Precision Fires

B.06 Air/Land Enhanced Reconnaissance and Targeting ATD

Objectives. Exploit emerging developments in on-the-move automatic target recognition (ATR) algorithms, including long-range detection, target identification, scene-to-scan correlation, smart sensor management, and temporal FLIR processing for moving target indicator; and evaluate the additional benefit provided by enhanced laser rangefinder functionality. The fast pace of many engagement scenarios requires a significantly improved capability to find and service targets while improving survivability.

Payoffs. The goal of the Air/Land Enhanced Reconnaissance and Targeting (ALERT) ATD is to provide the helicopter pilot and gunner the ability to automatically acquire and identify stationary and moving targets from a high-speed, dynamic aerial platform, such as a scout or attack helicopter. The net result will be a more efficient warfighting platform with greater survivability.

Challenges. Technical barriers include developing algorithms for motion compensation and optimizing FLIR/multifunction laser ATR fusion algorithms.

Milestones/Metrics.

FY2000: Integrate laser range mapping capability and enhanced on-the-move, search-and-detect algorithms.

FY2001: Automation to extend the safe ingress and egress rate of the platform by 50%–75% for full threat coverage over manual acquisition. Integrate a laser profiling capability to demonstrate target identifi-cation. Demonstrate the ability to provide on-the-move, long-range detection (in excess of 4,000 m).

Customer POC	Service/Agency POC	USD(A&T) POC
Mr. Mel JACKSON Comanche PEO	Mr. Rob SAUNDERS SARD/TT	Dr. Jasper LUPO ODUSD(S&T)/SS
	Mr. Richard WRIGHT USA/CECOM/NVESD	Mr. Art MCGREGOR DUSD/S&T

B.06 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603710A	K86	4.2	2.6	0.0	0.0	0.0	0.0
	DTO Total	**4.2**	**2.6**	**0.0**	**0.0**	**0.0**	**0.0**

B.07 Joint Continuous Strike Environment ACTD

Objectives. Focus technology and concepts to enable the application of a joint weapon suite to neutralize time-critical, high-value targets. The product of the joint continuous strike environment (JCSE) effort is an integrated system for joint, near-real-time attack operations based on distributed cooperative engagement planning and execution. The JCSE ACTD will demonstrate four capabilities: semiautomated target prioritization, continuous weapon availability monitoring, optimized weapon target pairing, and near-real-time airspace deconfliction.

Payoffs. The warfighter payoffs arising from JCSE are (1) production of dynamic target lists that automatically prioritize actionable targets in accordance with the commander's guidance, and their reprioritization to accommodate changes to that guidance; (2) cross-component awareness of current and projected weapon status and locations; (3) dynamic target ranking and strike asset status and location, combined to produce single- and multiple-weapon target tieups needed to prosecute emergent targets before they move with high P_k; and (4) for each weapon target pair or group of pairs, operators are informed of the need to deconflict airspace and are given the means to accomplish it rapidly.

Challenges. The challenges for JCSE involve integration of JCSE software into service and joint legacy and migration systems (e.g., Global Command and Control System (GCCS)) in such a manner that it operates at the module or segment level with minimal impact to the users in terms of training and system footprint modification. These challenges involve technical issues of integration, and programmatic issues of interface schedule development and management. The challenges are being addressed at the technical level through phased design, implementation, and testing of interface control documentation; and at the programmatic level through the JCSE transition working-level integrated process team chartered by DISA.

Milestones/Metrics.

FY2000: Demonstrate target prioritization incorporating enemy actions requiring plan modification; projected strike asset status based on planning information; multiple platform/weapon pairings on multiple-target complexes; and option generation for use of multiple manned aircraft (many on many). Participate in FBE–F.

FY2001: Participate in several exercises. Provide and support residual software with service fire support systems and GCCS. Provide capabilities to other programs, (e.g., M.02, Extending the Littoral Battlespace ACTD and B.25, Theater Precision Strike Operations (TPSO) ACTD).

FY2002: Complete integration into service systems. Complete integration with TPSO ACTD. Integration with DARPA JFACC. Residuals exercise and operations.

Customer POC	Service/Agency POC	USD(A&T) POC
LCDR Mike KRECHEL, USN EUCOM	Mr. Dan YATES JPSD	Dr. Judith A. DALY DUSD/AS&C
	Mr. Bruce ZIMMERMAN SAAL–TT	Mr. Art MCGREGOR DUSD/S&T

B.07 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603750D	P523	2.5	3.2	0.4	0.0	0.0	0.0
	DTO Total	**2.5**	**3.2**	**0.4**	**0.0**	**0.0**	**0.0**

B.07 Non-S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0208060F	None	0.2	0.2	0.0	0.0	0.0	0.0
0303026K	None	0.5	0.3	0.3	0.0	0.0	0.0
0603795N	None	1.0	0.2	0.2	0.0	0.0	0.0
	DTO Total	**1.7**	**0.7**	**0.5**	**0.0**	**0.0**	**0.0**

B.15 Powered Low-Cost Autonomous Attack System Program

Objectives. The objective of the Powered Low Cost Autonomous Attack System (P–LOCAAS) program is to demonstrate an affordable, miniature, autonomous, powered munition capable of searching, encountering, detecting, identifying, tracking, and destroying the entire spectrum of ground mobile targets in many types of target, weather, and terrain conditions. This program will demonstrate the feasibility and military utility of the LOCAAS technology for the Lethal Suppression of Enemy Air Defense (SEAD) Theater Missile Defense (TMD) Attack Operations and Interdiction mission areas through the integration of several maturing technologies. The subsystem technologies to be integrated into the P–LOCAAS program include a solid-state, 3D laser detection and ranging (LADAR) imaging seeker with autonomous target acquisition (ATA) algorithms, multimode warhead, safe-and-arm fuzing, inertial navigation system/global positioning system (INS/GPS) midcourse guidance, a compact high lift-to-drag ratio airframe, and a DARPA-developed miniature turbojet engine. Additionally, guidance processors are to be integrated into the munition as well. The submunition design will be compatible with both internal and external dispense concepts for both Air Force and Army platforms, including the tactical munition dispenser family (SUU–64 and SUU–66). The LOCAAS design will support a design roadmap to enable Multiple Launcher Rocket System (MLRS) compatibility. Additionally, the LOCAAS has affordability as a key objective with a unit production cost goal of $33,596 per munition ($FY00).

Payoffs. The combination of the powered airframe, INS/GPS midcourse guidance, and highly capable seeker/ATA system allow the LOCAAS concept to autonomously search over very large areas to find relocatable and mobile targets. This wide-area search capability will allow the LOCAAS to counter large initial target location error and deny the advantage of mobility to the enemy. Further, the range of the LOCAAS will allow launch from outside the engagement range of surface-to-air missiles, thus increasing the survivability of the launch aircraft. The following mission area needs will be addressed by the Powered LOCAAS program: increased ordnance carriage, standoff attack capability, autonomous attack capability, expanded off-boresight target engagement, multiple kills per pass, accurate/precision attack capability, limiting of the vulnerability of weapon to countermeasures, and improved weapon lethality/ effectiveness.

Challenges. Technology being demonstrated as part of the P–LOCAAS program includes the integration of the multimode warhead capability, LADAR seeker, turbojet engine, INS/GPS midcourse guidance, and guidance integrated fuzing. The primary challenges ahead in the P–LOCAAS program are sustaining LADAR/ATR performance over large search areas, designing and building tactically sized and performing components, integrating components into the guided test vehicles, and successfully demonstrating fully autonomous powered flight while conducting a wide-area search for targets. A further challenge is to develop a mission planning system that incorporates intelligence preparation of the battlefield, and allows for rapid targeting and effective operational employment of the powered LOCAAS technology.

Milestones/Metrics.

FY2000: Fabricate tactically sized seeker and conduct captive seeker flight tests; demonstrate capability versus varying targets, levels of obscuration, articulation, terrain, countermeasures, and weather. Design guided test vehicles.

FY2001: Complete third captive flight test and one captive flight data collection (score not used to meet exit criteria). Complete guided test vehicle fabrication and begin guided test flights. Complete fabrication and tower test the pre-production seeker (this seeker will achieve the same technical performance as the previous seekers, but will reduce the manufacturing risk).

FY2002: Complete flight test of guided test vehicles.

Customer POC

Maj Ben QUINTANA, USAF
ARI/SARU

Service/Agency POC

Mr. James MOORE
AFRL/AGTFT

USD(A&T) POC

Dr. Jasper LUPO
ODUSD(S&T)/SS

Mr. Art MCGREGOR
DUSD/S&T

B.15 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603601F	670A	0.0	7.8	7.2	0.0	0.0	0.0
0603601F	670B	8.4	0.0	0.0	0.0	0.0	0.0
	DTO Total	**8.4**	**7.8**	**7.2**	**0.0**	**0.0**	**0.0**

B.16 Concentric Canister Launcher

Objectives. Develop launcher technologies that yield significant reductions in the life cycle costs, maintenance requirements, and manning levels compared to existing systems. By combining a self-contained gas management system with a distributed electronic architecture, a “plug-and-play” launcher can be achieved where each Concentric Canister Launcher (CCL) is a separate node on the network and is a complete launching system for the payload it contains. This plug-and-play architecture promotes loadout flexibility and system modularity to accommodate a number of different mission areas and platform applications.

Payoffs. CCL requires little to no maintenance, permits unmanned operations, requires little to no specialized training, reduces manning, greatly simplifies and reduces logistic support, and is generic and broadly applicable to Navy ships and submarines. CCL technologies enable a plug-and-play capability for the introduction of new weapons and upgrades without ordnance alterations to the ship, reduce the cost and complexity of bringing weapon upgrades to the ship, and allow more flexibility to introduce non-Navy developed weapons. CCL emphasizes modularity and flexibility, both electronically and mechanically, generating the potential for cross-service commonality. At the end of FY00, the CCL program will have developed and demonstrated launcher technologies that affect significant reductions in life cycle costs, maintenance requirements, and manning levels. The feasibility of launcher component cross-service commonality will also be determined.

Challenges. The technical challenges to meeting program objectives include (1) self-contained gas management exit criteria: a restrained firing of a stressing missile (e.g., SM–2, Block IV) in a prototype-representative configuration, and the associated predictive modeling capability to handle future growth missiles; (2) distributed electronic architecture exit criteria: a single, survivable, distributed launch system architecture (featuring smart canisters) capable of simultaneously supporting the launch of multiple weapon types from multiple weapon systems; and (3) manning and life-cycle cost benefits exit criteria: independent validation of reductions in manning and production cost, simplified logistics, and compatibility.

Milestones/Metrics.

FY2000: SM–2 BLK IV restrained firing test. Develop and demonstrate technologies that result in 50% reduction in production costs, 66% reduction in manning, 50% reduction in maintenance costs, and 80% reduction in next-generation ship weapon integration cost.

Customer POC	Service/Agency POC	USD(A&T) POC
CAPT Ray PILCHER, USN CNO, N864	Mr. James CHEW ONR	Dr. Donald DIX ODDR&E/AT Mr. Art MCGREGOR DUSD/S&T

B.16 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603217N	R0447	5.1	0.0	0.0	0.0	0.0	0.0
	DTO Total	**5.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

B.18 Low-Cost Precision Kill ATD

Objectives. Develop, flight demonstrate, and integrate onto the AH–64 APACHE a very low-cost (~$10,000), accurate (~1-m circular error probability (CEP)) guidance and control retrofit package for the 2.75-in Hydra–70 rocket. A standoff range capability of greater than or equal to 6 km will be provided against specified nonheavy armor point targets often engaged in large numbers in many operational scenarios.

Payoffs. The small size, very low cost, and precision accuracy of the Hydra–70 guided rocket will increase stowed kills (lethality) while reducing cost per kill against nonheavy armor point targets typically engaged in large numbers in many operational scenarios. The standoff ranges and increased stowed kills reduces vulnerability of the launch platform, while surgical strike capability and sizing the right munition to the target provides for reduced collateral damage and reduced potential for fratracide. Hellfire SAL and Longbow are freed up for antitank missions. Small size and reduced number of required free rockets and antitank missiles enhances rapid force projection.

Challenges. Technical barriers include unproven, low-cost, producible strapdown solid-state mechanisms for precision guidance; a requirement for accurate, robust control of a highly rolling free rocket; the lack of small, very low-cost inertial components; weight and size minimization component packaging in the 2.75-in airframe; a limited understanding of structural, vibration, and shock considerations for guidance package retrofit to the 2.75-in Hydra–70 rocket; and lack of standoff range target acquisition and engagement techniques to address current free rocket launch and flight dispersions.

Milestones/Metrics.

FY2000: Demonstrate a 10X reduction in 2.75-in Hydra–70 rocket dispersions via control test vehicle flight tests.

FY2001: Demonstrate a 1-m CEP accuracy via ground-launched guided flights, document guided rocket performance specifications; and complete AH–64 aircraft integration.

FY2002: Complete guided flights from the AH–64 aircraft.

FY2003: Complete user tests by the end of year and document aircraft performance specifications.

Customer POC

Col Jesse M. DANIELSON, USAF
ATZQ/CD

Mr. Pat MCCARTNEY
ABL

COL Richard T. SAVAGE, USA
USA/MICOM/AGMS

Mr. Jose VAN LOO
AMBL

Service/Agency POC

Mr. Charles LEWIS
USA/AMCOM

Ms. Irena D. SZKRYBALO
SAAL–TT

USD(A&T) POC

Mr. Art MCGREGOR
DUSD/S&T

B.18 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603003A	435	1.0	3.7	1.8	1.3	0.0	0.0
0603313A	567	5.2	3.8	0.0	0.0	0.0	0.0
	DTO Total	**6.1**	**7.5**	**1.8**	**1.3**	**0.0**	**0.0**

B.19 Cruise Missile Real-Time Retargeting

Objectives. Develop technologies for brilliant autonomous cruise missiles with onboard mission planning and control systems. The program will demonstrate, by FY01, a brassboard real-time guidance and control system with an associated LADAR sensor mounted on a T–39 aircraft to demonstrate (1) immediate launch-on-coordinates capability for weapons; (2) in-flight, onboard decisionmaking to provide in-flight coordinated attack against fixed and mobile targets; (3) precise aimpoint selection for greater kill effectiveness; and (4) battle damage indication from the LADAR sensor. The LADAR seeker to be demonstrated is being developed jointly with the Air Force under the Demonstration of Advanced Solid-State LADAR (DASSL) program.

Payoffs. Weapon systems affordability and effectiveness will be significantly enhanced by the transition of the technology demonstrated by this project. Specific payoffs include (1) the ability to retarget a weapon while it is in flight, (2) improved target and target aimpoint selection to improve weapon effectiveness via small circular error probability (CEP) on high-value fixed and mobile targets, (3) reduced mission timeline for the destruction of time-critical targets, (4) development of reduced-cost LADAR seeker technology suitable for autonomous target identification in natural and man-made high-clutter environments, and (5) in-flight, onboard route replanning capability and onboard real-time autonomous decisionmaking capability to reduce the number of cruise missiles per target by one-third.

Challenges. There are three key technical challenges: (1) development of a higher-power, lower-cost LADAR seeker that is capable of rapid high-resolution data collection rates, greater range capability, and better weather penetration; (2) development of algorithms and processing schemes necessary to accomplish in-flight, real-time adaptive strike planning; and (3) development of ATR algorithms to provide a precise aimpoint for both fixed and mobile targets in high-clutter backgrounds.

Milestones/Metrics.

FY2000: Conduct captive flight tests; deliver DASSL seeker (20 W); and demonstrate critical mobile target algorithm tactical movement analyzer and sensor manager.

FY2001: Demonstrate a brassboard real-time guidance and control system with an associated LADAR sensor with a LADAR field of view of 1 km.

Customer POC

Mr. Edmund ANDERSON
PEO/CU

Bgen Timothy E. DONOVAN, USMC
USMC/WFL

CAPT Kevin QUINN, USN
CNO, N864

CAPT Robert TAYLOR, USN
CNO, N88

Service/Agency POC

Mr. James CHEW
ONR

USD(A&T) POC

Dr. Jasper LUPO
ODUSD(S&T)/SS

Mr. Art MCGREGOR
DUSD/S&T

B.19 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603217N	R0447	5.3	5.3	3.0	0.0	0.0	0.0
	DTO Total	**5.3**	**5.3**	**3.0**	**0.0**	**0.0**	**0.0**

B.21 Miniaturized Munition Technology Guided Flight Tests

Objectives. By FY04, demonstrate the effectiveness of a small (250 lb-class) munition with extended range, an enhanced fragmentation/enhanced blast warhead, antijam Global Positioning System/Inertial Navigation System (GPS/INS) guidance, and a laser radar (LADAR) terminal seeker. The goal is to demonstrate a small munitions capability to destroy a majority of fixed target threats.

Payoffs. The small package of a miniaturized munition will allow a three- to fourfold increase in aircraft loadout, thereby increasing the number of targets destroyed in a single sortie. Given a fixed number of aircraft, this will increase the tempo of the war and allow more targets to be destroyed in a shorter amount of time, providing the potential to shorten the war. The smaller logistics footprint will allow airlifting of more munitions in a shorter amount of time. The smaller munition will also give future aircraft designers more flexibility in sizing their weapon bays, and allow future stealth aircraft to carry more firepower in internal weapon bays and maintain their effectiveness against the majority of fixed targets. Demonstrations will include (1) a range-extension kit to substantially increase standoff range; (2) a penetrating warhead with an explosive 1.5X the energy in tritonal; (3) in conjunction with the hard-target smart fuzes, the ability of the warhead to sense layers and voids and detonate at the appropriate location to ensure the warhead's effectiveness against theater targets; (4) GPS with a 120-dB jam-to-signal ratio (J/S) (50 dB better than commercial systems) effective up to 1 nmi from a 100-kW jammer; (5) less than 3-m CEP accuracy using a LADAR terminal seeker; and (6) cost effective datalinks to allow in-flight target updates and to report bomb damage information.

Challenges. Technology barriers are aircraft integration of multiple smart munitions, including carriage systems (electrical and mechanical interface) and LADAR seeker integration within the prescribed munition length.

Milestones/Metrics.

FY2000: Demonstrate increased standoff range, 35-nmi flyout.

FY2001: Complete detailed design of guided flight test vehicle.

FY2002: Fabricate/purchase LADAR seeker hardware.

FY2003: Conduct flight qualification ground testing and hardware-in-the-loop simulations.

FY2004: Demonstrate the effectiveness of a small (250 lb-class) munition with an enhanced fragmentation/enhanced blast warhead, antijam GPS/INS guidance, 120-dB J/S in tracking, and LADAR terminal seeker with less than 3-m CEP.

Customer POC	Service/Agency POC	USD(A&T) POC
Maj Ben QUINTANA, USAF ARI/SARU	Mr. Michael FLYNN SAF/AQRT	Mr. Art MCGREGOR DUSD/S&T
Ms. Lynda RUTLEDGE, USAF ACC/WMX	Mr. Ken LOCKWOOD, USAF AFRL/MNAV	

B.21 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603601F	670A	0.8	1.3	4.2	10.0	8.1	0.0
0603601F	670B	0.7	0.0	0.0	0.0	0.0	0.0
	DTO Total	**1.5**	**1.3**	**4.2**	**10.0**	**8.1**	**0.0**

B.24 Programmable Integrated Ordnance Suite

Objectives. Develop and demonstrate an integrated ordnance suite comprised of an imaging infrared (I^2R) target detection device, advanced initiation fireset, and directional warhead to maximize counter-air-missile lethality. The Programmable Integrated Ordnance Suite (PIOS) is a joint U.S./U.K. program. The goal of the program is to show the ordnance suite's capability to detect a target, establish a vulnerable aimpoint, and compute and project a highly focused pattern of fragments onto the target aimpoint. Funding shown in this DTO does not include U.K. funds.

Payoffs. The PIOS program will provide the warfighter with an air-to-air missile ordnance package that will enhance missile effectiveness against cruise missiles, fighter aircraft, bombers, and helicopters; increase kills per sortie in air superiority missions; and provide a one-missile/one-kill capability.

Challenges. Dual, opposed, side-looking fisheye lenses provide spherical field-of-view imagery about the missile. Non-uniform window heating, stray solar light, ghost images, and fisheye image distortion present significant optical design challenges. High-speed image processing at 1-kHz frame rates is required to perform target detection, aimpoint selection, and burst point selection for high-closing-rate encounters. Multipoint initiation fireset requires accurate timing of detonation points sequencing to project warhead fragments in the preferred aim direction at the proper time.

Milestones/Metrics.

FY2000: Lethality analyses estimates baselined against advanced medium-range air-to-air missile. Fuze and warhead fabrication and laboratory testing.

FY2001: Integration of fuze and warhead as part of an Integrated Ordnance Suite static test set.

FY2002: Perform demonstration tests. Exercise fuze detection and decision processes, and warhead kill mechanism.

FY2003: Evaluate test results and transition technology to ASC/YA.

Customer POC	**Service/Agency POC**	**USD(A&T) POC**
Col Dennis MINER, USAF HQ USAF/XORBP	Mr. Don CUNARD, USA AFRL/MNM	Mr. Art MCGREGOR DUSD/S&T
	Mr. Michael FLYNN SAF/AQRT	

B.24 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603601F	670A	2.4	3.6	3.1	3.7	0.0	0.0
	DTO Total	**2.4**	**3.6**	**3.1**	**3.7**	**0.0**	**0.0**

B.24 Non-S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603790F	None	1.0	1.0	0.0	0.0	0.0	0.0
	DTO Total	**1.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**

B.25 Theater Precision Strike Operations ACTD

Objectives. Develop and demonstrate a significantly improved capability for the Ground Component Commander (GCC) to forecast, plan, and execute deep operations and counterfires with an integrated joint and coalition force to detect volume of fires, collaboratively plan targeting, and direct counterfire and precision engagements against all types of ground targets using joint/coalition assets.

Payoffs. Theater precision strike operations (TPSO) will enable the GCC to synchronize, coordinate, deconflict, and employ organic, joint, and coalition deep-strike assets focused on the area between the forward line of own troops and the forward boundary in near-real-time coordination with the air component commander, other component commanders, and coalition partners.

Challenges. TPSO is a system-of-systems program to integrate the precision strike functions of surveillance/reconnaissance, target acquisition, strike planning, weapons delivery, and battle damage assessment. The major challenges are to provide an enhanced C^4I capability at the theater Army level, centered within the newly established GCC Deep Operations Coordination Center (DOCC) to provide shared situational awareness, a common operating picture, and an automated strike planning capability within the context of the end-to-end, sensor-to-shooter precision strike process. Additional challenges include provision of the ability to rapidly detect volume of fires through new technical capabilities, such as the networking of firefinder radars and technologies to support the seamless transition from unreinforced to reinforced situations.

Milestones/Metrics.

FY2000: Conduct an unreinforced exercise to prosecute the initial hours of a war with the normally deployed force utilizing initial TPSO capability and functional enhancements.

FY2001: Demonstrate the issues associated with the transition from the unreinforced to reinforced fight. The TPSO-added capabilities, tactics, techniques, and procedures demonstrated should allow the GCC to defeat at least 50% more threat targets than the current capability.

FY2002: Commence interim capability support.

FY2003: Conclude interim capability support.

Customer POC	**Service/Agency POC**	**USD(A&T) POC**
COL Pete CORPAC, USA D&SA Battle Lab	COL Ken DOBECK, USA JPSD	Mr. Art MCGREGOR DUSD/S&T
COL Michael DAVIS, USA USFK	MAJ Will RIGGINS, USA JPSD/PO	Dr. Charles PERKINS DUSD/AS&C
MAJ David SOLLEY, USA D&SA Battle Lab	Mr. Bruce ZIMMERMAN SAAL–TT	

B.25 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603238A	177	18.4	21.1	14.0	10.0	0.0	0.0
0603750D	P523	5.7	6.4	5.5	0.0	0.0	0.0
	DTO Total	**24.1**	**27.5**	**19.5**	**10.0**	**0.0**	**0.0**

B.26 Multifunction Staring Sensor Suite ATD

Objectives. Demonstrate a sensor system capable of rapid acquisition and identification of threat targets beyond the threat's detection range with the ability to detect and identify targets in clutter. In addition to target acquisition functions, the host platform must perform supplementary tasks such as sensing target range, acquiring fleeting targets, and locating sources of sniper and mortar fires. The solution that accomplishes these functions requires the use of multiple sensors operating across the electromagnetic spectrum. The reconfigurable Multifunction Staring Sensor Suite (MFS^3) uses sensor fusion and integrates multiple advanced sensor components including staring arrays, a multifunction laser, and acoustic arrays.

Payoffs. The MFS^3 will provide future combat vehicles with a compact and affordable sensor suite capable of identifying threat targets before detection by the enemy, finding and recognizing camouflaged threat targets in defilade, acquiring threat targets quickly without radiating, and increasing vehicle and soldier survivability.

Challenges. Technical challenges include the fusion of multiple advanced sensor components, the application of the aided target recognition algorithms to these advanced sensors, and the achievement of high probability of target detection and recognition with a low false-alarm rate.

Milestones/Metrics.

FY2000: Integrate staring dual-band FLIR with MFS^3 backplane. Demonstrate manual long-range target identification of the 3-FOV, 3–5 m staring FLIR and compare against fielded 8–12 m scanning FLIR systems.

FY2001: Integrate multifunctional laser and acoustic sensors with common backplane processor and automatic target recognition (ATR) algorithms.

FY2002: From a stationary platform, demonstrate the ability to identify ground targets at 2.5X the range of present Scout vehicles and a 10X increase in azimuth field-of-regard. Demonstrate ATR performance of improved target detection/recognition timelines by 9X, low false-alarm rate, passive moving target indicator, and maintain simultaneous track of multiple targets.

FY2003: Demonstrate rapid wide-area search and long-range target identification while on the move.

Customer POC	**Service/Agency POC**	**USD(A&T) POC**
COL John KALB, USA USAAC	Mr. Paul LASTER USA/NVESD/MSSS	Dr. Jasper LUPO ODUSD(S&T)/SS
	Mr. Rob SAUNDERS SARD/TT	Mr. Art MCGREGOR DUSD/S&T

B.26 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603710A	K70	13.1	14.4	4.0	2.1	0.0	0.0
	DTO Total	**13.1**	**14.4**	**4.0**	**2.1**	**0.0**	**0.0**

B.27 Point-Hit ATACMS/MLRS

Objectives. Design, develop, and test a cost-effective, jamming-resistant, precision guidance package for application to long range artillery missiles (guided multiple-launch rocket system (MLRS)). In FY99, the program evaluated alternative Global Positioning System (GPS) SAASM receivers, antijam filters, and jam-resistant GPS antenna designs. In FY00, component-level testing of GPS receivers, antijam filters, and antennas will be accomplished in a hardware-in-the-loop facility and in an open-sky environment with jammers present. In addition, flight software modifications will be designed to allow for more sophisticated inertial/GPS blending to further increase accuracy and allow for specified dive angles in the terminal phase of the trajectory. In FY01, the guidance electronics unit and antennas will be integrated and tested in a hardware-in-the-loop facility under a jamming environment and will be available for integration into either a guided MLRS or a unitary MLRS.

Payoffs. A 25-fold increase in accuracy can be realized through incorporation of differential GPS, giving the Army the capability of defeating high-value point targets. The Army cannot effectively engage these targets at present. The Army Tactical Missile System (ATACMS) and the MLRS System both will benefit from the results of this program.

Challenges. The specific challenges of this DTO lie in evaluating the method for computing and transmitting GPS correction to the launcher; and evaluating GPS receiver candidates, antijam filters, and antenna designs in order to achieve the antijam goals while also meeting cost goals. Low-cost integrated antijam GPS accuracy will give the Army the capability of defeating a class of targets that cannot be effectively engaged at present.

Milestones/Metrics.

FY2000: Design, fabricate, and test hardware suite for computing and transmitting GPS correction to the launcher. Test GPS receivers, antijam filters, and antennas. Assemble guidance electronics unit and antennas.

FY2001: Assemble guidance electronics unit and antennas. Demonstrate guidance electronics unit in HWIL under a jamming environment.

Customer POC	**Service/Agency POC**	**USD(A&T) POC**
COL Barry WARD, USA USA/MICOM	Mr. Allan GAMBLE AMCOM	Mr. Art MCGREGOR DUSD/S&T
	Ms. Irena D. SZKRYBALO SAAL–TT	

B.27 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602303A	214	0.5	1.0	0.0	0.0	0.0	0.0
	DTO Total	**0.5**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**

B.29 Battle Damage Assessment in the Joint Targeting Toolbox ACTD

Objectives. Provide the warfighters with a significant battle damage assessment (BDA) capability by combining battle damage indicators, observed physical damage, and inferred functional damage into an accurate assessment of combat operations. This ACTD incorporates advanced technologies in artificial intelligence and decision aiding, especially evidential reasoning and case-based reasoning, to provide an accurate assessment of combat operations. This ACTD will address the four technical aspects of BDA: data acquisition, results analysis, data aggregation, and visualization. The BDA application will be developed to run as an integrated application in the Joint Targeting Toolbox (JTT).

Payoffs. The ACTD will provide an accurate and timely assessment of the damage resulting from combat operations, which is a critical shortfall for the joint force commander. The BDA will integrate the JTT to provide the theater/JTF commander a seamless, synergistic BDA and targeting process to correct current limitations. The ACTD will directly result in significant operational improvements to both the planning and targeting communities.

Challenges. Collection resources are insufficient for collecting the entire battlespace, which results in assessing the effectiveness of combat operations based on incomplete reporting and analysis. With reduced force structures, manually intensive BDA is a critical requirement that must be accomplished more efficiently, accurately, and timely to ensure that damage assessment supports the most efficient use of strike assets.

Milestones/Metrics.

FY2000: Beta tests at CENTCOM and J2–T.

FY2001: Military utility assessment in CENTCOM exercise.

FY2002: Commence interim capability support.

FY2003: Conclude interim capability support.

Customer POC

Mr. Mark HASKALL
CENTCOM

Mr. Mike MAGGIANO
J2–T

Maj Mark WALLACE, USAF
CENTCOM/J2

Service/Agency POC

Mr. Jim PAPAGNI
AFRL

USD(A&T) POC

Mr. Art MCGREGOR
DUSD/S&T

Lt Col Marty MEYER, USAF
DUSD/AS&C

B.29 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603750D	P523	0.5	0.3	0.1	0.1	0.0	0.0
	DTO Total	**0.5**	**0.3**	**0.1**	**0.1**	**0.0**	**0.0**

B.29 Non-S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0301335F	27431	1.0	1.0	0.9	0.9	0.0	0.0
	DTO Total	**1.0**	**1.0**	**0.9**	**0.9**	**0.0**	**0.0**

B.30 Affordable Moving Surface Target Engagement

Objectives. Develop and demonstrate the multiplatform tracking and related signal processing technologies required to enable affordable all-weather precision negation of moving surface targets (both land- and sea-based).

Payoffs. The use of netted ground moving target indication (GMTI) sensors will produce a fire control targeting solution to enable precision engagement of ground moving targets. Technologies developed under this program will provide high-confidence tracks generated from multiplatform data. These tracks will provide both the accuracy and continuity to support a targeting solution. Feature-based tracking techniques will enable high-confidence tracking of nominated targets of interest with a minimum expenditure of sensor resources. This will enable flexible battle management over potentially long duration while requiring only a minimum use of sensor timeline, thus minimizing the total number of sensors required to fulfill multiple missions and reducing the cost of the overall fire control system. This will also ensure track continuity through complex target maneuvers such as move-stop-move transition.

Challenges. Track association algorithms must accommodate multiplatform data, including problems associated with cross-platform registration, or “grid-locking.” Absolute geo-registration is also necessary, sometimes without any available external references as tie points. Achieving high accuracy may require the development of higher-order target motion models or advanced radar signal processing techniques. The tracking technology must provide projections of likely target positions into the future with high precision for short times (less than one minute) and with less precision for times out to 20 minutes or greater. To support target maintenance applications, the tracker must maintain high-confidence (greater than 90 %) track association on single targets of interest for time spans from 10 min through a few hours with sensor revisit times no shorter than 10 sec. This may require the use of additional target radar signature features to reduce association ambiguity. Little is currently known about the definition, measurement, and processing of these features for this application. Signature distinguishability may be required to be quite high (greater than 90%) for targets in high-density traffic.

Milestones/Metrics.

FY2000: Complete high-target-complexity, multiplatform precision fire control tracking laboratory experiment, and collect multiplatform GMTI and target signature data against a complex target environment.

FY2001: Conduct real-time field experiments to assess Affordable Moving Surface Target Engagement (AMSTE) precision tracking capability against a low-complexity target environment.

FY2002: Conduct real-time field experiments to assess AMSTE precision tracking capability against a high-complexity target environment.

FY2003: Conduct real-time field experiments to assess AMSTE precision tracking capability against a high-complexity target environment, including long-duration target maintenance in high-density traffic.

Customer POC	Service/Agency POC	USD(A&T) POC
LtCol Michael CLARK, USMC CNO, N864J	Dr. Timothy GRAYSON DARPA/SPO	Mr. Art MCGREGOR DUSD/S&T

B.30 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603762E	SGT–04	7.0	10.0	13.0	10.0	0.0	0.0
	DTO Total	**7.0**	**10.0**	**13.0**	**10.0**	**0.0**	**0.0**