JOINT SERVICE SMALL ARMS PROGRAM OFFICE (JSSAP)

NDIA Future Force Capabilities Conference and Exhibition Small Arms Track

Columbus, Georgia

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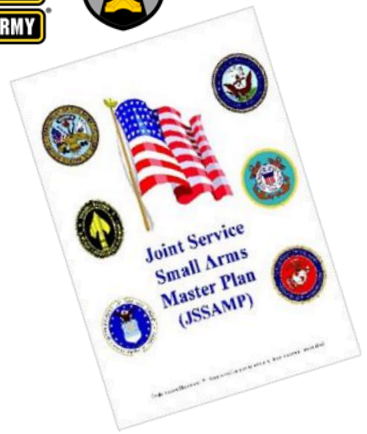
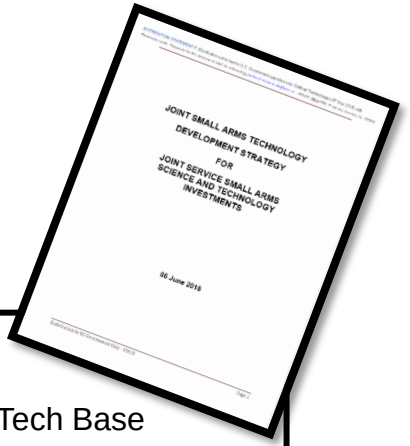
JOINT SERVICE SMALL ARMS PROGAM OFFICE



An OSD chartered Joint-Centric activity harmonizing requirements & providing Small Arms Technology for all the Armed Services



JSSAP Background/History

1978: Under Secretary of Defense established JSSAP office and the Joint Service Management Committee (JSMC) with the Army as the Executive Agent.

- JSMC was composed of 4 principal voting members: USA, USN USMC, USAF
- Harmonize multi-service requirements
- Consolidate and coordinate development, reduce costs, and improve the efficiency of the material acquisition process.

1991: JSSAP transitions PM and lifecycle support, focusing exclusively on S&T

2004: Charter updated adding 2 more principal members: USCG, SOCOM

Mission Statement

- ❑ Intensive management of the DoD Small Arms Tech Base
- ❑ Coordinate and Harmonization of Requirements
- ❑ Transitions Technology to Program Managers for Engineering and Manufacturing Development
- ❑ Long Range Plans and Strategies
- ❑ Influence of International Small Arms Activities

… and fulfill Executive Agent responsibilities per Deputy Under Secretary of Defense (Research and Engineering) Memorandum, 10 May 1978

Joint

JSSAP AREA OF RESPONSIBILITY

JSSAST – Joint Services Small Arms Synchronization Team
- Approves Annual Updates of Joint Service Small Arms Capability Gaps
- Approves JSSAP S&T project portfolio on annual basis
- Promotes, coordinates, and manages the exchange of small arms technology, acquisition, and sustainment information across the Joint Services, Program/Product Managers, Labs, R&D Centers, and Industry

JSSARI – Joint Services Small Arms Requirements Integration
- Develop, review, report, and submit Joint, harmonized Small Arms Systems capability documents
- Harmonize service requirements, including concurrence, disposition, support, and staffing of Small Arms Systems Capability Based Developments.
- Routinely review Service threat statements and assessments.

JSTAC – Joint S&T Advisory Council
- Manage timely exchange of Science & Technology information
- Manage Technology Development Strategy (TDS)
- Maintain awareness of the small arms science & technology Joint portfolio
- Maintain awareness of domestic and foreign technology - identify areas of possible exploitation
- Recommend prioritized plans, programs and strategies to the Steering Committee

JSSAME – JSSAP Metrics & Evaluation Working Group
- Ensure that test and evaluation of small arms weapon systems is operationally relevant, and done in a consistent, repeatable, and standardized manner.
- Review, coordinate, and monitor test and evaluation activities within the JSSAP project proposals and the JSSAP portfolio.

INTERNATIONAL
- NATO Army Armaments Group (NAAG) / Dismounted Soldier Systems (DSS)
  - Weapons and Sensors Subgroup (WS SG) - Serve a US Head of Delegation
  - Suppressor Team of Experts Lead
  - Several DEA/IEA/PA with various foreign nations
  - NATO CUAS WG participation

SL-CFT Soldier Lethality Cross Functional Team
- CCDC Armaments Center Lethality Lead
- Lethality LOE - How do we increase lethality to achieve and maintain overmatch against a peer/ near peer adversary?

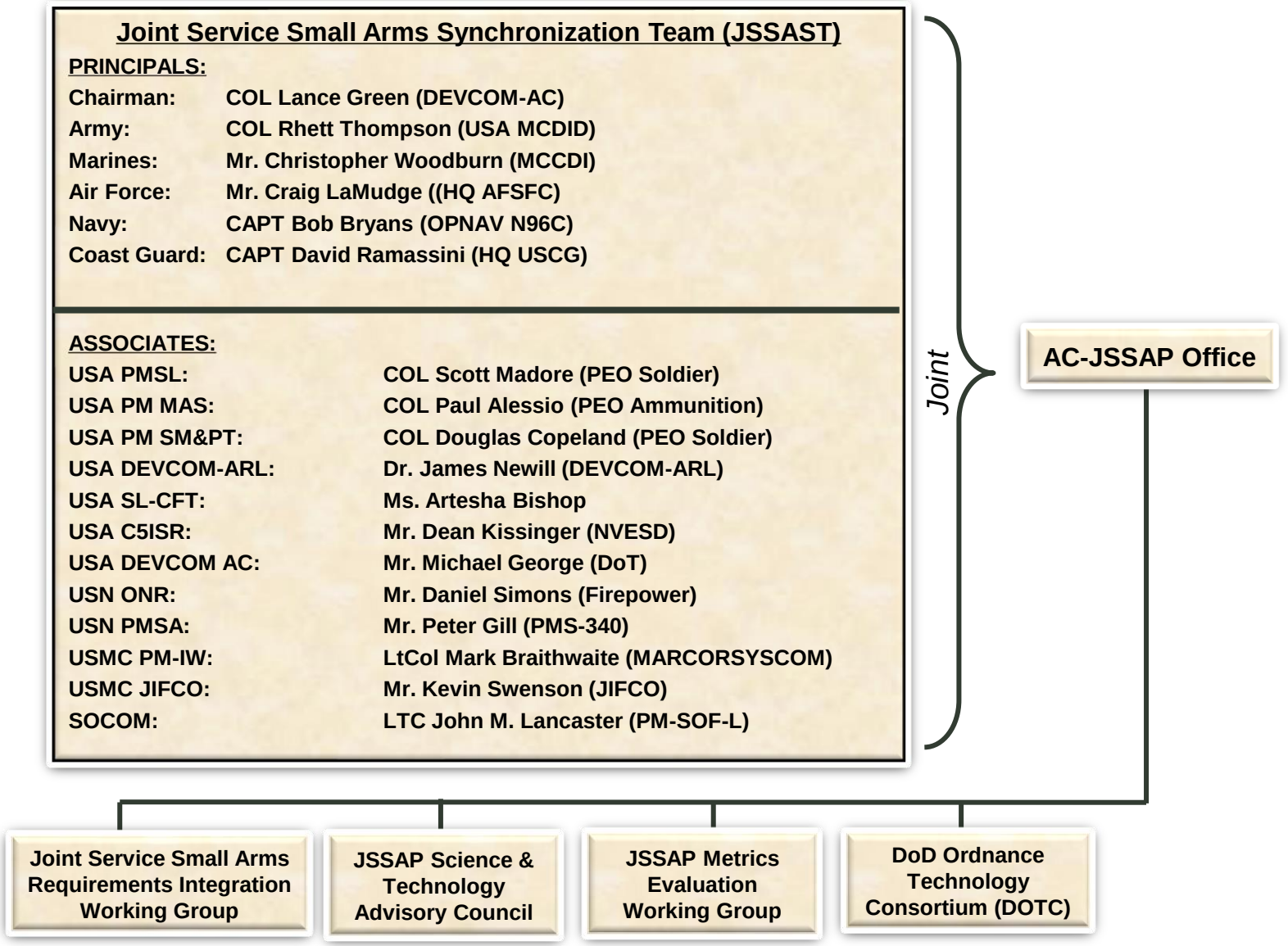
OSD-SBIR – Office of Secretary of Defense / Small Business Innovation Research
- Allows small, high-tech U.S. businesses and academia the opportunity to provide innovative research and development solutions in response to critical Army needs.
- To be the Army's premier source of innovative technology solutions, providing direct access to America's high-tech small business research and development community, enabling our Soldiers deployed around the world.

Industrial / OGA Base
- DOTC/NAC - Defense Ordnance Technology Consortium / National Armaments Consortium
- DARPA
- DOE-National Labs
- DOD-Research Labs

JS3 – Joint Service Signature Suppression IPT
- Develop harmonized understanding of signature suppression across the Joint Services
  - Test methods and standards
  - Requirements
  - S&T efforts

JSSAP Barrel Technology Development Strategy
- Generate a deliberate, organized approach to the development of small caliber barrel technologies
- Identify technical challenges, areas where improved knowledge is needed for small caliber barrels
- Transition barrel technologies to joint service PMs to improve performance in the field

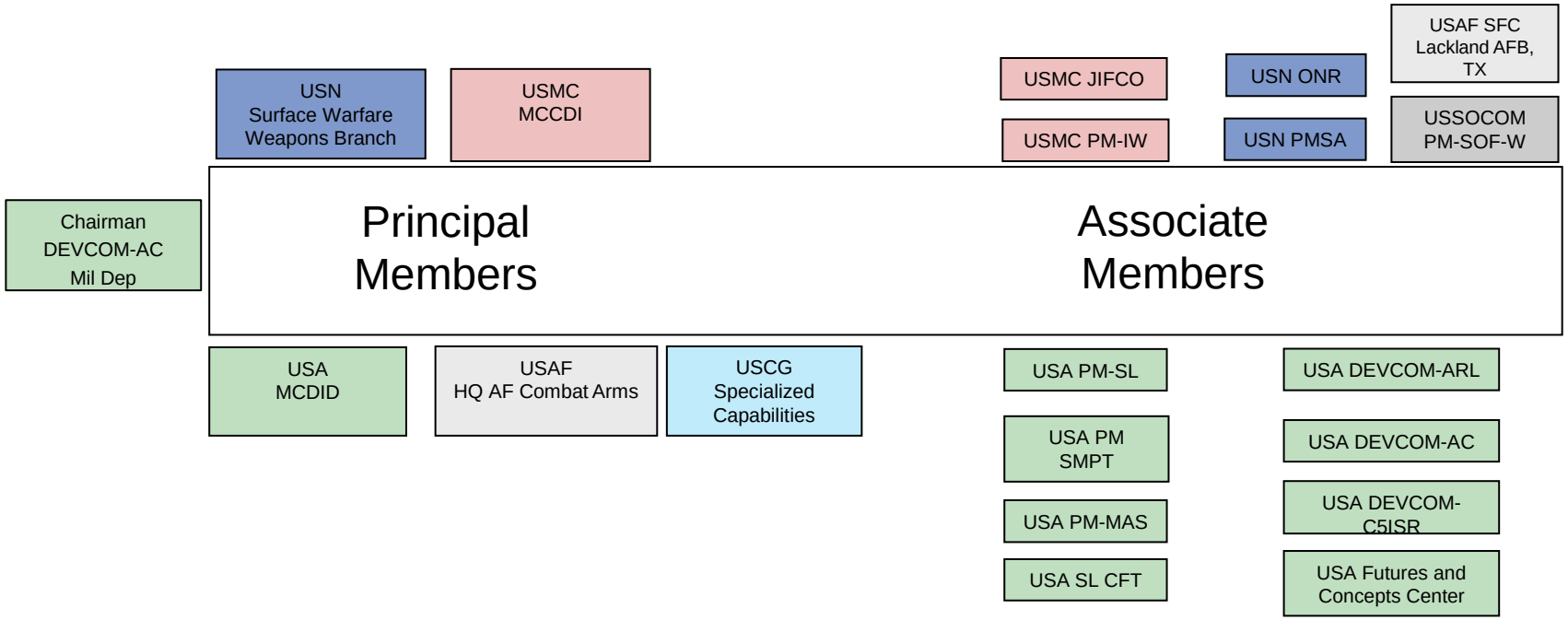
JOINT SERVICE SMALL ARMS PROGRAM OFFICE FRAMEWORK



JOINT SERVICE SMALL ARMS SYNCHRONIZATION TEAM (JSSAST)

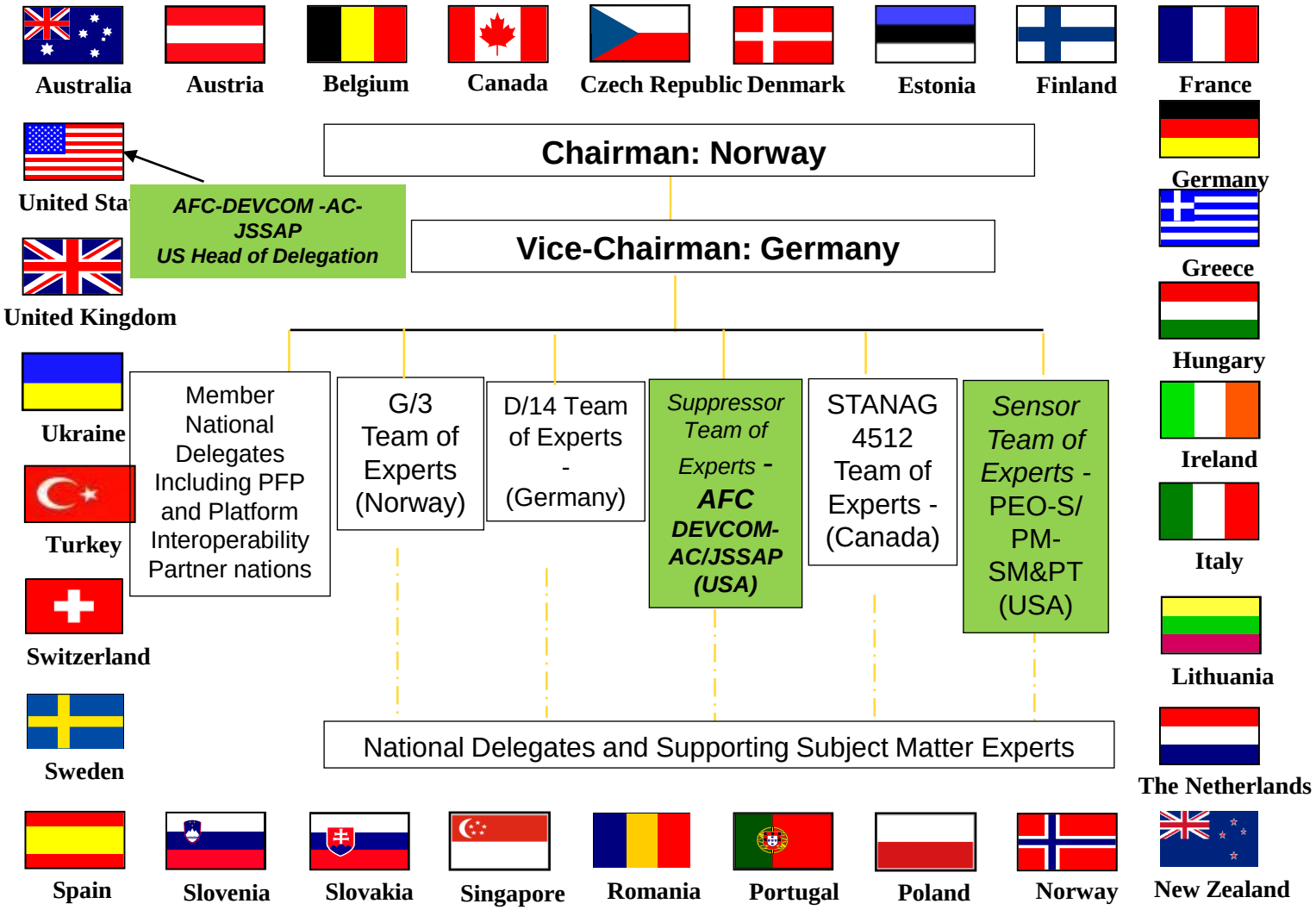
Areas of Responsibility:

- Approves Annual Updates of Joint Service Small Arms Capability Gaps
- Approves JSSAP S&T project portfolio on annual basis
- Identifies opportunities for potential joint programs
- Prepares and maintains a harmonized DoD wide Joint Service Small Arms Master Plan (JSSAMP) that integrates and harmonizes individual strategies of respective services



INTERNATIONAL SMALL ARMS ACTIVITIES

NATO ARMY ARMAMENT GROUP (NAAG)/DISMOUNTED SOLDIER SYSTEMS (DSS) WEAPONS and SENSORS SUBGROUP (WS SG)



Project Arrangement (PA):

- Defence Research and Development of Canada
- Focus on enabling technologies for future small arms systems.

Data Exchange Agreement (DEA):

- Defence Research and Development of Canada
- Small Caliber Weapons and Ammunition Data Exchange

Information Exchange Agreements (IEAs):

- Defence Science and Technology Laboratory (DSTL) of UK
- Infantry Weapons and Munitions Information Exchange Agreement

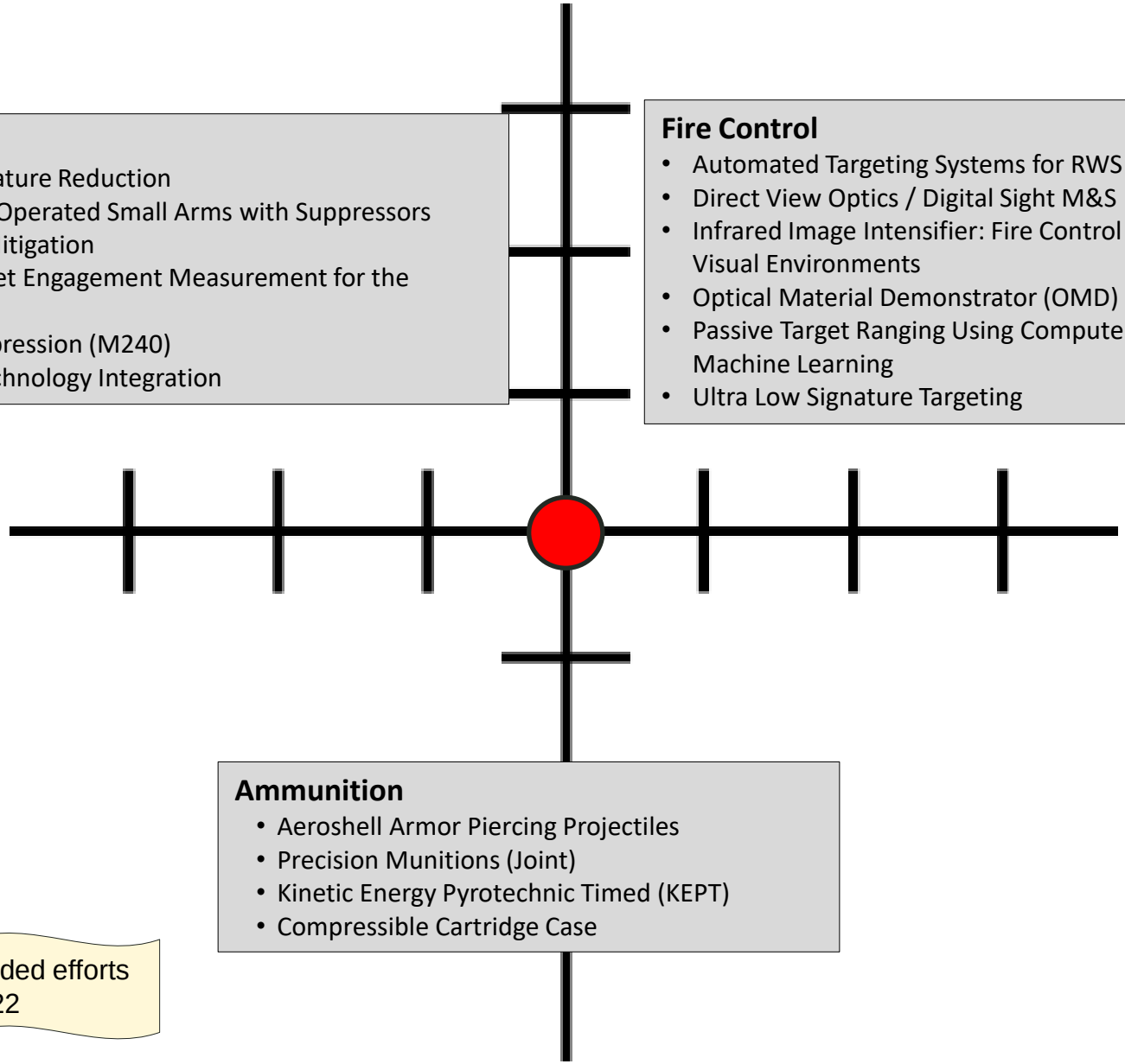
U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND

Joint Service Small Arms Program Office Portfolio

Update to the NDIA

Terence F. Rice (terence.f.rice.civ@army.mil)
Project Management Engineer
DEVCOM Armaments Center
Joint Service Small Arms Program (JSSAP) Office

JSSAP PORTFOLIO (FY22)



Weapons
- First Shot Signature Reduction
- Modeling Gas Operated Small Arms with Suppressors
- Novel Recoil Mitigation
- Objective Target Engagement Measurement for the LWMMG
- Signature Suppression (M240)
- Suppressor Technology Integration

Fire Control
- Automated Targeting Systems for RWS
- Direct View Optics / Digital Sight M&S
- Infrared Image Intensifier: Fire Control for Degraded Visual Environments
- Optical Material Demonstrator (OMD)
- Passive Target Ranging Using Computer Vision and Machine Learning
- Ultra Low Signature Targeting

Ammunition
- Aeroshell Armor Piercing Projectiles
- Precision Munitions (Joint)
- Kinetic Energy Pyrotechnic Timed (KEPT)
- Compressible Cartridge Case

Sixteen (16) funded efforts for FY22

FY22 PORTFOLIO (WHAT JSSAP IS TRACKING)

AMMUNITION	
Project	**Purpose**
Aeroshell Armor Piercing Projectiles	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.
Compressible Cartridge Case	Under the vast majority of material condition combinations of chamber headspace and case length, axial clearance exists between the base of the case head and the face of the breech bolt after chambering and locking are complete but prior to the shot. This clearance is an undesirable consequence of manufacturing tolerances as well as practical limits on the input peak force and energy to lock the breech bolt. The compressible cartridge case aims to increase the achievable levels of axial case crush for a given input force and energy in order to reduce or eliminate pre-shot axial clearance under all material condition combinations.
Kinetic Energy Pyrotechnic Timed	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. Provide increased hit probability while maintaining sufficient kinetic energy to neutralize targets.
Precision Munitions (Joint)	Develop scalable precision munition technologies to increase Warfighter capability in anti-materiel, anti-personnel and other specialized missions.

FY22 PORTFOLIO (WHAT JSSAP IS TRACKING)

FIRE CONTROL	
Project	**Purpose**
Automated Targeting System for RWS	Enhance the mission effectiveness of existing Remote Weapons Stations (RWS) by extending current capability to include acting as an Automated Targeting System (ATS). Integrate with NSWCDD's Autonomous Remote Engagement System (ARES) enabled RWS as a new targeting node.
Direct View Optics / Digital Sight M&S	Updated Direct View Optic (DVO / Glass optics) & Digital Camera Modeling, Simulation and Test. Color cameras are rapidly improving due to commercial sector investment – "prosumer" (SLR & mirrorless) cameras and cell phone cameras. Updated modeling, simulation and test is needed to identify times and environments where digital or direct view perform best in order to provide the best capability to the Soldier.
Infrared Image Intensifier: Fire Control for Degraded Visual Environments	Add MWIR to VIS-NIR imaging capability of existing NVD tubes through photocathode modification. Enhances capability above traditional Image Intensifiers in degraded, sub-t and low moonlight environments Enables warfighters to target in degraded visual environments by integrating thermal band into Night Vision Scopes (NVS)
Optical Material Demonstrator	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
Passive Target Ranging Using Computer Vision and Machine Learning	Accurate ranging is a difficult task. Investigate the use of a computer vision technique known as depth from defocus (DfD) to perform passive target ranging from 2-D imagery. Range information gained by passive means will allow COVERT units to determine various object distances and target those objects without emitting signals which can be detected by opposing forces. This method will provide ranges for the entire image, not just a single point.
Ultra Low Signature Targeting	Develop an ultra-low output light detection and ranging (LIDAR) system for range determination, target recognition, and wind sensing. This system will be capable of operating with significantly less output power than any prior laser based systems, thus minimizing probability of detection and/or interception

FY22 PORTFOLIO (WHAT JSSAP IS TRACKING)

WEAPONS	
Project	**Purpose**
First Shot Signature Reduction	Reduce 1st-shot weapon signature in low light to conduct operations without detection. First shots produces a brighter flash.
Modeling Gas Operated Small Arms with Suppressors	Develop numerical, physics based simulation tools that can be used to understand and predict the operation of gas operated, suppressed small arms systems and obtain more detailed information than can be found experimentally. Investigate methods to correlate gas species distributions and states to the radiation energy and flash that develops. Include the gas flow conditions, chemical reactions, particulates, heat transfer, and phase changing metal. Determine levels of model detail required to capture a given phenomena, flow condition, or performance measure.
Novel Recoil Motigation	Development of advanced recoil mitigation automatic weapon operating mechanism for NGSWT / NGCT. Unique combination of automatic operating methods
Objective Target Engagement Measurement for the LWMMG	To develop an objective, repeatable measurement approach for quantifying high-rate automatic firing performance for shooters, using the .338 Norma Magnum-chambered LMG-M as a test platform.
Signature Suppression (M240)	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.
Suppressor Technology Integration	Integrate a variety of different suppressor technologies to develop a suppressor system that performs optimally in all areas.

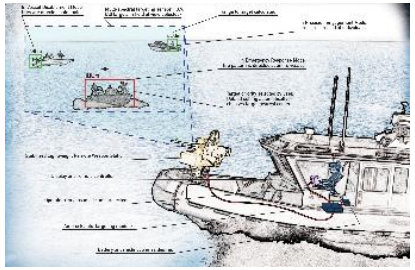
PORTFOLIO UPDATES – TRANSITION

- **FY21 Transitions**
  - Lethal Limited Range Reduced (L2R2)
  - Active Stabilization
  - ARES Improved Machine Gun Barrel
  - Small Arms Ballistic Solver

- **FY22 Planned Transitions**
  - Aeroshell Armor Piercing Projectiles
  - Compressible Cartridge Case
  - Kinetic Energy Pyrotechnic Timed
  - Precision Munitions (Joint)
  - Automated Targeting System for RWS
  - Direct View Optics / Digital Sight M&S
  - Infrared Image Intensifier: Fire Control for Degraded Visual Environments
  - Optical Material Demonstrator(OMD)
  - Passive Target Ranging Using Computer Vision and Machine Learning
  - Multispectral Dual Channel Crosstalk Reduction
  - Modeling Gas Operated Small Arms with Suppressors
  - Novel Recoil Mitigation
  - Suppressor Technology Integration

ACTIVE STABILIZATION TECHNOLOGIES

(U) Auto-Targeting Remote Operated Weapons



(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

(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@army.mil

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:

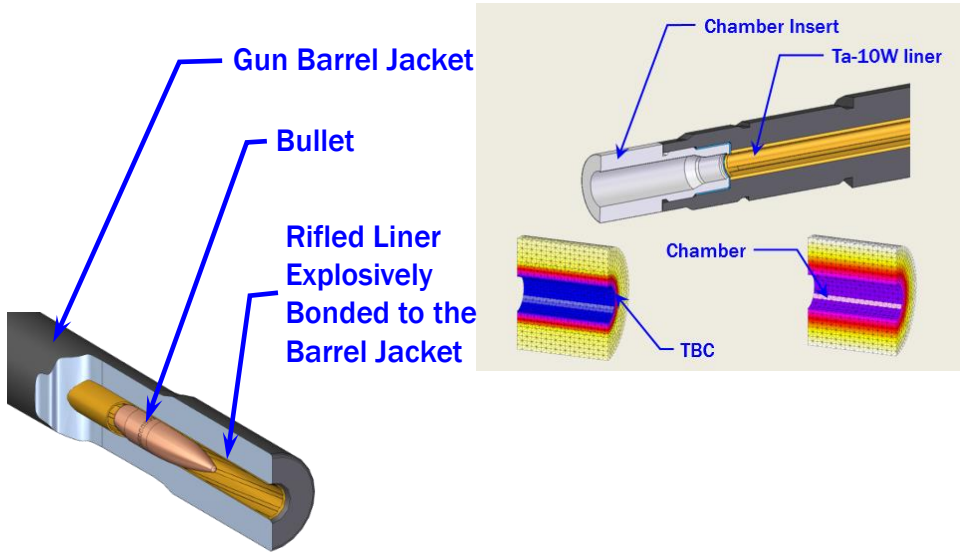
Lethal Limited Range ammunition to limit collateral damage

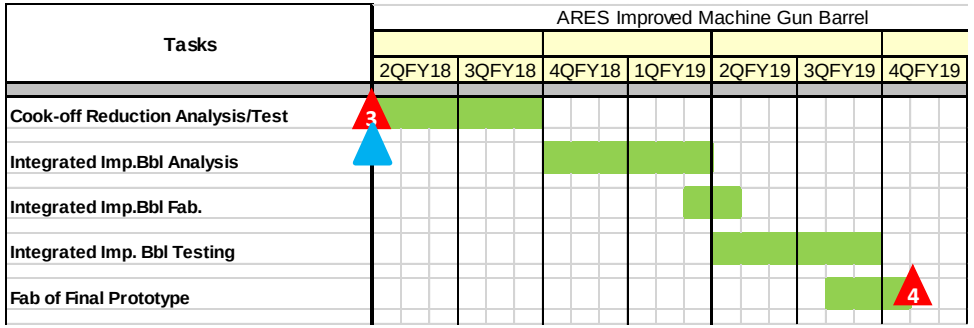
Key Upcoming Events:

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

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

ARES IMPROVED MACHINE GUN BARREL





= TRL

Contract Award

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

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).

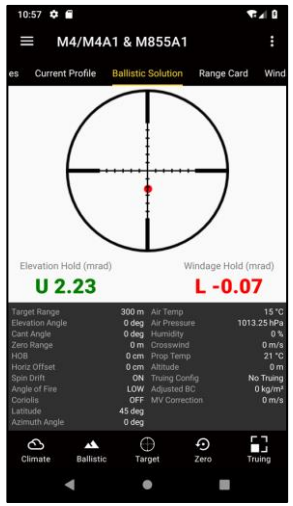
Transition:

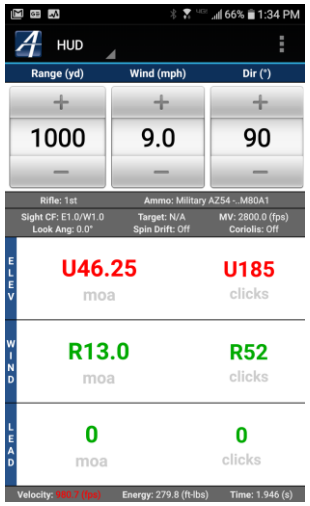
- PM-CSW

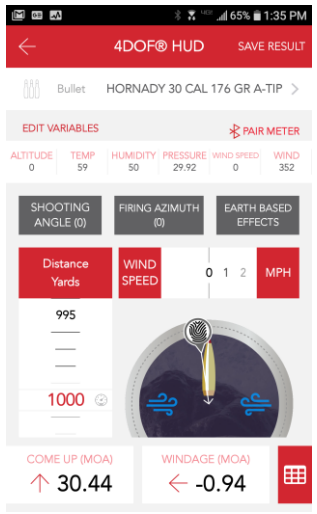
Capability Gap / Opportunity Area(s) Focus:

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

JSSAP HANDHELD BALLISTIC CALCULATOR COMPARISON PROPOSAL







Schedule

MILESTONES	FY20	FY21	FY22
Task 1		5	
Task 2			6
Task 3			
Task 4			
Task 5			
Task 6			

Purpose:

- Compare, verify, and validate effectiveness and accuracy of Army Advanced Small Arms Ballistic Solver (ASABS), Applied Ballistics (version ABX), and Hornady 4DOF direct fire control systems

Product(s):

- Ballistic calculator comparison study (completed, paper due April)
- Live Fire test report of fire control vs holes on target

(U//FOUO) Payoffs:

- Soldier buy-in
- Government maintained library of ballistics data
- Common fire control solutions and software re-use across different direct fire weapon systems

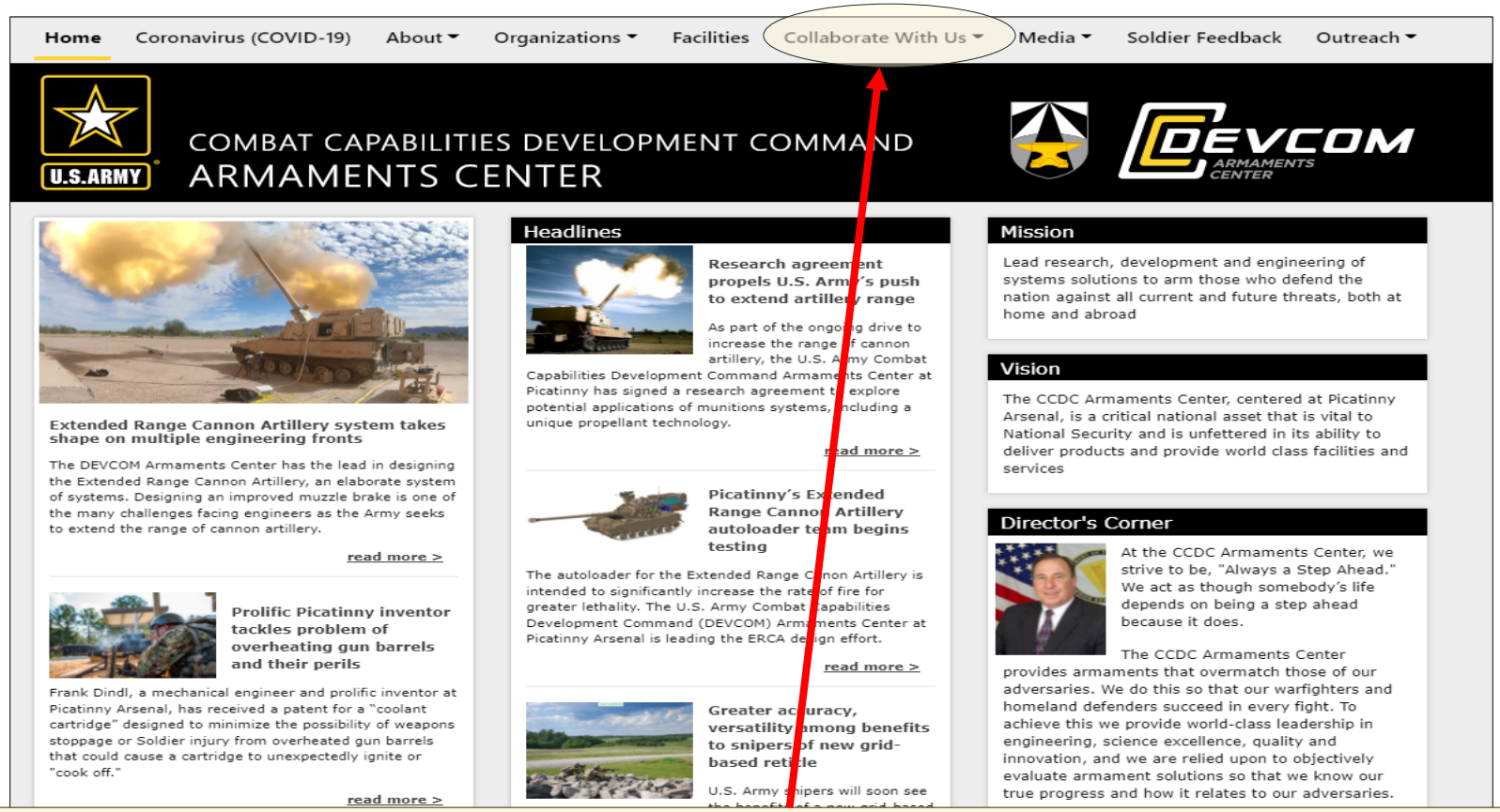
(U//FOUO) Transition:

- ASABS is in beta form on android systems for soldier testing, Applied Ballistics and Hornady 4DOF are commercial systems
- ASABS will be used in the Next Gen Fire Control program
- Also ASABS software and is already being used in Small Tactical Optical Rifle Mounted (STORM) II

POC: Christopher James, CCDC AC FTaB
4102783880, christopher.p.james12.civ@mail.mil

TRANSITIONS OPPORTUNITIES PATH FORWARD

Combat Capabilities Development Command (CCDC) Armaments Center (https://ac.ccdc.army.mil/)



JSSAP team working(in progress) with DEVCOM Armaments Center Business Interface Office (BIO) on Technology Transfer Opportunities for:

- Lethal Limited Range Reduced (L2R2)
- Active Stabilization
- ARES Improved Machine Gun Barrel
- Small Arms Ballistic Solver

CCDC-AC CONTACT:
https://www.pica.army.mil/SBP/Contacts.aspx
mailto:usarmy.pica.ccdc-ac.mbx.domestic-tech-transfer@mail.mil

Joint Service Small Arms Program Office - Office of the Secretary of Defense (OSD) Small Business Innovation Research (SBIR) Update to the NDIA

Corey D. Hall

Program Management Engineer

JSSAP

19 OCT 2021

OSD SBIRS FOR JSSAP

- OSD SBIR Cycle is 3x per year
- Plan is to initiate topic generation 2 months prior to due date
  - Current Cycle SBIR 21.3 is open for proposal submissions
- Guiding Principles for Topics
  - Further Exploration of Existing Opportunity Areas
  - Unfunded Opportunity Areas
  - Previous Opportunity Areas that have become lower priority
  - Service Specific Needs
  - Concepts Which require Tech Push vs. Pull Model
- Potential Future topics of interest
  - Aim Augmentation
  - Assured Position/Navigation/Timing for small caliber weapon fire control in a denied environment
  - Coatings/Materials for higher pressure cartridge cases

Joint Service Small Arms Requirements Integration (JSSARI) Working Group Update to the NDIA

Mark J. McFadden

JSSARI WG CHAIRMAN

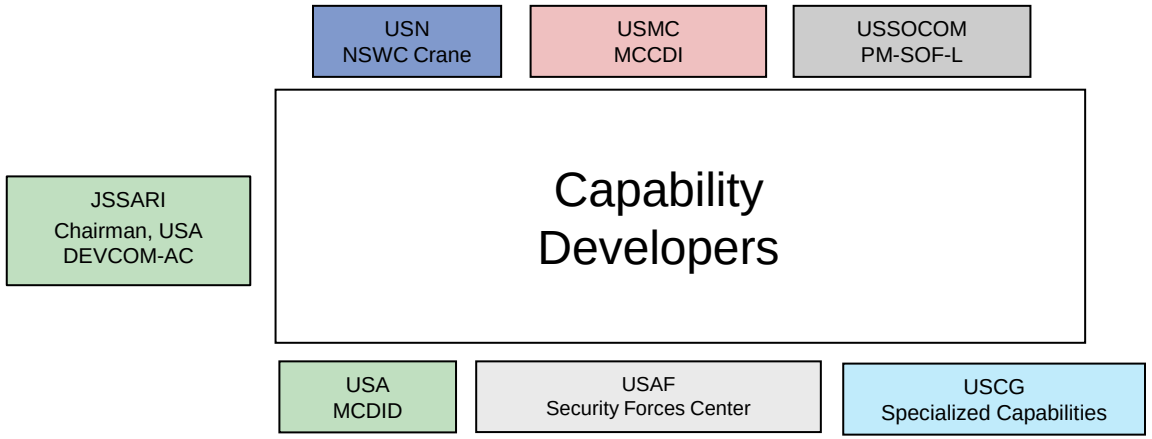
US ARMY AFC/DEVCOM-AC

19 OCT 2021

JOINT SERVICE SMALL ARMS REQUIREMENTS INTEGRATION (JSSARI)

Areas of Responsibility:

- Develop, review, report, and submit Joint, harmonized Small Arms Systems capability documents
- Harmonize service requirements, including concurrence, disposition, support, and staffing of Small Arms Systems Capability Based Developments.
- Prepare, update and coordinate harmonized Department of Defense Small Arms Capability Roadmap on a two year basis to reflect the latest and emerging trends in small arms systems threats, capabilities and capabilities gaps.



JSSARI WG – INTEGRATION WITH JSSAME WG, JSTAC

JSSARI O/As → JSTAC S&T Investment Areas → JSSAP Portfolio

Ensure that test and evaluation of small arms weapon systems is operationally relevant, and done in a consistent, repeatable, and standardized manner.

Opportunity Areas (O/As)	S&T Investment Areas	Portfolio (Results)
Derived from service capability gaps	JTACS SMEs further break down O/As into S&T Investment Areas needed to 'close' O/A	16 efforts 14 continuations from FY20 2 New Starts
JSSARI ranked	Duplicate S&T Investment Areas can emerge across multiple O/As	Portfolio alignment at O/A level
22 approved O/As	S&T Investment Areas used to build portfolio for FY per POM planning	
	Metrics: 76 unique S&T Investment Areas 179 total S&T Investment Areas across 22 O/As	

SMALL ARMS TASKS

- Engage threat personnel with SA fire
- Engage threat personnel that are in defilade
- Engage threats with precise SA fire
- Engage threats with SA volume fire
- Acquire personnel and vehicle targets
- Determine range to target
- Mark or tag targets
- Breach existing entry points
- Avoid detection caused by weapon signature
- Operate and maintain weapons.

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND

Joint Service Small Arms Metrics and Evaluation Working Group (JSSAME WG) Update to the NDIA

Adam M. Jacob

Project Management Engineer

Joint Service Small Arms Program

19 Oct 2021

JOINT SERVICE SMALL ARMS METRICS AND EVALUATION WG

Improve the delivery of small arms capability to Warfighters by synchronizing ***small arms metrics*** around ***operationally relevant capabilities*** that have a ***common translation*** to the technical communities in both ***development and evaluation***.

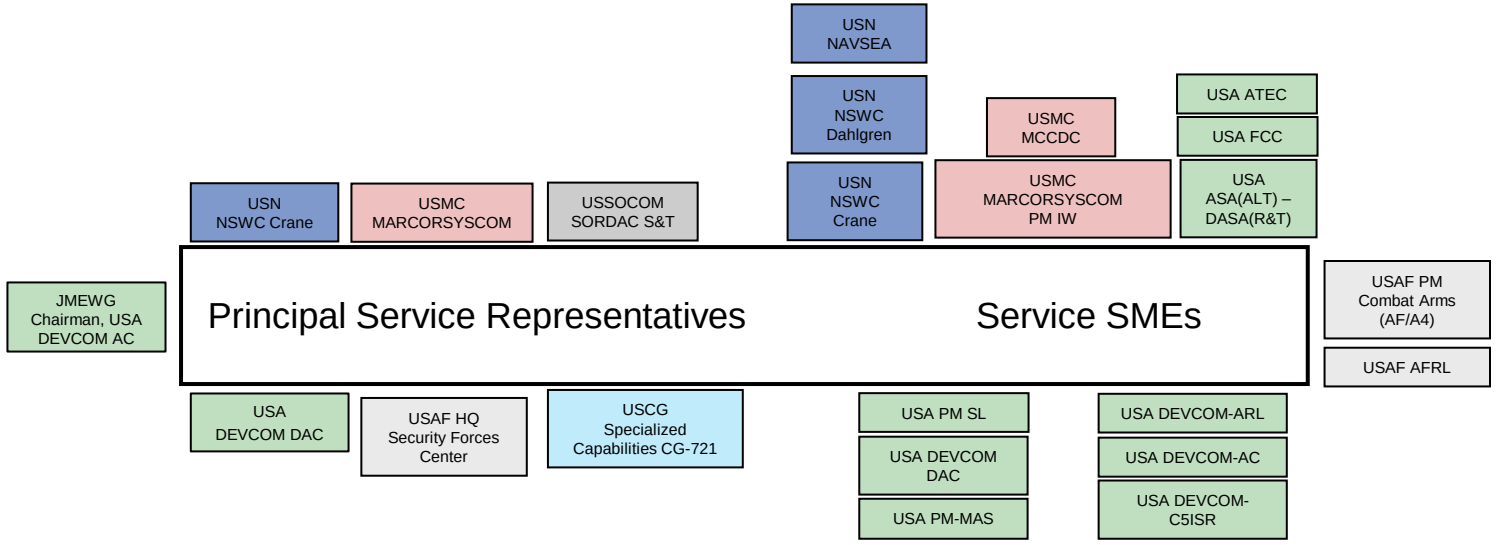
JOINT SERVICE SMALL ARMS METRIC EVALUATION (JSSAME) WORKING GROUP

Areas of Responsibility:

- Develop and maintain a common understanding of small arms performance across the user community, program offices, operational and evaluation community, and industry in order to generate a common language for small arms performance characterization.

- Identify, develop, and validate small arms evaluation standards, metrics, and modeling tools across the Joint Services.

- Coordinate with the JSTAC and JSSARI to provide recommendations on JSSAP portfolio to the JSSAST, including new start recommendations and ongoing project review and redirection as necessary, with focus on S&T programs' ability to close capability gaps.



JSSAME WG – INTEGRATION WITH JSSARI, JSTAC

JSSAME

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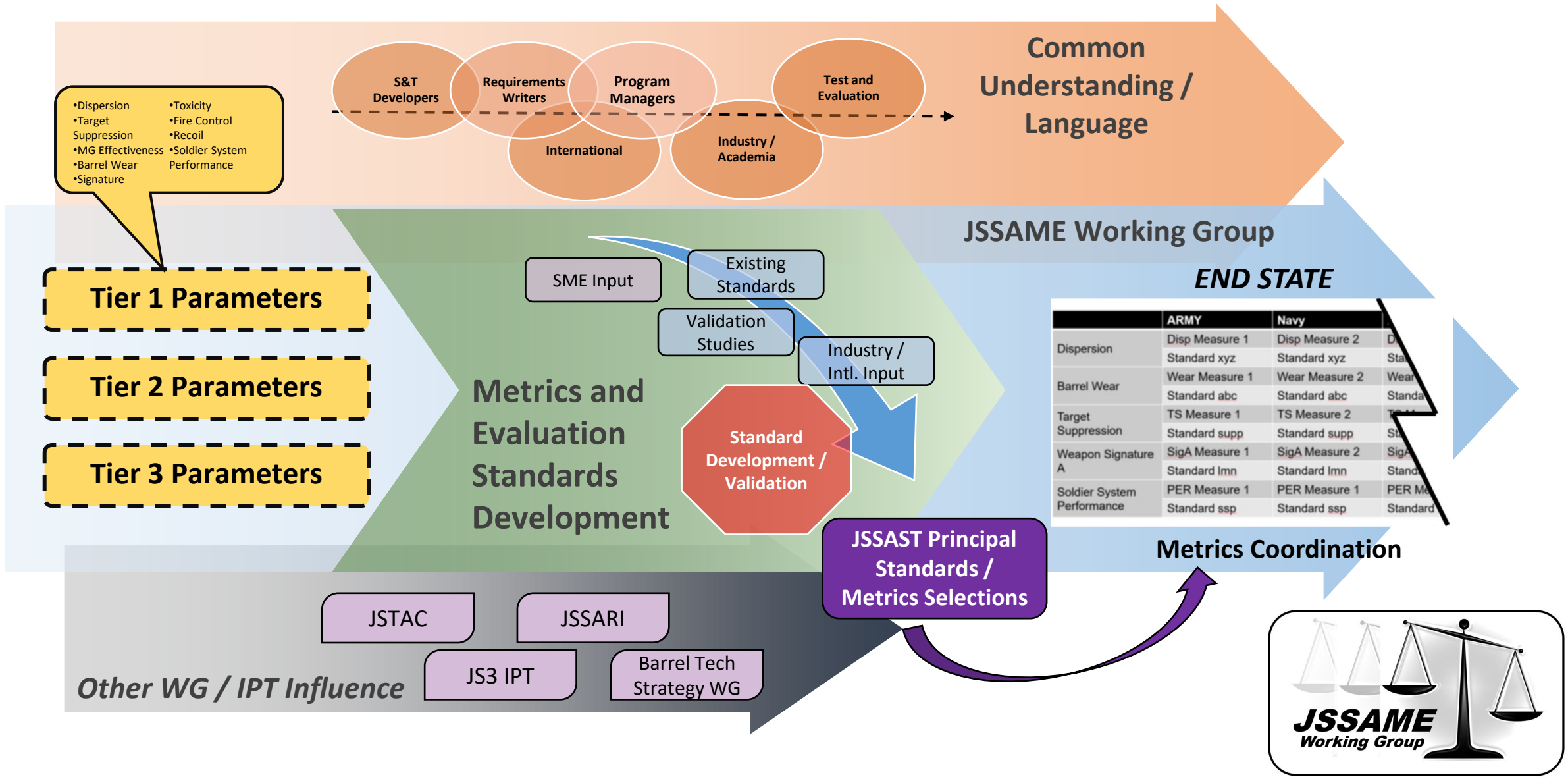
JSSAME Working Group

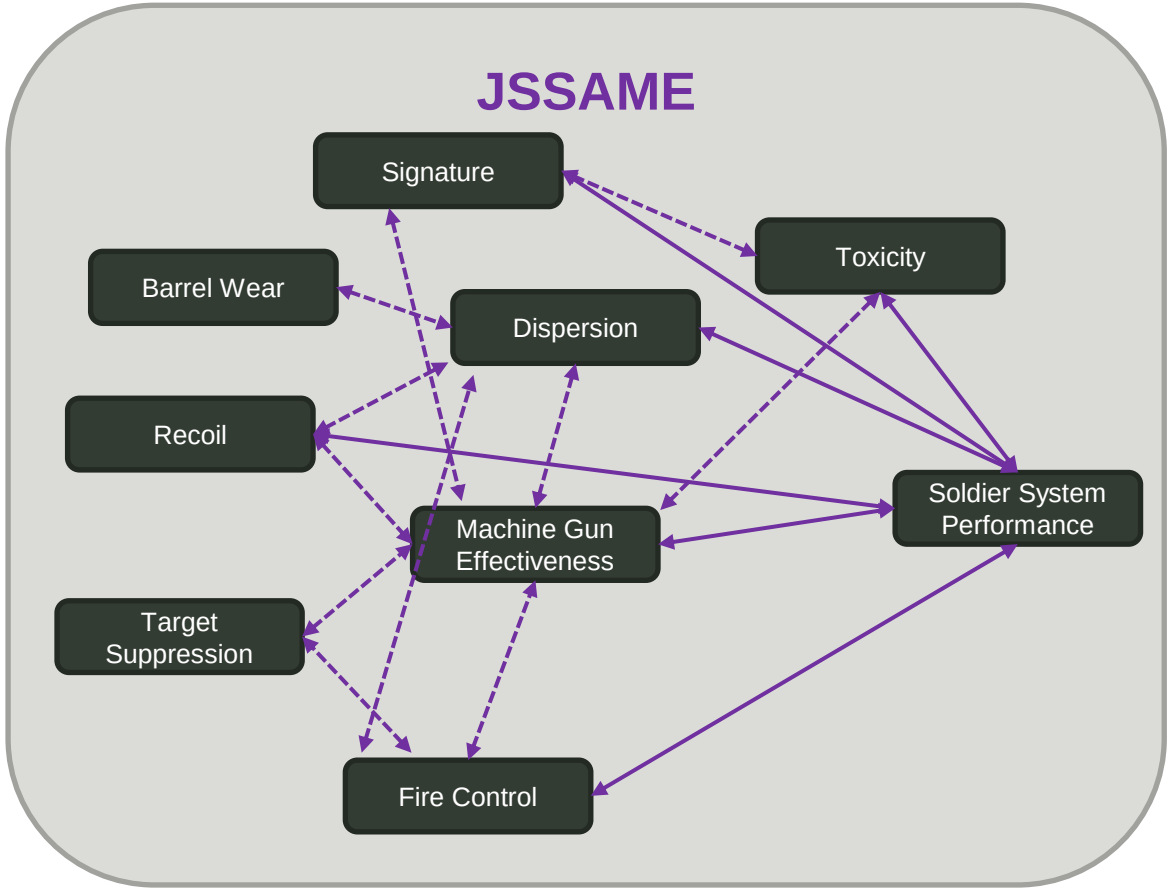
JSSAME WG – FLOW CHART



TIER 1 PARAMETER RELATIONSHIPS

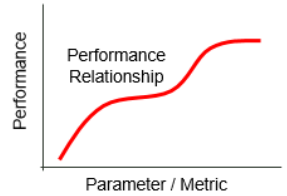
WHY?

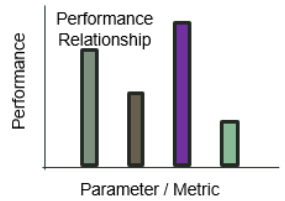
TO DEFINE THE DESIRED PERFORMANCE, WE FIRST NEED TO KNOW HOW TO QUANTIFY EACH OF THESE PARAMETERS (TEST PROCEDURE, METRIC).

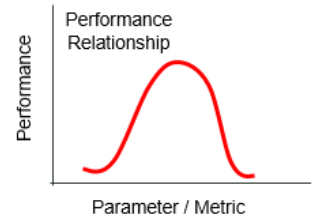


DESIRED PERFORMANCE

Define the performance relationship – Now that we know how to measure performance, what does "right" look like? Depends on mission, range, environment, etc.

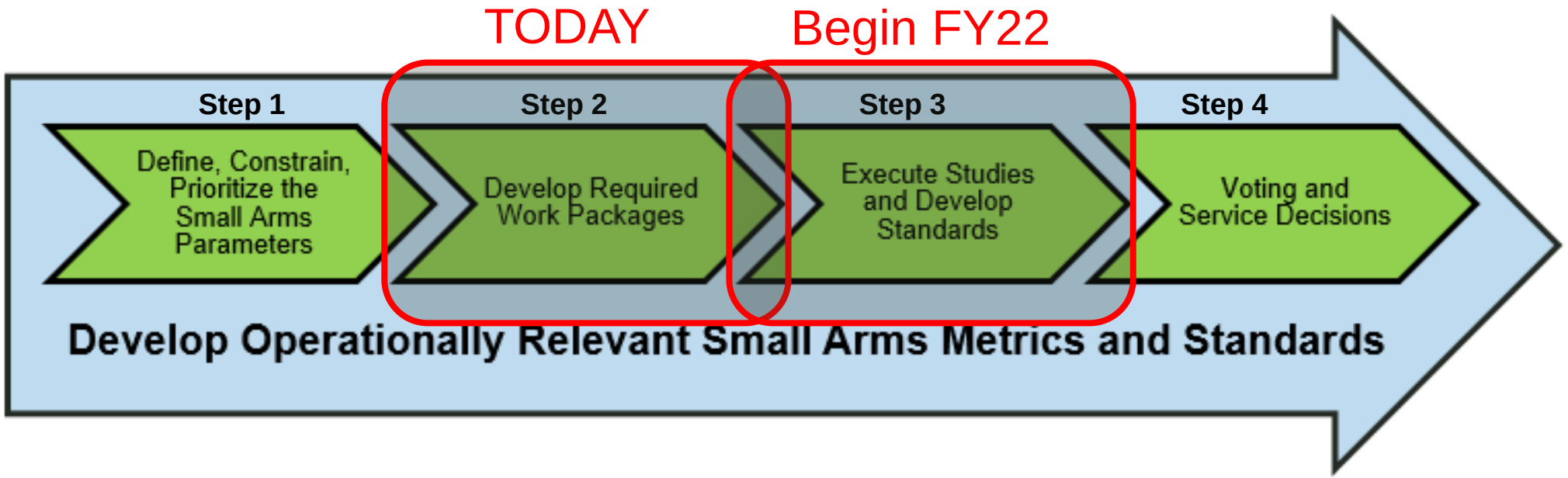






JSSAME Working Group

JSSAME WG – STANDARDIZATION APPROACH



Early in the process – Opportunities for Industry, Academia, and Government to collaborate.

JSSAME Working Group

JSSAP S&T CHALLENGE STATEMENTS TO INDUSTRY

2 examples of 17

Remainder in Backup

CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ENGAGE THREATS WITH SMALL ARMS VOLUME FIRE

Technology Investment Area: MACHINE GUN AUTOMATIC BALLISTIC CORRECTION

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on Machine Gun Automatic Ballistic Correction prototype solutions.

- This refers to technologies that automatically correct and/or optimize aimpoint/shot. Placement/dispersion to minimize operator aim error and increase probability of hit using machine guns.

- Technologies may be similar to other applications of Automatic Ballistic Correction for weapon systems, however, since volume fire consists of extended bursts, the automatic ballistic correction may need to be quicker reacting, longer duration, or may need to optimize and control unique weapon system parameters in order to be effective in a machine gun.

- These considerations should be addressed in any proposed solutions.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ENGAGE THREATS WITH SMALL ARMS VOLUME FIRE

Technology Investment Area: SYSTEM THERMAL CHARACTERIZATION AND MANAGEMENT

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information that addresses the development of advanced barrel cooling techniques that eliminate cook off, enable the use of caseless ammunition, and enable the use of low cost high strength heat treatable steels.

- The Government is looking for novel designs that offer practical and effective methods for cooling barrels.

- The requested information will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address the requirement. No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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QUESTIONS

BACKUP

CHALLENGE STATEMENT

Small Arms Task(s) Addressed: AVOID DETECTION CAUSED BY WEAPON SIGNATURE

Technology Investment Area: HOLISTIC/INTEGRAL SIGNATURE SUPPRESSION DEVELOPMENT

Background/Problem Statement:

- Recent advances in commercial suppressor technology have reduced sound and flash.
- Attempts have been made to reduce toxic fume blowback but it is not sufficient for military grade weapons with higher duty cycles and rates of fire.
- An integrated weapon system technology is necessary whereby the suppressor is not just an add-on, but is integrated and the weapon operating characteristics are in tune with the suppressor including heat, signature and blowback management utilizing a system approach.
- Integrally suppressed weapons have been tried in the past but have not dealt with all of the deleterious issues of suppressors in a balanced system approach including sound signature, flash signature, thermal signature; blowback, durability, fouling, etc. to build a durable military grade suppressed weapon system.
- Good measurement techniques are needed to evaluate all of the system performance measures in order to ensure deleterious effects, including toxic fumes, thermal signature and heat, weapon cycling, sound, and flash are necessary.
- Advances in how to modify weapon operating speeds may be necessary to deal with some of these issues.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ACQUIRE PERSONNEL AND VEHICLE TARGETS

Technology Investment Area: NIGHT TIME DIGIITAL IMAGE DATA FUSION

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) office is seeking information on multi-camera Digital Image Data Fusion techniques and technology for small arms applications.
- JSSAP is interested in information technologies in Digital Image Data Fusion, focusing on S&T Activity in the fusion of cameras with various modalities.
- This can include camera at different locations, with various levels of resolution, focal length, field-of–view, and spectral response.
- By extension this includes nighttime images, such as those from light image intensifier (I2) devices, ShortWave InfraRed (SWIR) devices, thermal Imagers and more.
- Latency, frame rate and other parameters known to directly affect human movement and cognitive processing should be considered.
- Both Daytime and nighttime images can be enhanced using multiple cameras and spectral fusion.
- Artificial Intelligence and Machine Learning could be used to determine and transmit the best synthesized image to display to Operators for any proposed solution.
- The request for information response will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address how any Daytime, or Nighttime Digital Image Data Fusion would be accomplished.
- A rough schedule and cost is for information only. No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ACQUIRE PERSONNEL AND VEHICLE TARGETS, DETERMINE RANGE TO TARGET, MARK OR TAG TARGET

Technology Investment Area: ULTRA LOW SIGNATURE LIDAR

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information to improve personnel target detection, classification, recognition and identification (DCRI) involves the development of an extremely sensitive, i.e. high signal to noise ratio LIDAR systems for near covert operation while providing high resolution three dimensional imaging with single photon sensitivity.
- There is also interest in LIDAR technologies that employ integrated photonics allowing for a system with a very attractive size, weight, and power profile.
- A rough schedule and cost is for information only.
- No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ACQUIRE PERSONNEL AND VEHICLE TARGETS, MARK OR TAG TARGETS

Technology Investment Area: PHOTONICS BASED NEURAL NETWORK COMPUTING

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on Photonic based Neural Network computing technology development to further enable personnel and vehicle target identification in lowlight or long range situations.
- Optical computing, discussed in the scientific literature for several decades, has been a field in search of a viable hardware approach.
- Advances in integrated photonics have made an optically based neural network a near reality.
- These “circuits” can adjust couplings between “fibers” thus emulating weights in neural nets.
- They can also combine beams which have suffered differential delays; optically they are interferometers.
- Both these mechanisms provide the full panoply of functionality that implements highly capable neural nets.
- Advances in active optical waveguides have provided access to a new set of approaches, the viability of which have yet to be established.
- An optically based photonic chip for specialized AI processing could be more than one hundred times faster than similar specialized AI chips based on conventional electronics and use less electrical power.
- The neural nets can be used for target identification and tracking and low light or degrading imaging exploitation.
- They can also implement a wide array of linear algebra operations, including optimization, regression and convolutions.
- It is essential that any such identification or tracking system be validated early in the development cycle.
- Neural nets can also help realize image reconstruction and target identification for images collected using compressive sensing methods.
- The request for information response will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address how Photonics Based Neural Network Computing would be accomplished. A rough schedule and cost is for information only.
- No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ACQUIRE PERSONNEL AND VEHICLE TARGETS, MARK OR TAG TARGETS

Technology Investment Area: TECHNIQUES FOR REMOVAL OF ATMOSPHERIC INDUCED IMAGE DEGRADATION

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on techniques to remove atmospheric induced image and targeting degradation.
- JSSAP is interested in ideas to development digital signal processing algorithms that would be able to characterize image distortion due to atmospheric effects such of turbulence, refraction, mirage and haze.
- There are known algorithms to remove atmospheric aberrations and distortions from frame sequences.
- These software solutions may provide solutions that are more practical than those afforded by active wave-front compensation.
- Advances in processor speed continue to be achieved, and this S&T Activity is intended to take advantage of those increased capabilities.
- There is also an opportunity to use the atmospheric modeling to provide spectral band selection and sensor capability assessments and requirements definitions for future force battlespaces that are still under evaluated.
- Atmospheric correction in the VNIR will also allow for the estimation of cross-range wind an important aid in finding ballistic solutions.
- The request for information response will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address how Technologies for Removal of Atmospheric Induced Image Degradation would be accomplished.
- A rough schedule and cost is for information only. No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ACQUIRE PERSONNEL AND VEHICLE TARGETS, MARK OR TAG TARGETS

Technology Investment Area: NOVEL DIGITAL IMAGING

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on the development of Novel Digital Imaging techniques for the development of technologies and systems that facilitate digital target recognition, identification and tracking in novel ways for small arms applications. This could include super resolution, in-scene LADAR, Flat Diffractive optics, and Artificial Intelligence /machine Learning (AI/ML) supplemented targeting.
- This S&T Activity would require the development of advanced digital signal processing algorithms such as high quality spatial (in-frame) upscaling and/or motion compensation for finding corresponding areas in neighbor frames.
- Efficiencies in processing would be examined, including foveated imaging and Flat diffractive optics processing and imaging. Recovering high resolution images from optical systems that are aperture-limited could improve situational awareness, and allow for novel passive depth finding, where doing so would require the injection of surmised information.
- Smart imagers are known to reduce power requirements particularly for low level functions such as optical flow and registration, or autonomous pixel binning decision processing.
- Other opportunities lie in the application of light field methods, particularly in situations where 3D scene reconstructions are needed.
- The need for synthetic generation of super-resolved imagery is more important in the VNIR, SWIR and MWIR than in the visible.
- The SWIR band could take advantage of airglow in night time conditions.
- Foreground, background and image segmentation can be performed in multiple bands and the results cross-correlated to aid target identification and tracking.
- VNIR processing will eventually require atmospheric correction.
- The request for information response will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address how Novel Digital Imaging would be accomplished.
- A rough schedule and cost is for information only.
- No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ACQUIRE PERSONNEL AND VEHICLE TARGETS

Technology Investment Area: INTEGRATION OF HIGH QUANTUM EFFICIENCY DETECTORS FOR DAY, NIGHT, AND DEGRADED CONDITIONS

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on the development of High Quantum Efficiency Detectors for Day, Night, and Degraded Condition battlespace imaging for small arms applications.
- The JSSAP office is looking for S&T technologies to further extend the material, physical and electrical designs of the detector, ROIC and FPA components to further improve the collection efficiency and responsivity of ultra-low SWaP battle field sensors for targeting and ISR applications in any proposed solution.
- The request for information response will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address how Integration of High Quantum Efficiency Detectors for Day, Night, and Degraded Conditions would be accomplished.
- A rough schedule and cost is for information only.
- No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ENGAGE THREATS WITH SMALL ARMS VOLUME FIRE, ENGAGE THREAT PERSONNEL WITH PRECIS SMALL ARMS FIRE

Technology Investment Area: RECOIL REDUCTION

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on advanced recoil mitigation technologies that reduce the firing specific impulse (i.e. force over time) for future squad and platoon level weapons.
- Technologies in this area include those of which reduce felt recoil and/or improve weapon controllability in the hands of a
- User to reduce Soldier aim error when shoulder firing and/or firing from a bipod.
- Proposals may also address the development of improved muzzle brake/compensator effectiveness while minimizing adverse effects, and should combine recoil impulse reduction with the various aspects of signature suppression.
- Technologies that address the relationship between recoil, rate of fire, integration of weapon systems with body armor and various other parameters are also required.
- The request for information will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address the requirement.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ENGAGE THREATS WITH SMALL ARMS VOLUME FIRE, OPERATE AND MAINTAIN WEAPONS

Technology Investment Area: SYSTEM THERMAL CHARACTERIZATION AND MANAGEMENT

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking proposals for the development of advanced system thermal characterization methods (non-contact thermometry) and thermal management concepts for small caliber weapon systems.
- Management of thermal characteristics (impact on weapons system reliability, cook-off, sustained rate of fire rating, etc.) and thermal signature management (heat dissipation, thermal barriers, thermal wraps, etc.) are critical to system performance and soldier effectiveness.
- Traditional thermal characterization methods for predicting things like bore surface temperatures can be sensitive to installation techniques, may be limited to locations and depths of measurement, can be limited in dynamic response behavior, and can typically only provide pin point measurements making it almost impossible to determine real time temperature gradient fluctuations.
- The request for information will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address the requirement.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ENGAGE THREATS WITH SMALL ARMS VOLUME FIRE, ENGAGE THREAT PERSONNEL WITH PRECISE SMALL ARMS FIRE, OPERATE AND MAINTAIN WEAPONS

Technology Investment Area: ADVANCED RIFLING, MATERIALS, COATINGS, AND PROCESSING FOR BARRELS

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on advanced barrel technologies including advanced rifling techniques, novel materials and coatings (ferrous/non-ferrous / chrome alternatives), and/or unique manufacturing processing methods with direct application to legacy and future weapon systems.
- Proposal shall identify unique attributes that will improve accuracy and dispersion, inhibit the erosion of the bore surface, and extend overall barrel life.
- Proposals shall include discussion of past-experience with the barrel manufacturing.
- Whitepaper proposal should indicate scalability towards future 6.8mm weapons that push the current bounds of pressures, temperatures, and muzzle velocities.
- The request for information will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address the requirement.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: OPERATE AND MAINTAIN WEAPONS

Technology Investment Area: ADVANCED SURFACE TREATMENTS

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on advanced surface treatment technologies applicable to legacy and future small arms weapons systems.
- The objective of this proposed investigation is to identify permanent surface treatments with the ability to maximize weapon system Operational Availability (Ao). Successful technologies (and supporting processes) shall concurrently advance weapon systems reliability, availability and lessen required maintenance and repairs.
- Efforts should include all technologies, materials, surface treatments and supporting processes capable of enhancing operational system performance.
- Successful surface treatment technologies shall eliminate the need for conventional liquid lubricants.
- In parallel, candidate technologies should prevent corrosion and other negative effects of water and salt-spray on the weapon and ammunition systems (including ancillary equipment) when systems are deployed in wet environments or aboard ships and boats.
- Prototype technology threshold requirements shall include provisions that the candidate treatment be capable of permanent application on metal substrates and that application processes can be optimized for performance and concurrently demonstrated as feasible with respect to treatment processing costs.
- Objective requirements demonstrate the ability to operate at temperatures above 400 °C.
- The request for information will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address the requirement.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ENGAGE THREAT PRESONNEL WITH PRECISE SMALL ARMS FIRE

Technology Investment Area: BARREL BORE CHARACTERIZATION AND PERFORMANCE CORRELATION

Background/Problem Statement:

- Existing barrel wear testing is too basic to understand the complex wear mechanics.
- Advanced in barrel wear material analysis and characterization has just started making its way into small caliber barrel testing.
- Barrel wear analysis tools developed for large caliber are too complex and time consuming for rapid turn small caliber systems.
- Thermo-chemical experimentation on barrel samples involves measuring material properties, analyzing effects of maximum surface temperature and propellant chemical interactions.
- Modeling involves understanding interior ballistics and thermal-mechanical interaction with the barrel.
- Full scale barrel testing does not identify and characterize wear mechanisms.
- State of the art advancement of this technology will demonstrate the development of tools and processes that better characterize wear mechanisms with simpler methodology than has existed in the past for large caliber systems.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: AVOID DETECTION CAUSED BY WEAPON SIGNATURE

Technology Investment Area: SUPPRESSOR THERMAL MANAGEMENT

Background/Problem Statement:

- Suppressors absorb tremendous amounts of heat from the propellant gases due to their high surface area, gas velocity and turbulent flow.
- Managing or mitigating this high heat load is important because it can affect structural integrity, weapon operation and cycling rates, mirage, and increase thermal signature.
- Having effective ways to manage and/or reduce the overall heat load is critical to improving suppressor operation and signatures.
- Methods to cool suppressors and dissipate heat loads have been tried in the past with some success.
- Ways of masking the heat load and managing the thermal signature have also been tried.
- Reducing the heat transfer from the propellant gases to the suppressor has also been tried by attempting to reduce turbulence levels and reducing overall surface area inside the suppressor. Unfortunately this is typically at the expense of increases in sound and flash.
- Innovations in how to better manage thermal effects will take into account how to balance overall system performance while reducing deleterious effects thermal load.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: ENGAGE THREAT PRESONNEL WITH PRECISE SMALL ARMS FIRE

Technology Investment Area: BARREL BORE CHARACTERIZATION AND PERFORMANCE CORRELATION

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information on small caliber barrel inspection equipment to verify manufacturing capability and to ensure items are created to the required specification.
- Requested equipment should provide high resolution inspection capabilities for assessment of gun barrel conditions (bore erosion profiling, dimensional measurements, optical images, surface roughness, etc) and should include advanced analysis and reporting features.
- The request for information will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address the requirement.

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CHALLENGE STATEMENT

Small Arms Task(s) Addressed: OPERATE AND MAINTAIN WEAPONS

Technology Investment Area: WEAR INDICATOR EMBEDDED SENSORS

Background/Problem Statement:

- The Joint Service Small Arms Program (JSSAP) Office is seeking information for the development of sensor hardware for the purposes of tracking weapon life due to barrel and component wear.
- Currently weapon life is based on visual inspection, testing of weapon performance, and/or estimates of how many rounds have been fired. Sensors embedded into the weapon, barrel, or components can change these qualitative analyses to quantitative.
- The information should demonstrate knowledge of capabilities and limitations of employed sensors due to extreme operating conditions.
- Technology should be able to be incorporated in legacy and future weapon systems, but shall focus on embedded sensors for future weapon systems for incorporation during production.
- Sensors shall capture data while weapon is being utilized for predictive analysis on weapon performance and failure modes needed for maintainability and sustainability.
- The request for information response will demonstrate the offeror's basic understanding of the problem, provide a discussion of how the offeror would attack the problem, and include recent advances in technology that address how sensors embedded in weapon systems would be accomplished. A rough schedule and cost is for information only.
- No offers or responses to this RFI should be expected by the offeror and is only for internal information to the government in program planning.

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