Military Operations on Urbanized Terrain

E.01 Small-Unit Operations TD

Objectives. By FY01, demonstrate a situation awareness/communications/geolocation capability in restrictive environments to provide (1) scalable, nonhierarchical networks with robust communications to enhance decisionmaking at all echelons involved in military operations in urbanized terrain (MOUT); (2) situation awareness for tactical-level combatants to enhance collaborative planning from the battalion level down to the individual soldier or marine; (3) tasking and control of multiple autonomous systems with multiagent tasking and planning algorithms, integrated reflective and reactive planning, and automated tasking decomposition strategies; and (4) an internetted and arrayed advanced sensor capability, dynamically linked with situational awareness and tasking capability, to extend the tactical local area awareness and provide a flexible precision targeting capability integrated into the communications and geolocation architecture. Emerging military communications system advanced technology and system concepts developed under the DARPA small-unit operations (SUO) synthetic aperture sonar (SAS), commercial communications, and other technology will be evaluated to determine suitability as potential candidate for dismounted soldier equipment block upgrades (i.e., Land Warrior) and future communications systems (i.e., Joint Tactical Radio (JTR) wideband communications mobile networking).

Payoffs. Specific capabilities to be demonstrated include (1) mobile wireless communications providing voice, data, video, and graphics (operating in a severe multipath environment) with a twofold to fivefold range increase and a greater than 40-dB process gain in a lightweight package (less than 1 kg without battery) integrated with geolocation and navigation technologies capable of better than 3-m location accuracy that operate reliably in built-up environments with intermittent or obscured GPS data; (2) distributed interactive hubs to monitor and automatically update data, alerts, and warnings in a collaborative environment providing a moving bubble of the battlespace (8- to 30-km radius providing 8- to 10-min warning time) to teams subordinate to the battalion; (3) modular, open system C^4I architecture to provide soldier system-of-systems integration.; 4) low-power, lightweight miniaturization of dismounted soldier radio communications and portable computing technologies to increase mobility and affordability; and (5) sensor technology with a volume of 1 in^3 to 1 ft^3, an operating life from 1 day to 2 months, and coverage to 30 km to detect, locate, identify, and report targets.

Challenges. The enabling technologies to be exploited include enhanced packaging; forward error correction coding; advanced protocols; diverse antenna technologies; multichannel, variable bandwidth; advanced modulation techniques; intelligent software agents to aid in filtering, planning, and decisionmaking; and precision navigation. Technology barriers that must be overcome are lightweight power sources, dynamically reconfigurable and self-healing networks, RF propagation in restrictive environments, and GPS acquisition in restrictive environments.

Milestones/Metrics.

FY2000: (1) Complete detailed SAS system design. Build and test prototype SAS components to brassboard level. Complete component integration. (2) Evaluate peer-to-peer, multihop packet relay networking technology to demonstrate speed of convergence for pedestrian-oriented mobility (initialize 8–20 node network in 1–3 min; network join in 3–5 sec; network leave in 4 sec; reroute in 6 sec; add a hop in 35 sec).

FY2001: Build, integrate, and test SUO SAS. Demonstrate tactical-level, real-time essential information and communications, scalable from the individual soldier or marine to the battalion operating in urban, forested, and mountainous environments with 10X the capacity of the current Tactical Internet and precision geolocation (less than 3 m). Evaluate low probability of detection/intercept and antijam performance through field test and experimentation with representative electronic warfare threat systems.

FY2002: Evaluate SUO SAS advanced technologies and system and update design architecture and technology transition roadmap. Specify additional advanced technology development and system engineering manufacturing development to achieve SUO SAS size, weight, power, and cost objectives.

FY2003: Reduce size, weight, power, and cost of radio communication and applications processor modules through system-on-a-chip design methodologies, ASIC implementation, and application of MEMS technologies.

FY2004: Develop and demonstrate improved SUO SAS prototypes in operational demonstration. Complete SUO SAS technology transition through U.S. Army ATD/ACTD or acquisition program.

Customer POC	**Service/Agency POC**	**USD(A&T) POC**
COL Mitchel T. POODRY, USA USA/DBBL	Dr. Mark MCHENRY DARPA/TTO	TBD
LtCol Clarence WALLACE, USMC MCWL	LtCol Duane SCHATTLE, USMC NAVSEA, J8/LLD	

E.01 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602782A	779	0.5	1.8	2.0	2.0	0.7	0.0
0602782A	H92	3.6	3.6	2.7	2.7	0.0	0.0
0603764E	LNW–02	38.1	24.4	14.0	0.0	0.0	0.0
	DTO Total	**42.2**	**29.8**	**18.7**	**4.7**	**0.7**	**0.0**

E.02 Military Operations in Urbanized Terrain ACTD

Objectives. Integrate commercial/government off-the-shelf and service/DARPA/OGA developmental technologies, along with advanced operational concepts and tactics, techniques, and procedures (TTP) into a Military Operations in Urbanized Terrain (MOUT) system-of-systems to improve the operational effectiveness of Army and Marine Corps infantry in urban or built-up areas at battalion level and below in the areas of C^4I, engagement, force protection, and mobility.

Payoffs. The MOUT ACTD will include field experiments and simulations to demonstrate the interoperability and functionality of the integrated system-of-systems with supporting TTP, including non-line-of-sight communications; position and location intelligence collection and dissemination via advanced sensors; through-wall sensors mapping to the small unit; advanced marking capabilities; nonlethal capabilities for controlling personnel and vehicles; advanced MOUT munitions and breaching capabilities; precision mortars; sniper detection; combat identification; small arms protection; booby trap detection/disarmament; advanced individual mobility; and mission rehearsal capabilities for leaders. The military utility and force effectiveness of individual and aggregated technologies and advanced operational concepts/TTP will be quantified through high-level architecture instrumentation and a supporting suite of modeling and simulation tools. The ACTD will culminate in a battalion-level experiment at the Joint Readiness Training Center (JRTC). An interim capability will be provided for two years following the ACTD to units in the U.S. Army XVIII Airborne Corps (10th Mountain Division) and the U.S. Marine Corps 2nd Division.

Challenges. The most significant challenge is the integration of existing and emerging technologies while still ensuring optimum effectiveness in the restricted MOUT terrain. A MOUT ACTD systems architecture that is responsive to users' operational concept and mission threads will be developed and implemented as the blueprint to integrate the myriad of products that, in aggregate, will meet the 32-user requirements. It will also ensure appropriate connectivity with other organic assets and developing technologies that are external to the ACTD products per se, but with which ACTD products must interface in operational situations.

Milestones/Metrics.

FY2000: Complete battalion-level culminating demonstration: 25% increase in lethality, 20% increase in force protection, 50% increase in C^4I, and 20% increase in mobility.

FY2002: Complete data collection/analysis for extended user evaluation during residual phase of ACTD.

Customer POC	Service/Agency POC	USD(A&T) POC
Col Gary ANDERSON, USMC MCWL	Ms. Carol FITZGERALD USA/SSCOM/NVESD	Mr. Bob SHIELDS DUSD/AS&C
COL Mitchel T. POODRY, USA USA/DBBL	Mr. Bruce ZIMMERMAN SAAL–TT	

E.02 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603001A	393	19.6	3.9	3.9	0.0	0.0	0.0
	DTO Total	**19.6**	**3.9**	**3.9**	**0.0**	**0.0**	**0.0**

E.04 Joint Nonlethal Weapons

Objectives. Develop, demonstrate, and expedite fielding of antipersonnel and antimateriel nonlethal devices, munitions, and weapons. Mission areas of priority include crowd control; localizing or dispersing noncombatants; denying an area to personnel or vehicles; and disabling vehicles, aircraft, vessels, facilities, and equipment.

Payoffs. Currently our forces have very few options for conducting operations in these mission areas in the Military Operations in Urbanized Terrain (MOUT) environment within the stringent rules of engagement that often apply. Technologies from this program will lead to increased nonlethal options for the theater CINCs and field commanders.

Challenges. Technical challenges include development of kinetic- and directed-energy technologies that will operate at sufficient ranges and be logistically supportable, and generation and verification of bio-effects data to ensure system nonlethality.

Milestones/Metrics.

FY2000: Conduct development and field testing of prototype system for disabling large sea-going vessels with 90% probability of effect. Develop a prototype demonstration system for rapidly dispensing nonlethal payloads for area denial and conduct outdoor field testing. Develop 50 MW prototype ground vehicle stopper system capable of stopping a moving vehicle from a range of 100 m. Conduct outdoor field tests of prototype ground vehicle stopper systems to demonstrate effectiveness against 90% of all moving vehicles from a range of 100 m.

FY2001: Ground Vehicle Stoppers—Develop 100-MW prototype ground vehicle stopper system. Develop a HMMWV-mountable demonstration unit; continue testing and evaluation.

FY2002: Ground Vehicle Stoppers—Complete development of 100-MW prototype ground vehicle stopper system and conduct demonstration tests. Develop a second HMMWV-mountable demonstration unit; continue testing and evaluation.

Customer POC	Service/Agency POC	USD(A&T) POC
Maj Jim BUDWAY, USMC USMC HQ POS	Col George FENTON, USMC OSD	Dr. C. W., Jr. KITCHENS DDR&E/WT
CDR David JONES, USN CNO, N851		Mr. Art MCGREGOR DUSD/S&T
COL Thomas F. PAGE, USA HQ TRADOC/ATCD–Q		
Lt Col Albert RESPRESS, USAF AFSFC/SFOR		

E.04 Non-S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603851M	None	5.5	6.5	6.1	0.0	0.0	0.0
	DTO Total	**5.5**	**6.5**	**6.1**	**0.0**	**0.0**	**0.0**