, and the low-light capabilities enable it to perform during both day and nighttime operations. The pivoting manipulator arm is capable of extending up to 2 feet and can lift up to 15 pounds close in and 7 pounds fully extended.

RS JPO utilizes feedback from units using the Mini-EOD in theater and U.S. training sites to develop enhancements and solutions for improved performance, reliability, and operational effectiveness for the soldier or marine.

As a result of a joint urgent operational needs statement, more than 400 Mini-EOD robots have been fielded in support of combat operations by all branches of the military.