



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND

JSSAP Portfolio
NDIA Update
04 June 2019

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Project Management Engineer
Joint Service Small Arms Program





JSSAP FY19 PORTFOLIO (PROPOSED)



Soldier Lethality - CFT

- Next Gen Family of Ammunition
- Next Gen Squad Weapon Technology
- Next Gen Carbine Tech
- SCOPE (Squad Common Optic Performance Enhancement)

Volume

- Optical Material Demonstrator
- External Pressure Rifling
- Novel Recoil Mitigation

Small Arms Enablers

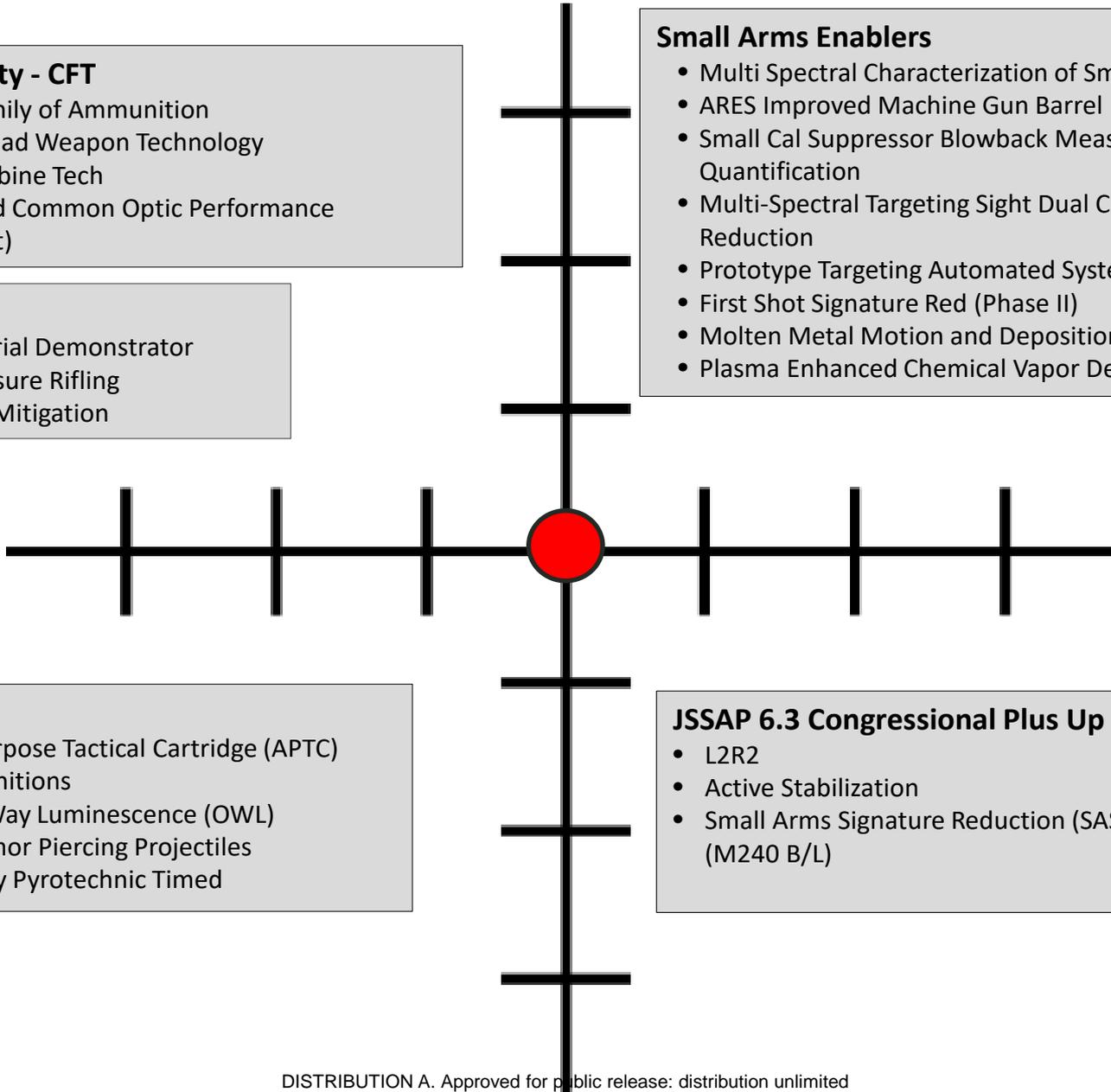
- Multi Spectral Characterization of Small Arms
- ARES Improved Machine Gun Barrel
- Small Cal Suppressor Blowback Measurement and Quantification
- Multi-Spectral Targeting Sight Dual Channel Crosstalk Reduction
- Prototype Targeting Automated System for RWS
- First Shot Signature Red (Phase II)
- Molten Metal Motion and Deposition
- Plasma Enhanced Chemical Vapor Deposition

Ammunition

- .50 cal All-Purpose Tactical Cartridge (APTCL)
- Precision Munitions
- .50 cal One-Way Luminescence (OWL)
- Aeroshell Armor Piercing Projectiles
- Kinetic Energy Pyrotechnic Timed

JSSAP 6.3 Congressional Plus Up

- L2R2
- Active Stabilization
- Small Arms Signature Reduction (SASR) – Crew Served (M240 B/L)





NEXT GENERATION FAMILY OF AMMUNITION



Projectile pictures are examples not actual representations



Combat Round



Reduced Range Ammo (RRA)

Schedule

Milestones	FY19	FY20	FY21	FY22	FY23	FY24	FY25
Combat Projectile	5-6						
Reduced Range Ammunition (RRA)	4-6						
Combat Tracer		4-6					
RRA Tracer		4-6					
CCMCK/Blank/DDI			4-6				
Projectile Optimization					5-6		

Purpose:

- Design and development of family of 6.8mm projectiles
- Projectiles directly transitioning to Next Generation Squad Weapon (NGSW) system for cartridge development and fielding

Products:

- Combat round for soft and hard targets
- Training Projectile with trajectory match and reduced Surface Danger Zone (SDZ).
- Tracer rounds not visible by threat targets down range
- Force on Force training cartridge (Close Combat Marking Capability Kit - CCMCK)

Payoffs:

- Provide improved capability vs. a broad spectrum of targets
- Increase soldier survivability (current tracers are seen from all directions)

Partners:

- CCDC Army Research Lab
- Program Manager Soldier Weapons
- Program Manager Maneuver Ammunition Systems
- Maneuver Center of Excellence
- Soldier Lethality Cross Functional Team

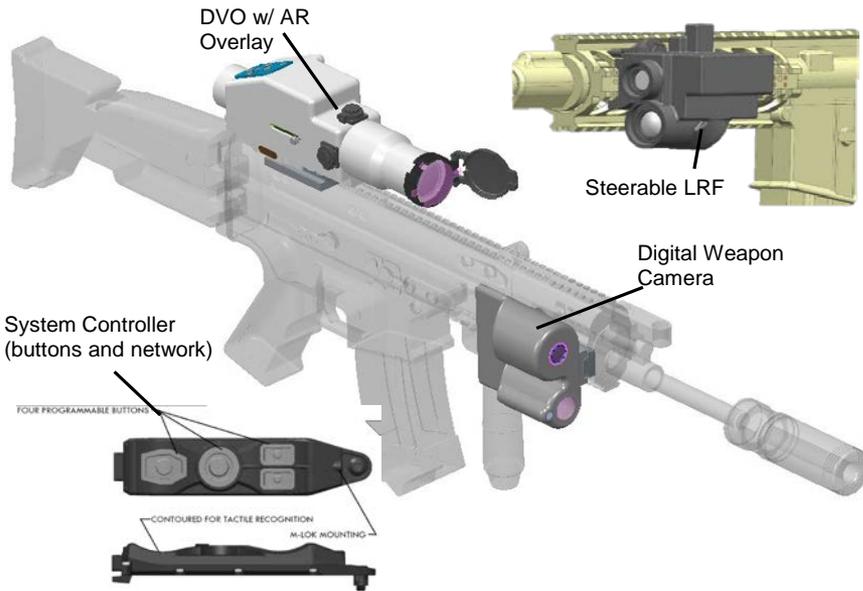
Upcoming Events:

- TRL 4 Assessment of Reduced Range – 3QFY19

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SQUAD COMBAT OPTIC PERFORMANCE ENHANCEMENT (SCOPE)



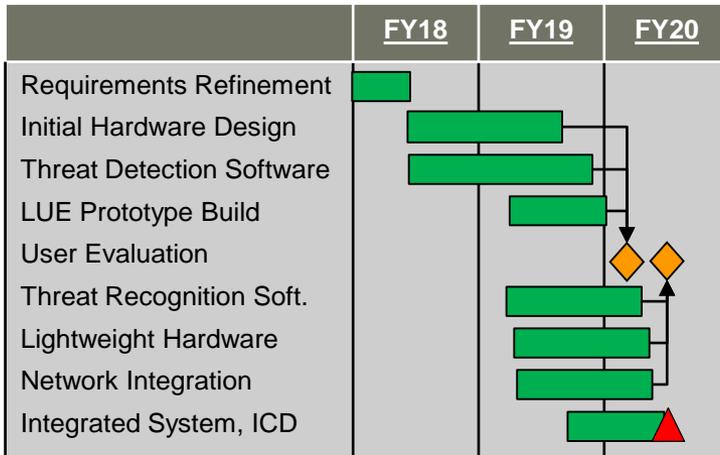
Purpose:

- Pair with the Next Generation Squad Weapons Technology (NGSWT) to mitigate the dismounted combatant threat, as described in Small Arms Ammunition Configuration (SAAC) Study. Develop Fire Control Technologies which meet Next Generation Squad Weapon Fire Control tech insertion timelines and drive down risk on emerging aim augmentation technology for rapid integration/fielding.

Product:

- Full System Interface Control Documentation, including hardware/software/firmware for platform upgradability/maintainability
- Rapid Integration of Digital Fire Control Elements for TRL 6 Rifle-Mounted Advanced Fire Control Optic, including:
 - Digitally Enhanced Aiming when paired with aim augmentation capable weapon platform (steerable barrel, electronic trigger, etc.)
 - Automated Target Recognition/Tracking Algorithms
 - Direct View Primary Optic with Augmented Reality Overlay
 - Steerable Rangefinder which accommodates for aim error
- Integrated Design leveraging Emerging Technologies
 - Artificial Intelligence (AI) for threat recognition and prioritization
 - AI Framework for integration with higher order data systems
 - Advanced Optical Materials for order of magnitude weight savings

Schedule



◆ = Test ▲ = Transition to PMSW

Payoff:

- TRL 6 demonstrator of fire control technologies, including hardware for Soldier touch points and feedback
- Initial increment AI capability, appropriate for dismounted use
- System Design to Improve P(I) at max effective range of the weapon in order to mitigate threat (per SAAC modeling)
- Drive advancement of bleeding edge technologies required to achieve objective capabilities outlined in Next Generation Squad Weapon Fire Control requirement and support Soldier Lethality CFT vision



NEXT GENERATION SQUAD WEAPONS TECHNOLOGY (NGSWT)



CT Polymer Cartridge



Mid-Cal Projectiles



Data/Power Transfer Rail

Muzzle Device

E/M Trigger

(U) Schedule

	FY17	FY18	FY19
Program Planning			
Weapon and Cartridge Technology Tradeoffs		4	
Fab. Mann Barrel & Cartridge to critical threshold		4	
Test & Refine Firing Fixture & Function Cartridge		5	
Integrate chamber, barrel, muzzle device		4	
Fab, Test & Refine Integrated Weapon & Cartridge			6
Fire Control Integration Development			6
Projectile Development			6

Purpose:

- Provide weapon integrated technologies leveraging Lightweight Small Arms Technologies (LSAT), Future Advanced Squad Technologies (FAST), 6.5mm Cased Telescoped (CT) Carbine, and Small Arms Ammunition Configuration (SAAC) study results
- Provide for fire control integration - Squad Combat Optic Performance Enhancement (SCOPE) program

Product:

- Demonstration of Weapon/Cartridge for Automatic Rifle (TRL 6)
- Optimized Cartridge Configuration - weight/size vs lethality
- Case Telescoped (CT) Cartridge
- Mid-Caliber Projectiles (TRL 5/6)
- Lightweight Materials
- New Barrel Manufacturing Processes
- Muzzle Device
- Integrated Electromechanical (E/M) Trigger and Data/Power Transfer Rail - interfaces for SCOPE
- TDP for Weapon, Ammunition, and Fire Control Interface

Payoff:

- Provides a TRL 6 platform and growth for future squad weapons by providing the next generation cartridge (carbine, SDMR, etc.)

Partners:

- AAI Corp. (Textron Systems)



NEXT GENERATION CARBINE TECHNOLOGY



Purpose:

Development and demonstration of critical component level technologies that provide light weight, reduced signature (visual, acoustic), lower-recoil rifle development to enable increased system performance

Product:

- Develop evaluation and demonstration fixtures
 - Allow for part interchange within single platform
- Characterization of advanced barrel technologies
 - Bore erosion, velocity and dispersion degradation
 - Various technologies
- Characterize visual and acoustic signature and recoil technologies
 - Various technologies targeting signature and recoil

Payoff:

- Enable component development and evaluation
- Knowledge transition of advanced component technologies

Partners:

- ARL

Transition:

- Knowledge transition to PMSW FY20

Capability Gap / Opportunity Area(s) Focus:

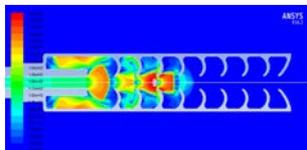
- NGSW - Barrel erosion, signature, and recoil mitigation

Key Upcoming Events:

- Obtain fixture and ammunition hardware
- Obtain advanced barrels and signature/recoil devices
- Characterization Testing

POC: Thomas C. Grego
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Signature/Recoil Reduction



Advanced Barrel Wear



Evaluation Fixture



Schedule

	FY18	FY19	FY20
Program Planning			
S&T Stakeholder Analysis	[Green bar]		
Evaluation Fixture		[Green bar]	
Signature and Recoil Reduction	[Green bar]	[Green bar]	[Green bar]
Advanced Barrel Wear		[Green bar]	[Green bar]



US ARMY SUPPORT OF USCG LETHAL REDUCED RANGE AMMUNITION



M80



SC18



LW3



P6?

Schedule

Tasks	FY(19)	2QTR	3QTR	4QTR
Current RRTA design review; analysis, selection		█		
Engineering Support		█		
Ballistic Testing		█		
Ballistic Analysis			█	
Program Reviews		▲	▲	▲
			TRL5	TRL6

Purpose:

- Provide program support and comprehensive ballistic testing with analysis for the USCG Lethal Reduced Range Ammunition

Product:

- Lethal Reduced Range meeting USCG needs
- Approximate TRL 6 TDP & Demonstration

Payoff:

- Provide support and analysis to USCG that will provide understanding of their product, leveraging Army experience and techniques being applied to the US Army RRTA programs
- Flight and terminal ballistic performance characterized as a function of range.
- Evaluation of JSSAP provided contractor M240 test data

Partners:

US ARMY CCDC-AC; USCG

Transition:

JSSAP-to-USCG

Capability Gap / Opportunity Area(s) Focus:

Lethal Limited Range ammunition to limit collateral damage

Key Upcoming Events:

- Requirements review with CCDC-AC / USCG
- RRTA design Review
- Contractor Support Kickoff

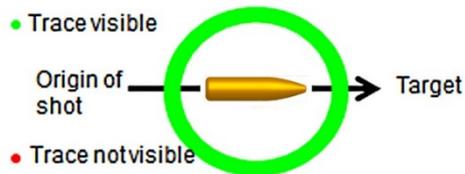
POC: Mark Minisi (x4326)
Shawn Spickert-Fulton (x6088)



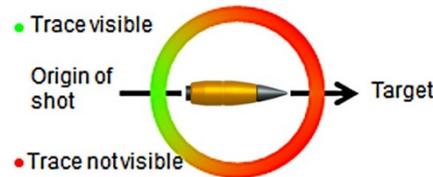
ONE-WAY LUMINESCENCE (OWL) 0.50"



Approximate Visual Signature with Current Tracers



Approximate Visual Signature with One Way Luminescence



.50 Cal Tracer Example



(U) Schedule

	FY19	FY20	FY21
Limited Generic Surrogate Trace Performance	█		
Tooling Development Application I	█	█	█
Application I Testing		█	█
Tooling Development Application II		█	█
Application II Testing		█	

Purpose:

- Develop 0.50" tracers not visible from locations down-range of projectile (enemy locations) during flight
- Will utilize 5.56mm & 7.62mm OWL government technology toward 0.50" type projectiles

Product:

- Cal 0.50" small scale one-way tracer manufacturing and testing capability
- Begin gathering test data QTR2 FY19
- Incorporate 5.56mm/7.62mm OWL lessons learned

Payoff:

- Increase soldier survivability (current tracers are 2-way)
- Decrease ball-trace mismatch
- Decrease tracer muzzle signature
- Decrease tracer caused range-fires
- Potential cost savings

Partners:

- Project Manager – Maneuver Ammunition systems

Key Upcoming Events:

- June-Sept continued charging and trace performance testing
- Updated formulation and projectile design iterations



PRECISION MUNITIONS



Purpose:

- Develop scalable precision munition technologies to increase Warfighter capability in anti-materiel, anti-personnel and other specialized missions.



Product:

- .338 caliber Anti-Material Cartridge
- .300 caliber Improved Performance Round
- 7.62mm Improved Performance Round



Payoff:

- Increase in Probability of Hit and Probability of Incapacitation due to increased projectile velocity, flatter shot trajectory and reduced projectile wind/environmental sensitivity
- Increased effective system range
- Increased capability in hard-target penetration

Schedule

.338 Cartridge Technology Transition					5
7.62mm IPR Projectile	3	4			5
7.62mm Saboted Projectile		3	4		5
7.62mm Advanced Performance Projectile		3	4		5
7.62mm Cartridge Technology Transition					5
Propellant Development			4		5
Cartridge Case Development			4		5

Partners:

- Polymer Technologies Inc.
- Concurrent Technologies Corporation

Transition:

- The CDD is currently being revised
- Working with PM-MAS on the TTA

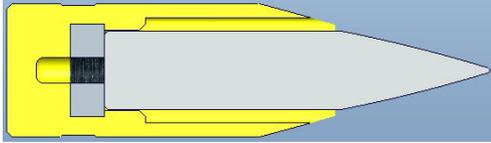
Key Upcoming Events:

- New .338 caliber penetrator concepts
- 7.62mm projectile down-select
- Sabot design enhancements

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973-724-4778



.50 CAL ALL PURPOSE TACTICAL CARTRIDGE



Current M903 SLAP

Purpose:

- Develop a single .50 caliber All Purpose Tactical Cartridge (APTC) capable of performing the mission tasks of M8 API and M903 SLAP.
- Incorporate small caliber munitions developmental efforts, including One Way Luminescence (OWL) and Green Primer

Product:

- Prototype .50 caliber APTC ammunition
- Scalable, caliber-agnostic munition technology which can be leveraged by future efforts

Payoff:

- Addresses capability gaps in .50 Caliber Munitions CDD
- Increased probability of hit due to increased effective range

Partners:

- JSSAP, PM MAS, MCoE, ARL

Transition:

- PM MAS Endorsement – new start program begins FY20

Key Upcoming Events:

- Propellant optimization via CRADA with SMP, 3Q FY19
- Hard target testing at ARL, 4Q FY19
- EPVAT/Dispersion testing at ATF, 4Q FY20

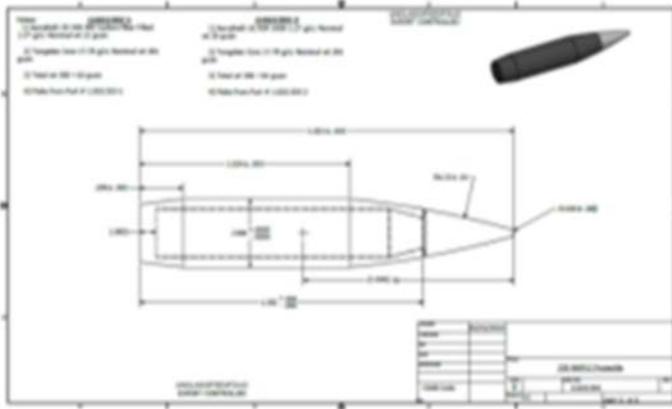
Schedule

Program Activities	FY18	FY19	FY20	FY21	FY22
Capability Assessment of DODICs	█				
R&D/AoA on Cartridge Designs	█	4			
Design Downselect and T&E		5	6		
EMD				█	█

POC: Gavin McFarland, FCDD-ACM-MI
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AEROSHELL ARMOR PIERCING PROJECTILES



Purpose:

- Provide Snipers and Advanced Marksmen with the capability of shooting **low-cost** armor-piercing projectiles that will safely pass through suppressors, muzzle brakes, and flash-hiders. Greatly reduce sniper-barrel wear. Provide all Warfighters with new ammunition that will extend barrel life and be environmentally-friendly.

Product(s):

1. RFI for Market Survey – market Survey Report
2. 120 prototype rounds in (a.) 6.5 Creedmore, (b) .300 Norma Magnum, and (c.) .338 Norma Magnum.
3. Developmental Test Plan.
4. Developmental Test and Report.
5. Technology Transfer to Industry via CRADA

Payoffs:

- An understanding of the art of the possible low-cost sniper-grade armor-piercing ammunition.
- Provide snipers and advanced marksmen an affordable sniper-grade ammunition set in relevant future calibers.

Schedule

	FY19	FY20	FY21
Program Planning			
Market Survey	■ 3		
Market Survey Report	■ 4		
Prototyping	■ 3		
Prototype Live Fires		■ 4	■ 2
Test Report			■ 1
Technology Transfer		■ 3	

Transition:

- Transition 1: USG studies, prototyping and test fires to inform the future requirement.
- Transition 2: Competitive industrial Technology Transition.

Opportunity Area Focus:

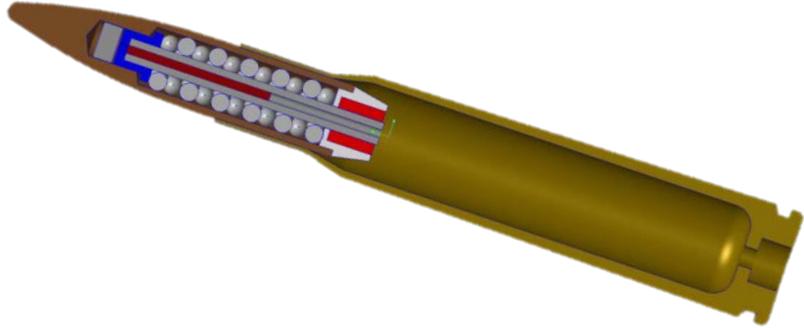
- Advanced Ammunition Development

(U) POC: Mr. Gus Taylor, NSWC Crane
 (812) 296-1393, Lucius.taylor@navy.mil

PATENT APPLICATION NUMBER 62/779,234



KINETIC ENERGY PYROTECHNIC TIMED PROJECTILE



Purpose:

- Provide increased hit probability while maintaining sufficient kinetic energy to neutralize targets.

Product(s):

1. RFI for Market Survey – Market Survey Report
2. 500 Prototype rounds with various delay times.
3. Developmental Test Plan.
4. Developmental Test and Report.
5. Technology Transfer to Industry via CRADA

Payoffs:

- An understanding of the art of the possible on increasing incapacitation of Unmanned Aerial Systems
- Provide user with “shotgun” capability at extended ranges utilizing existing, fielded weapon systems.
- Potential for Lower Collateral Damage Projectile for use in CONUS situations.

Schedule

	FY19	FY20	FY21
Program Planning			
Market Survey	█ 3		
Market Survey Report	█ 4		
Prototyping	█ 3		
Prototype Live Fires		█ 4	█ 2
Test Report		█ 1	
Technology Transfer		█ 3	

Transition:

- Transition 1: USG studies, prototyping and test fires to inform the future requirement.
- Transition 2: Competitive Industrial Technology Transition.

Opportunity Area Focus:

- Advanced Ammunition Development

Key Upcoming Events:

- None Schedule at This Time

**POC: Mr. Lucas Allison, NSWC Crane
(812) 854-5300, Lucas.Allison@navy.mil**

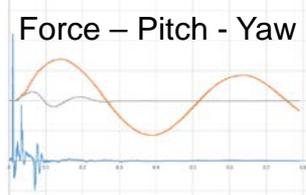
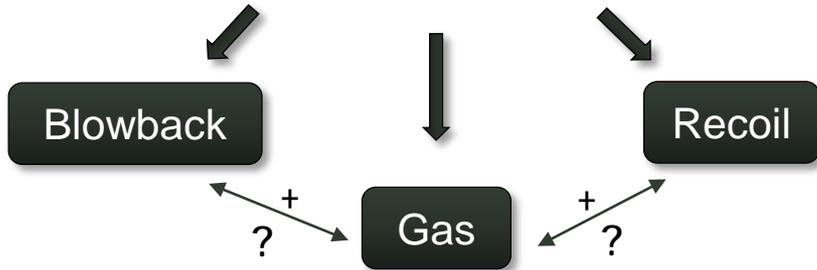
PATENT APPLICATION NUMBER 62/779,234



NOVEL RECOIL MITIGATION



Automatic Weapon Operating Methods



(U) Schedule

Tasks	NRM			
	Phase I		Phase II	
	1QFY19	2QFY19	3QFY19	4QFY19
Program Planning	█			
Literature Review / Research		█		
Modeling and Simulation		█	█	
Prototype Fabrication			█	█
Test and Evaluation				█
Final Report				█

Purpose:

- Development of advanced recoil mitigation automatic weapon operating mechanism for NGSWT / NGCT
 - Unique combination of automatic operating methods

Product(s):

- Phase I
 - Literature Review
 - Modeling and Simulation
- Phase II
 - Prototype Fabrication
 - Test and Evaluation using WRSS
 - Final report documenting all findings

Payoffs:

- Reduced felt recoil
- Improved accuracy and controllability
- Improved Probability of hit P(h)

Partners:

- PM-SW

Key Upcoming Events:

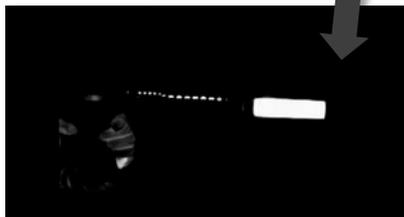
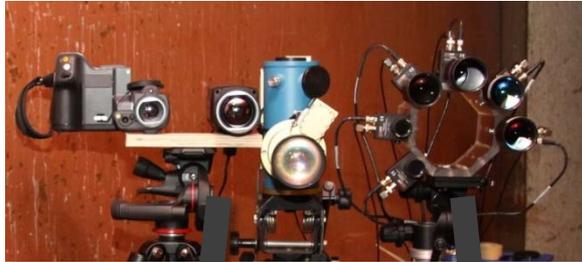
- Program Planning

POC: Adam L. Foltz, P.E.

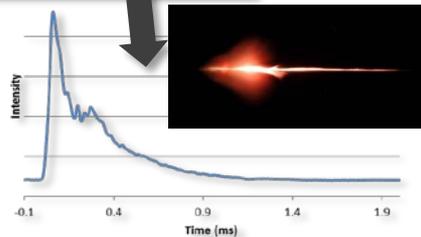
adam.l.foltz.civ@mail.mil, 973-724-7096



MULTI-SPECTRAL SIGNATURE CHARACTERIZATION OF SMALL ARMS



Thermal Signature



Flash Signature

Schedule

	FY17	FY18	FY19
Program Planning			
Draft NATO AEP for flash signature measurement		█	
Flash method validation testing		█	
Draft NATO AEP for thermal signature measurement			█
Thermal signature method validation testing			█
Conduct baseline signature measurements		█	█

Purpose:

- Develop, validate, & document quantitative, multi-spectral flash & thermal weapon signature measurement methods

Product:

- NATO test standards
- Baseline weapon & suppressor signature measurements

Payoff:

- Improved signature data: quantitative vs. qualitative
- Objective performance evaluation:
 - Quantitative vs. qualitative data
 - Objective programmatic decision making

Partners:

- DSTL (UK), FFI (Norway), DRDC (Canada), SOCOM

Transition:

- Government & private test centers
- Multiple test center customers including SOCOM (SURG)

Capability Gap / Opportunity Area(s) Focus:

- Small arms weapon signatures

Key Upcoming Events:

- Thermal signature validation testing at NSWC Crane
- 7.62 mm machine gun suppressor signature measurements

POC: Dr. David F. Dye,
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M240B/L SUPPRESSOR



(U) Schedule & Cost

MILESTONES	FY 19	FY20	FY21
Requirements Development and Contracting	[Green bar spanning FY19 to start of FY20]		
Contractor A M240B/L Supp.		[Green bar from start of FY20 to end of FY20 with diamond '5' at end]	
Contractor B M240B/L Supp.		[Green bar from start of FY20 to end of FY20 with diamond '5' at end]	
Contractor C M240B/L Supp.		[Green bar from start of FY20 to end of FY21 with diamond '5' at end]	
Government Testing/User Eval			[Green bar from start of FY21 to end of FY21]

Purpose:

- The purpose of the project is to develop an M240B/L signature suppressor that meets Joint Service requirements for flash, sound, durability, dispersion and point of impact, ease of use, weight, and size.

Product:

- Joint Service developed M240B/L Signature Suppressor requirements.
- Minimum three (3) signature suppressor designs for M240B/L.
- Tech Data Package(s) as appropriate.
- Final design reports, test results, analysis results.
- Minimum three (3) and up to fifty (50) prototype suppressors of each design.

Payoff:

- Provides signature suppression capabilities for the M240B/L that meet military suppression standards while providing a durable platform that withstands rigors of military use.
- Develops technologies that can be transitioned to other signature suppression systems.

Partners:

- Currently working with three(3) different industry partners.

Transition:

- No formal Technology transition Agreement (TTA) in place.
- Will transfer to PM SW M240B/L Signature Suppressor program or other Joint Service M240B/L Signature Suppressor program.

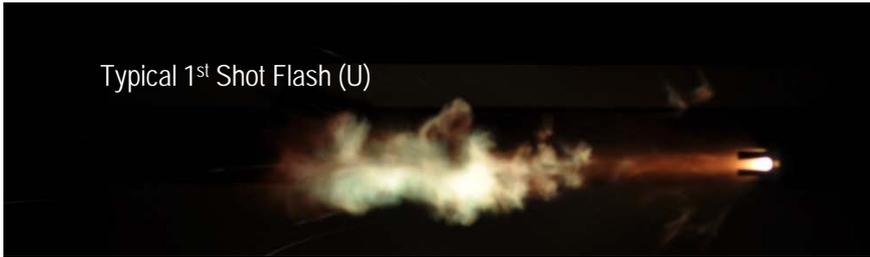
Opportunity Area Focus:

Opportunity Area 1 – Signature Reduction.

POC: Adam M. Jacob,
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FIRST SHOT SIGNATURE REDUCTION PHASE-2 PROTOTYPE ADVANCEMENT



Typical 1st Shot Flash (U)



Typical 3rd Shot Flash (U)

Purpose:

- Reduce 1st-shot weapon signature in low light to conduct operations without detection. First shots produces a brighter flash.

Product:

- Continue development of a convenient gas purge system to remove oxygen from the barrel to reduce the weapon flash from the first shot.

Payoff:

- At the completion of the program we will receive oxygen purging devices.

(U) Schedule

MILESTONES	FY19 Q4	FY20 Q1/2	FY20 Q3/4	FY21 Q1
	J/A/S	O/N/D/J/F/M	A/M/J/J/A/S	O/N/D
Finalize Contract / Kickoff Meeting	4			
User Assessment of Ph-1 Device & Design Ph-2 Prototypes				
Design Review PH-2				
Bench Test Design				
Build Prototypes				
Conduct Flash & Pressure Tests				
On-Site Review				
Submit Phase 2 Report				

Partners:

- Knight's Armament Company (KAC)

Transition:

- Transition to PM Soldier Weapons for further advancement.

Capability Gap / Opportunity Area(s) Focus:

- Reduce or close the gap for position detection

Key Upcoming Events:

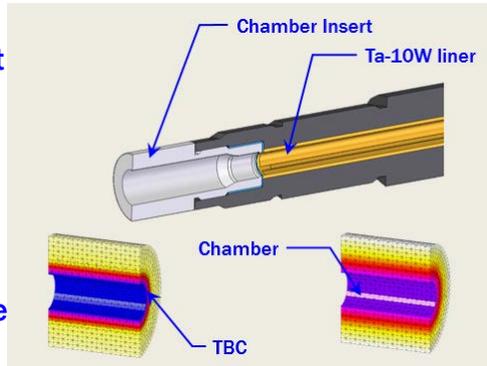
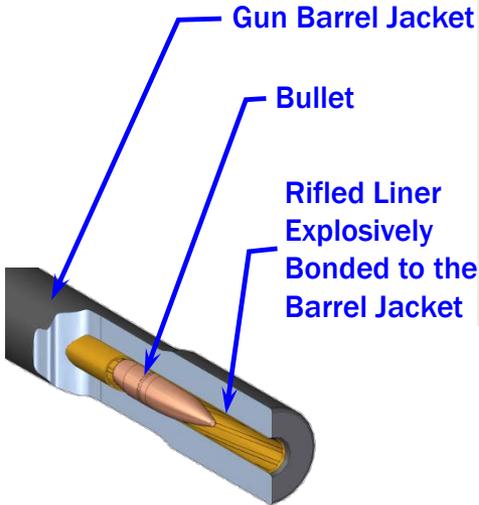
- Demo firing of Phase 1 prototype at APG - Completed
- Finalize Phase 2 SOW
- Execute contract with KAC

Milestone Indicators: TRL or SRL: Significant Activities:

POC: John T. Brennan – Engineer FCDD-ACW-WF
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 973-724-6494



ARES IMPROVED MACHINE GUN BARREL



Purpose:

- Develop, fabricate, and test a superalloy lined, jacketed barrel with an isolated chamber.

Product:

- Development and analysis of cook-off reduction through thermal isolation of chamber.
- Development and analysis of superalloy lined barrels for improved wear.
- Results of modeling and simulation, testing.
- Barrel prototype.

Payoff:

- Demonstration of chamber isolation technology and improved cook-off potential. Potential for hotter barrel with reduced cook-off.
- Demonstration of rifling technologies for superalloy liners. Superalloy liners have a variety of advantages but traditionally suffer from difficulty to rifle.
- Feeds PM SW barrel improvement product improvements.
- Demonstration of wear performance in various superalloy liners. Potential to meet wear requirements for advanced projectiles in support of Next Gen. Squad Weapons (NGSW).

Transition:

- PM-CSW

Capability Gap / Opportunity Area(s) Focus:

- Potential elimination of spare barrel – soldier load
- Extending barrel life – lifecycle cost savings

Tasks	ARES Improved Machine Gun Barrel						
	2QFY18	3QFY18	4QFY18	1QFY19	2QFY19	3QFY19	4QFY19
Cook-off Reduction Analysis/Test	▲3						
Integrated Imp.Bbl Analysis	▲						
Integrated Imp.Bbl Fab.							
Integrated Imp. Bbl Testing							
Fab of Final Prototype							▲4

Principle Investigators

Ryan Berg, ARES, Inc., Port Clinton, OH
 Alex Smith, CCDC-AC Project Officer, CCDC-AC



TRL



Contract Award

POC: Alexander Smith,
 973-724-9642,
 Alexander.p.smith28.civ@mail.mil



EXTERNAL PRESSURE RIFLING



7.62 mm barrel for external pressure rifling with electric opening pressure chamber

Purpose:

- Develop new rifling technology, forming rifling grooves under extreme external pressures, where the entire outer surface of the barrel is subjected to high external pressure and the inside is supported by a hard full length mandrel with the rifling geometry machined into the mandrel.

Product(s):

- Three prototype barrels with rifling profiles to be determined through discussions with Army

Payoffs:

- This rifling process will allow the gun designer to choose barrel materials that would be impossible by any conventional manufacturing method.

Partners:

- PM-SW

Key Upcoming Events:

- Program Planning

POC: David Ng. david.ng@us.army.mil , 973-724-6981

Schedule

External Pressure Rifling

		2019								2010			
		May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Task 1.	Determine Army Requirements	■	■										
Task 2.	Make barrel blanks and mandrels			■	■	■							
Task 3.	External Pressure rifle grooves						■	■					
Task 4.	Characterize the rifle geometry								■	■			
Task 5.	Finish Machine the barrels										■		
Task 6.	Government verification											■	
Task 7.	Prototype Barrel Delivery												■



SMALL CALIBER SUPPRESSOR BLOWBACK MEASUREMENT AND QUANTIFICATION



(U) Schedule

	FY17	FY18	FY19
Blowback Measurement			
Planning, Prelim Experiments, Equip. Acquisition	■		
Test and Data Analysis	■		
Test Operations Procedure (TOP) Generation		■	
NATO AEP Generation		■	
Validation Testing and Document Revision		■	
Document Review and Approval			■

Purpose:

- Currently there is no standard for measuring blowback in a way that is repeatable, and thus blowback is not accurately quantified when assessing small arms suppressors.
- The purpose of this project is to develop a standard method and conceptual system to accurately measure and quantify blowback produced by small caliber suppressors.

Product:

- Initial research, assessment, and concept formulation.
- Concept development, fabrication, testing and validation of a system and method to measure and quantify blowback effects.
- Final Test Procedure documents (Test Operations Procedure (TOP), NATO Allied Engineering Publication (AEP) Volume.

Payoff:

- Method developed will standardize the way to measure and quantify blowback, and be used in Army, SOCOM, NATO and possibly industry, as well as other services.

Partners:

- Naval Surface Warfare Center (NSWC) Crane, CCDC ARL, Army Test and Evaluation Center (ATEC), NATO Land Capabilities Group – Dismounted Soldier Systems (LCG-DSS) Weapons and Sensors Sub Group

Transition:

- Proposed method to be transitioned to Army in form of Army TOP, and to NATO in the form of a NATO Standard Recommendation (STANREC) AEP/Volume.

Capability Gap / Opportunity Area(s) Focus:

- Opportunity Area 1: Signature Suppression.

Key Upcoming Events:

- Completion of final test methods and formal approval – Spring/Summer 2019.

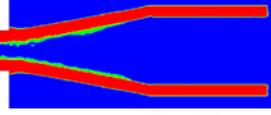
POC: Adam Jacob, adam.m.Jacob.civ@mail.mil, 973-724-0535



MOLTEN METAL MOTION AND DEPOSITION

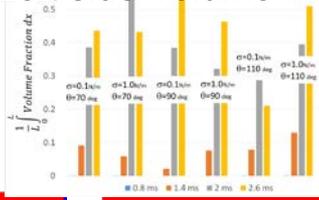


Expansion



Baffle

Left side Volume Fraction



(U) Purpose:

- To enhance the capabilities to predict the areas most prone to erosion and fouling caused by the deposition of molten metal along the internal flow paths of small arms weapon systems

(U) Products:

- Tools to perform simulations of the metallic material motion and deposition along flow path surfaces.
- Analysis of the effects of system parameters on the metal deposition characteristics
- Report documenting the results

(U) Payoffs:

- Improved insight into potential issues with metallic build-up
- Ability to test the effects of different design geometries
- Ability to test the effects of different surface conditions
- Visualization of the molten material motion and deposition

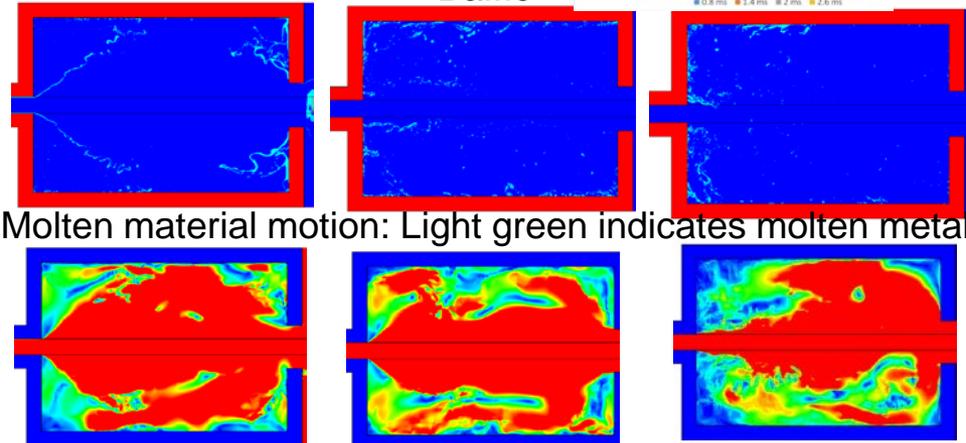
(U) Partners:

- Leveraging test data from the A. Foltz study.

(U) Key Upcoming Events:

- Study of drop/surface interaction properties.
- Study of longer term flow conditions
- Study of system geometric changes
- Study with particles

POC: Laurie A. Florio, Ph.D.



Molten material motion: Light green indicates molten metal

Velocity contours showing low velocity to rear of chamber

(U) Schedule & Cost

MILESTONES	Q1	Q2	Q3	Q4
1. Geometry/surface properties, literature review	█			
2. Develop models/test	█	█		
3. Surface tension/contact angle studies		█		
4. Effect of changes in the system geometry		█	█	
5. Carbon/grain particles			█	█
6. Report/Documentation				█



APPLICATION OF PLASMA ENHANCED CHEMICAL VAPOR DEPOSITION (PECVD) TO PREVENT PLATING OF METALLIC MATERIALS



Significant buildup of material on suppressor baffles from endurance firing



Purpose:

- The proposed work aims to study the adhesion mechanisms of copper to Plasma Enhanced Chemical Vapor Deposition applied coatings
 - Leverage current Durable Solid Lubricant (DSL) development efforts by exploring alternative formulations capable of withstanding high temperature environment applications
 - Identify and define critical material property characteristics directly associated performance requirements
 - Develop bench scale test methods to verify performance parameters

Product(s):

- **Phase I:** Literature review, Analysis of performance requirements and operating conditions, Development of bench scale testing methods
- **Phase II:** Bench scale coupon sample treatment, Bench scale testing of applied coating options, Analysis of results

(U) Schedule

Tasks	PECVD			
	Phase I		Phase II	
	3QFY18	4QFY18	1QFY19	2QFY19
Program Planning	█			
Literature Review / Research		█		
Analysi of Performance		█	█	
Coupon Treatment			█	█ ⁴
Test and Evaluation				█
Final Report				█ ⁵

Payoffs:

- Enhanced performance coating resistant to plating of metallic materials
- War fighting operation benefits: **Improved Weapon System Performance, Improved maintainability, Reduced weight**

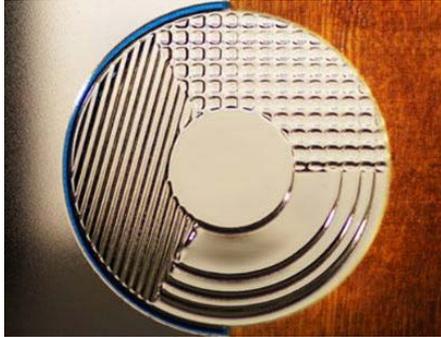
Partners:

- PM-SW

POC: Adam L. Foltz, P.E.
adam.l.foltz.civ@mail.mil, 973-724-7096



OPTICAL MATERIAL DEMONSTRATOR (OMD)



Purpose:

- Leverage advances in manufacturing technology to demonstrate a 3-D printed optic.
- Provide optical performance commensurate with fielded optics, at significantly reduced weight and cost

Product(s):

- TRL 6 printed optical system, using low-weight housing material and printed graded index (GRIN) optical system
- Multiple optical designs built around GRIN technology, facilitating tailoring of performance to other capability gaps
- Multiple high strength, ultra-low weight mechanical design structures which can withstand weapon pyroshock

Payoffs:

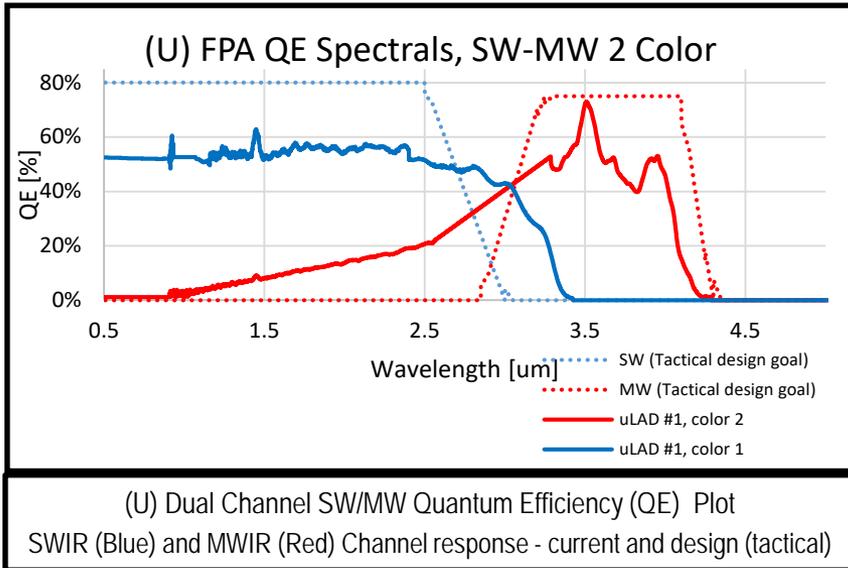
- Significantly reduced weight of optical systems
- Reduces weight limitation induced by conventional optics; greater sighting capability at the same or lower weight
- Decrease manufacturing time and overall optic cost.
- Improved Government and industry capability to leverage advanced optical structures

Schedule

MILESTONES	FY19	FY20	FY21
Requirements Analysis	Starts in FY19, ends in FY19 (Yellow diamond)		
Optical Component Design		Starts in FY19, ends in FY20 (Green bar)	
Mechanical Component Design	Starts in FY19, ends in FY20 (Green bar)		
Integration		Starts in FY20, ends in FY21 (Yellow diamond)	
Subsystem Level Eval		Starts in FY20, ends in FY20 (Yellow triangle)	
User Performance Eval		Starts in FY20, ends in FY21 (Yellow triangle)	



MULTI-SPECTRAL TARGETING SIGHT DUAL CHANNEL CROSSTALK REDUCTION



Purpose:

- Reduce spectral crosstalk in 2 band SWIR/MWIR imager
- Detector material spectral absorber development
- Cold-filter spectral notch development
- Anti-Reflective Coating development

Product:

- Research and simulation of spectral absorbance tuning of III-V wafer process material absorbers.
- Established reduced crosstalk wafer process flow.
- In-line test results of wafer test structure parametrics.
- Wafer growth/processing to optimize spectral absorbance
- FPA build and characterization report- TRL 4.

Payoff:

- Development of a multi-spectral SA-FC targeting FPA
- Potential to inform requirements for future SA-FC solutions

Schedule

Multi-Spectral Targeting Sight, Dual Channel Crosstalk reduction							
MILESTONES	Q2 FY19	Q3FY19	Q4FY19	Q1FY20	Q2FY20	Q3FY20	Q4FY20
	1/F/M	A/M/J	1/A/S	O/N/D	1/F/M	1/F/M	1/A/S
Project Kickoff Meeting	1/F/M						
Conduct Wafer Material Design Review	2						
Wafer Process Development - Detector Testing							
Detector Material Process CDR2							
AntiReflective Coating Design					3		
LN2 IDCA Design, Buid, Test, Qualify							
ColdFilter Design, LN2 IDCA testing							
Wafer Inline parametric Review							
Wafer level Characterization							
Qty2 FPA to Dahlgren for characterization							
Final program Review							4
	milestone indicator: 1			TRL: 3			

Partners: Lockheed Martin-Santa Barbara Focalplane

Transition: ONR/USMC Integrated Clip-on Advanced Targeting Sight (ICATS)

Capability Gap / Opportunity Area(s) Focus:

Six of The (ICDT) Soldier Capabilities-Based Assessment (CBA) Functional Solution Analysis (FSA) Gaps- Including:

Key Upcoming Events:

- LM-SBF Kickoff Meeting Jan19
- Round 1 Detector Material CDR Apr19
- Coldfilter Requirements Down select Apr19

ARC CDR Aug19



AUTOMATED TARGETING SYSTEM FOR REMOTE WEAPONS STATIONS



Purpose:

- Enhance the mission effectiveness of existing Remote Weapons Stations (RWS) with an Automated Targeting System (ATS).

Product:

- Prototype to perform real-time target detection, identification, and tracking.

Payoff:

- Enables RWS automation for remote/unmanned applications
- Provides Aided Target Recognition (AiTR) for transition to programs of record

Partners:

- JSSAP, NSWCCD

Transition:

- Transition through integration with multiple Army and Marine Corps programs/projects

Capability Gap / Opportunity Area(s) Focus:

- Remote Weapons Stations (RWS)/Externally Powered Weapons (EPW)

Key Upcoming Events:

- Contract Award & Kickoff Meeting – 3rd Q FY19

POC: Lee Beale, richard.beale@navy.mil, 540-653-3019

Schedule

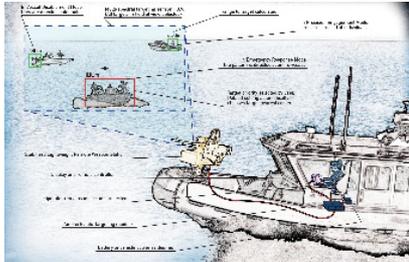
	FY18	FY19	FY20
Requirements Development & Analysis		5	
Hardware & Software Subsystem Design			
Hardware Development			
Software Coding			
System Integration			6



ACTIVE STABILIZATION TECHNOLOGIES



(U) Auto-Targeting Remote Operated Weapons



(U) Purpose:

- (U) Develop and demonstrate applicability of active stabilized concepts for mounted operations (Vehicle, Boat, Airborne).

(U) Products:

- (U) Full Auto Analysis – Observe and measure unique environmental factors in full automatic fire conditions
- (U) Sensor Analysis – Perform market survey of single spectrum and multi-spectrum weapon sights; culminates in a target detection experiment in realistic environments
- (U) Fabricate Surrogate Systems - Design and fabricate a technology demonstrator
- (U) Development of machine gun mounted prototype solution
- (U) Target detector integration for boat/engine and other non-standard high-value targets
- (U) High Precision Long Range Application Modification

(U) Payoff

Foundational Development

- (U) Automatic Target Recognition
- (U) Active Stabilization Techniques

Technologies/Techniques for improvements in Aim Error

- (U) Reduce engagement time for increased lethality and improved survivability.
- (U) Fire Control ==> 4th Gen/Level 5+
- (U) Can Active Stabilization techniques be applied to FVL concepts?

(U) Future Events

- (U) CY19 – Maritime Testing, USCG,/USN, Location: TBD
- (U) CY19 – Test Readiness Review (TRR) – Final Life Fire Test prior to project transition.

POC: Terence F. Rice, terence.f.rice.civ@mail.mil

(U) Schedule & Funding

MILESTONES	FY16	FY17	FY18	FY19	FY20
Remote Weapon Status					
Requirements	3				
Sytem Development					
Test1 - Crane					
Test2 - Aimlock					
Live-Fire Test & Evaluation					6
Foundational Development					

Transition to Joint Services