This document is being used for the August/September/October 2019 Air Force 19.3 SBIR proposal call and is applicable to both AF193-CSO1 Open Innovation in Dual Use Technology topic and AF19D-001 Direct to Phase II Open Innovation in Dual Use Technology topic. The first 3 focus areas are tied to upcoming Air Force Pitch Day events focusing on the transition of Phase I companies to Phase II. This means that if awarded a Phase I under the Open Innovation Dual Use Technology topic companies will go through the Phase I as managed by AFWERX and the Pitch Day event will focus on the transition from Phase I to Phase II. Please note which focus area you are applying for on the first page of your pitch deck presentation and technical proposal. Please check back on this document throughout the proposal period as changes may be made.

Please note that the POCs listed below are the technical POCs for each focus area, if contacting the listed POC please cc sbir@afwerx.af.mil. If there are any questions on the overall effort please contact sbir@afwerx.af.mil.

1. Focus Area: Air Force Cyber Systems and Process

The Air Force is seeking cyber-related commercial innovations to improve our Cyber posture regarding CI/CD platforms and enterprise services architectures in application like LevelUP. The areas include, but are not limited to

- Securing and hardening software containers--automated, portable, and secure hardening process
- Employing zero-trust model (Service Mesh)--securely and efficiently--in a DevSecOps Software Factory and Production Environment (containers and microservices)
- Architecting/designing/building a container and microservices-based distributed enterprise platform to support Artificial Intelligence and Machine Learning
- Cross operation system malware detection and defense
- Blockchain technology to secure software chain of custody
- Employment of avocado security model in a container and microservices-based platform/environment,
- Software-based/virtual Cross Domain Solutions that support moving software containers (binaries) from low-to-high in an automated fashion without modifying containers or code in containers
- A multi-factor enabled (CAC) collaboration service that is able to prioritize communication via chat, voice, or video based on bandwidth conditions, and support distributed, intermittent, and limited bandwidth connections
- Situational Awareness

The technical areas discussed are not all inclusive and this focus area is designed to be an open topic area for any Cyber technologies that may impact present or future Air Force missions. In addition, awardees of this topic area will be invited to attend an Air Force COMSEC/Cyber Space Pitch Day, where companies, along with an identified Air Force transition partner, will be able to pitch your concept and transition plan for a RAPID Phase II Award.
The AF COMSEC/Cyber Pitch Day is planned for Feb 2020 in Texas and will focus on Phase II pitches.

POC: Troy Mathews
Email: Troy.Matthews@us.af.mil
Pitch Day: Planned for Feb 2020

2. Focus Area: Air Force Communication Security (COMSEC)

The Air Force is seeking commercial innovations to improve our COMSEC posture. These include, but are not limited to

- Enterprise and non-enterprise cross domain solutions
- Space based network solutions
- Self-Forming/Self-Healing Networks
- Multiple Independent Level of Security solutions
- Reprogrammable processors
- Quantum: Processing, Resistance, Architecture, Algorithms
- Homomorphic Encryption
- Physically Unclonable Functions (PUF)
- Next generation authentication techniques
- Multi-functional encryption solutions (for example, Data-At-Rest and Inline Network Encryption (INE), INE and Intrusion Detection Sensing)
- Common Cryptographic Management
- Cryptographic Situation Awareness for Cyber Defense (identify network COMSEC components and current states)

The technical areas discussed are not all inclusive and this focus area is designed to be an open topic area for any COMSEC technologies that may impact present or future Air Force missions. In addition, awardees of this topic area will be invited to attend an Air Force COMSEC/Cyber Space Pitch Day, where companies, along with an identified Air Force transition partner, will be able to pitch your concept and transition plan for a RAPID Phase II Award.
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POC: Troy Mathews
Email: Troy.Matthews@us.af.mil
Pitch Day: Planned for Feb 2020

3. Focus Area: Tactical Level Innovation Opportunities

The objective of this topic is to provide tactical-level Airmen with the opportunity to identify innovative technologies and processes with a high probability of having a direct mission impact within a 6 to 18 month timeframe. These selections will be made under the advisement of participating MAJCOMs, labs, and program offices for considerations of strategic integration & impact, technical feasibility, and sustainability of the solution. Tactical-level solutions include technologies and processes that are used by Airmen who directly execute their mission. Solutions could include technologies and processes on both the operational and the support side.

Potential solutions could be either Horizon 1, 2, or 3 innovations, but need to be implementable and impactful within a 6 to 18 month time period.

Horizon 1 ideas provide continuous innovation to a company's existing business model and core capabilities in the short-term.

Horizon 2 ideas extend a company's existing business model and core capabilities to new customers, markets, or targets.

Horizon 3 is the creation of new capabilities and new business to take advantage of or respond to disruptive opportunities or to counter disruption.

Ref:
https://www.doctrine.af.mil/Portals/61/documents/Volume_1/V1-D34-Levels-of-War.pdf
https://hbr.org/2019/02/mckinseys-three-horizons-model-defined-innovation-for-years-heres-why-it-no-longer-applies

POC: Anthony Perez
POC Email: tony.perez@afwerx.af.mil
Pitch Day: Planned for March 2020

4. Focus Area: Base of the Future Concepts, Technologies, and Technology Applications

Base of the Future submissions should focus on the following areas:

1. Resilience concepts that help improve the durability of facilities to high impact weather and support the installation to withstand climatic events (i.e., hurricanes, flooding, and other weather events).
2. Energy resilience concepts that help facilities and the installation maintain power through natural disasters and/or cyber-attacks.
3. Cybersecure network architecture that improves cybersecurity for installed Operational Technology (OT) in military facilities, equipment, and utilities.
4. Installation security and defense
5. Automated and/or autonomous operations on the flight line and other facilities
6. Mixed Reality (AR/VR) and other technologies to enhance operations – MR Operations
7. Emergency operations center concepts that collect and analyze data derived from installed Facility Related Control Systems (FRCS) in facilities on the Installation. FRCS Operations Center
8. Installation resilience concepts that optimize central operations and collect and analyze data stemming from installed systems within mechanical systems and other utilities.
9. Concepts that incorporate Artificial Intelligence and Machine Learning (AI/ML) to analyze data and provide actionable information to the user.
10. Concepts to support and sustain improved workforce agility and bolster a culture of innovation.
11. Additive manufacturing techniques for improved operational efficiency and effectiveness
12. Leverage Operational Technology platform and solutions to improve operational efficiency and effectiveness

The overarching goal is to identify solutions that result in reduced operations and maintenance costs and serve as force multipliers for Airmen. These technologies will help to transform Air Force

installations into weapon systems; thereby, optimizing human capital, enhancing resilience, improving quality of life, lowering utility costs, augmenting connectivity/productivity, and enhancing the surrounding community.

POC: Vincent "SWATH" Pecoraro
Email: vince.pecoraro@afwerx.af.mil
Pitch Day: YES

5. Focus Area: Strategic Warning Pitch Day

A. Integrated Air Warning (AW) & Missile Warning (MW) Common Operating Picture (COP)
Background of the effort: The operators need to characterize without ambiguity, without delay, and provide continuous tracking of the air and missile events. But, the customer has too many displays to reference to make the critical time-limited assessments for decisional conferences. Threats could cross AW and MW domains. The operator needs a single display to seamlessly track cross-domain events.

Objective: Prototype an integrated AW and MW COP.
-seamlessly integrate missile and air tracks
-alternative display options
-integration of high-fidelity data from other non-traditional sources
-characterize threats without ambiguity or delay
-provide continuous event tracking

POC: Chastity Herrera
Email: Chastity.herrera@us.af.mil

B. Missile Warning (MW) AI/ML Decision Support System
Multi-domain data will address the mission gaps; but without cognitive support the sheer volume of data will overwhelm operators and decision makers. Harness machine learning/artificial Intelligence (ML/AI) technologies for seamless transition across multiple domains to improve the warfighter cognitive decision-making ability. Apply computational methods to rapidly search massive data sources and bring to the display the most valuable information for understanding events.

1. Missile Warning operators are looking at increasingly complex displays with an expanding number of sources and a variety of display options.

   -machine learning or AI to augment assessments to better identify threatened areas and targets for assessment reporting
   -implementation of this decision capability in the Processing and Display Subsystem-Migration (PDS-M) software
   -augment physics-based algorithms at forward user sites to increase fidelity of operator assessments.

2. Given new requirements to provide various calculations, the future system components may process information better offloaded to graphical user processing vs. current core processing to continue to meet processing Key Performance Parameters (KPPs).

-ML/AI to perform calculations for new requirements
-utilize Graphical Processing Unit/Compute Unified Device Architecture (GPU/CUDA) core processing

3. Increase left of launch intelligence threat situational awareness.
   - incorporate intelligence source data into machine learning capability.

4. The Ground Based Radars (GBRs) "throw data on the floor."
   -analyze discarded data set
   -discover value added when dismissed data is consolidated for assessment of threats.

POC: Raul Diaz
Email: Raul.Diaz@us.af.mil

C. De-orbit Correlation Tool
The NCMC-ITW/AA and Legacy Space program office needs the ability to take observations of a de-orbiting object and correlate them to a known object in the operational space catalogue. Current Legacy Space systems process observations of de-orbiting objects.

Objective:
-utilize legacy system observations
-correlate observations to known object in space catalogue
-transmit information to C2 system

POC: Michael Elmer
Email: Michael.Elmer@us.af.mil

D. Air Warning (AW), Missile Warning (MW), Missile Defense (MD), Space Situational Awareness (SSA), & Theater Event System (TES) Data Lake
Since threat data crosses multiple domains, the need to integrate the data sources from these domains is becoming evident. Currently, the data is separately sourced and processed by multiple systems for separate deliveries to forward users.

Objective:
-establishing a data lake to streamline data intake and will allow our operational users to receive all needed types of data.
-The data lake should be able to incorporate multiple security levels.
-Incorporate AI/ML and analytics of data

POC: Chastity Herrera
Email: Chastity.herrera@us.af.mil
Pitch Day: YES

6. Focus Area: Artificial Intelligence/Machine Learning Dual Use Technologies

The United States Air Force (USAF) Artificial Intelligence Technology Accelerator, in collaboration with Program Executive Office (PEO) Digital and the Air Force Research Lab Autonomy Capability Team, is establishing a state-of-the-art, end-to-end, sustainable pipeline of Artificial Intelligence (AI) and Machine Learning (ML) technology. This effort is in response to expectations described in the February 2019 Executive Order on AI, vision outlined in the 2018 National Defense Strategy, and senior Department of Defense (DoD) goals for creating AI centric organizations. As part of this effort, the USAF is facilitating the growth and development of innovative commercial businesses and university teams across America engaged in creating and deploying cutting edge AI/ML capabilities.

The goal is twofold:
1) Give the U.S. a competitive advantage in national defense by being a first "partner of choice" for cutting-edge AI/ML entrepreneurs and small businesses
2) Expand the existing private sector AI/ML ecosystem capabilities by applying private sector technology to new users within the Department of Defense.

Given the exponential pace of AI/ML developments, this topic is designed to facilitate an open-engagement between the government and private sector regarding the latest AI/ML ideas and technology as opposed to satisfying specific requirements. Additionally specific areas the USAF is interested in integrating AI/ML technologies include:
1) Natural Language Processing of both written text and spoken word to improve business processes (contract/legal document analysis as well as enhanced human-machine interfaces)
2) Rapid processing of publicly available information to improve prediction and response to emergent crises
3) Improved image and video processing from sensors
4) Enhanced supervised/unsupervised AI/ML techniques for situations where little to no structured data exists
5) Transfer of AI/ML algorithms developed in simulated environments to real-world platforms

POC: Col Randy "Laz" Gordon
Email: Laz.gordon@afwerx.af.mil

7. Focus Area: Prototyping and testing new options for an advanced Joint MDC2

The core of dominance in purple warfighting is the ability to effectively command and control (C2) the battle across multiple domains (MDC2), with a decision accuracy and flexibility that is significantly faster than our adversaries. A future C2 system must inherently include Joint and changing Coalition partners. It must be rapidly tailorable to execute in any geographic region, and adaptable to support the full range of missions such as homeland defense to theater offensive operations. Since the Air Force is not likely to execute a massive acquisition to develop a common MDC2 system for all of our various Op Centers, any proposed approach must be open, inter-operable, and able to easily share data with other systems.

The objective of this topic is to identify new technologies, approaches and concepts of operations that can be quickly prototyped and field tested for applicability in a future Joint MDC2. Expected concepts and attributes may include the following:

- A virtual environment that shares data, common operating picture, and AI/ML analytics with any securely connected device (AF, Joint or Coalition).
- An augmented environment (to include new or leveraged hardware) that can be deployed in the operational setting and provide real-time engagement support with the ability to either act standalone or connect back into the joint operating picture.
- A persistent C2 capability that enables tasking and authorities to dynamically shift between an aggregated Op Center, a disaggregated team that has been rapidly assembled, or a theater Squadron executing Mission-type orders.
- The ability to rapidly and securely ingest new data feeds across DoD communications, and from non-traditional sources such as local authorities or commercial entities.
- The ability to rapidly and securely connect and network a geographically separated squadron-sized team. This includes a rapidly-deployed team such as special operations, or a team that is organically assembled from different organizations for missions such as disaster relief or homeland defense.
- The C2 ability for the teams to deploy anywhere on the planet, and still have secure and resilient beyond-line-of-sight reach-back capability to CONUS.

Proposed approaches may address any area that improves our ability to have an agile dynamic Joint MDC2 capability. Proposals can address an individual aspect of the problem, or propose a system-level solution. Proposals that include new information technology should address the proposed approach for integrating with AF and government systems (or securely operating without that integration).

The Air Force is seeking relatively mature technologies, and ideally prototype technologies that can be put into field testing and operational utility experimentation under the SBIR contract. The AF will provide access to field testing with airmen and operators who will test your new technology and provide feedback.

Major technology development is not encouraged, unless the payoff warrants the investment. Ideally we are exploring options to leverage commercial technology advances to adapt to and perform this critical AF mission. Proposed approaches should also consider the challenges of technology transition into operations, and consider innovative approaches that help enable the transition path.

POC: Dr. Greg Spanjers, AF Strategic Development Planning and Experimentation office (AF SDPE)
Email: usaf.sdpe.sbir@us.af.mil

8. Focus Area: Cruise Missile Defense (CMD)

The objective of this topic is to prototype technologies to detect, track, identify and mitigate adversary cruise missiles. Advanced long-range cruise missiles are a significant threat to America and its allies, especially in NORAD and USNORTHCOM, USINDOPACOM and USEUCOM theaters. Adversaries continue to develop new cruise missile technologies with longer range, reduced detectability, and the ability to be launched in great numbers from land, maritime and airborne assets with extreme accuracy, to target land or maritime targets. Detecting and defeating this cruise missiles threat will require an integrated and layered approach and must also address vast areas of regard, and adapt to various deployment and employment challenges.

The Air Force has long deployed excellent capabilities to detect, track, identify and mitigate adversary cruise missiles to protect the homeland and our interests abroad. However, technology advancement

has created the opportunity to deploy new systems with significantly lower cost (deployment and sustainment), and/or higher performance (sensitivity, response time, coverage area). Therefore the Air Force is seeking innovative approaches for Cruise Missile Defense (CMD) in 2 primary areas: Detection of Cruise Missiles and Defeat of Cruise Missiles. The Detection area includes detect, track, and identify. Defeat includes the full range of mitigation approaches. Proposals may address 1 or both areas, or offer cutting-edge technologies or innovative approaches that provide new means to accomplish the mission. Proposals may address a local point solution for missions such as Base Defense, or a regional Defense capability such as protecting the US and ally borders. An ideal solution is scalable to serve both applications. Detection solutions may consider all domains (land, air, space, near space, cyber) and may consider any detection phenomenology. Proposals may consider advanced data analytics (AI/ML) at the sensor or at a centralized location with fused data from many sensors.

A fundamental challenge of cruise missile detection is the low radar cross section that can evade legacy radars. This same challenge is also presented by small commercial drones and light aircraft. Proposals that can simultaneously address this broader range of potential threats is of high interest.

The Air Force is seeking proposals that quickly develop prototype technologies that can be put into field testing and operational utility experimentation under the SBIR contract. Major technology development is not encouraged, unless the payoff warrants the investment. Ideally we are exploring options to leverage commercial technology advances to adapt to and perform this critical AF mission. Proposed approaches should also consider the challenges of technology transition into operations, and consider innovative approaches that help enable the transition path.

POC: Dr. Gregory Spanjers, AF Strategic Development Planning & Experimentation office (AF SDPE)
Email: usaf.sdpe.sbir@us.af.mil

9. Focus Area: National Air and Space Intelligence Center (NASIC)

The objective of this focus area is to find technologies to enhance the capabilities of The National Air and Space Intelligence Center (NASIC). NASIC creates integrated, predictive intelligence in the air, space, and cyberspace domains enabling military operations, force modernization, and policymaking. NASIC is looking for technologies to assist in analyzing and compiling data, as well as producing and communicating intelligence assessments for U.S. policy and decision makers. Specific topics of interest relating to this Focus Area include, but are not limited to:

1. Virtual Reality and Augmented Reality (VR/AR)
2. Artificial Intelligence and Machine Learning (AI/ML)
3. Modelling and Simulation (M&S)
4. Data Management
5. New Sensor Technologies that Enable #1-4

For more info on NASIC capability areas and technologies please visit:
http://www.nasic.af.mil/LinkClick.aspx?fileticket=pu7BO6VYBcI%3d&tabid=1345&portalid=19&mid=9028

POC: Capt John Munro
Email: john.munro.1@us.af.mil

10. Focus Area: Real-Time Fatigue System for Risk Assessment

The AF is seeking a validated system that provides real-time, quantitative and/or qualitative data on fatigue levels of individual personnel assigned to aircrews that help leaders proactively manage the risks associated with personnel fatigue in training, routine, and combat missions.

The Air Force often demands a high operational tempo of its aircrews and leaders must make critical, data-based decisions when assessing overall risk associated with the mission. One of the vital elements to the risk assessment strategy is aircrew availability and readiness. While operators have specific rules and guidelines around rest and recovery to ensure operational readiness, there are many, often uncontrollable, factors such as quality of sleep that are not currently available for proper risk assessment. Such factors, if left unaccounted for, may artificially put the mission and our people at unnecessary risk.

The proposed solution should provide leaders with data and a comprehensive analysis of individuals and teams in areas that are commonly associated with fatigue to support real-time risk management to improve safety across the AF.

POC: Angel Hudnall
Email: angelique.hudnall@us.af.mil

11. Focus Area: Real-Time Fatigue System for Risk Assessment

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The proposed validated system should provide analysis and integrate into existing systems or describe the path to platform integration to support senior leaders, flight planners, and aircrews in their risk-management strategies to address:

(1) the dangerous prevalence of unidentified fatigue risks, which will likely lead to catastrophic consequences to both aircrew and assets,

(2) the opportunity for increased safety and improved health of the force through proactive management of fatigue risks.

The proposed system should also provide decision-makers and air crews adaptive recommendations for rest and recovery based on real-time data and other resources such as actigraphs/personal circadian

rhythms, fatigue levels, and cumulative sleep debts thereby helping individual members of crews recover and increase their overall effectiveness levels for upcoming missions.

POC: Angel Hudnall
Email: angelique.hudnall@us.af.mil

12. Focus Area: Simulators Program Office

The Air Force Lifecycle Management Center Simulators Program Office (AFLCMC/WNS) and the Air Force Agency for Modeling and Simulation (AFAMS) are seeking proposals on the following topic areas. This list is not meant to be all inclusive, and innovative solutions to improve the state of the art in simulator training not listed below are encouraged to apply.

12.A) High end Weather effects within Simulator Gaming Environment: Simulators is looking for a solution that can interpret all of our platform weather engines and output a common picture. Weather effects should be "felt" on the aircraft, sensors, weapons and visibility (as applicable). The full gamut of weather felt in the real-world must be accurately presented on the simulated environment.

12.B) Deployable, austere environment high-fidelity simulator:Simulators is looking for innovative solutions to re-packaging a current platform's existing hardware and software into a lightweight, deployable format. Fidelity to the platform's cockpit including but not limited to all switches, displays, warning lights and audio, weapons and avionics must be simulated. Proposals which include VR/AR along with accurate kinesthetic feedback are highly desired.

12.C) State of the art visual systems: Many of our simulators utilize 6, 8 or even 18 channel projection systems in order to meet their field of view requirements. Simulators is looking for companies to propose novel solutions to existing visual systems that are graphics and power hungry, often times requiring dedicated facilities with unique HVAC and power requirements. Proposals which address a reduction in HVAC, power and/or space without a reduction in fidelity in the simulator are highly desired.

12.D) Interoperability amongst networked simulators: Our simulators are all developed and integrated multiple vendors, some which use proprietary methods to meet their requirements. Often times, this results in a product that works excellent on its own but does not play nice with others. Simulators is looking for solutions (hardware, software or combination thereof) which allow the gaming environments to synchronize and display the same data, visuals and other artifacts while considering security classification guidance across platforms. Proposals which address all of the above to include networked operations with our partner nations are highly desired.

12.E) Performance Based Training, Data Collection and Analysis: The objective of this topic is to explore solutions capable of ingesting and manipulating large amounts of this data over time to explore trends and patterns. Solutions to this problem would be able to collect and retain training device data from disparate sources and be capable of analyzing and displaying trends, providing real-time feedback in the simulator environment, provide commanders with a squadron readiness state and recommend future

training syllabi. This topic includes areas such as Machine Learning, Natural Language Processing, and other applications of Artificial Intelligence.

12.F) Cloud based simulators: Air Force simulators typically have locally hosted compute and storage, requiring updates and maintenance for each location. This topic seeks to address ways storage and compute resources can be leveraged in conjunction with the locally hosted simulators. Some example areas to consider are: Native OFP emulation; Content repository and update including visuals, threats, physics based environment, Electronic Warfare (EW), weapons models, 6 Degrees of Freedom (DoF), aero models, Computer Generated Forces (CGF); Analytic data collection and tools, including presentation and debriefing; Automated testing; and Remote monitoring. Proposals should include a notional architecture for existing simulators enterprise connecting to and/or leveraging cloud compute and storage, addressing security, open architecture, authoritative data sources, and information protection standards (at minimum).

12.G) Shortening the timeline for maintenance and pilot training: The objective of this topic is to explore methods to shorten the timeline for maintenance and aircrew training, improve memory retention, decrease the load on the instructors and introduce COTS solutions to augment and/or replace the current training methods. Proposals should explore the opportunities associated with introducing new technology, including but not limited to expedited updated models, procedures or tasks, artificial intelligence enabled real-time task feedback and syllabi improvements. Proposals should discuss notional architecture of proposed solution if the solution require a technological investment, empirical evidence that the solution will be effective in accomplishing the objective and considerations for each course of action proposed.

12.H) Altitude Chamber Training: The Air Force utilizes 12 Hypobaric Altitude Chambers. Although the altitude chambers vary in size, shape, and configuration, the principles of operation and intended purpose are similar. The altitude chambers provide a locale for practical instruction in the physiology of flight in controlled and safe but realistic high-altitude conditions. The altitude chambers provide the environment where aircrew members learn to effectively handle hypoxia, hyperventilation, mechanical gas expansion, and pressure breathing. All of these stresses occur during high altitude flying and an aircrew members' survival depends on how well prepared they are to handle them. We are looking for innovative solutions which can replicate the training conducted within the altitude chamber.

12.I) Machine learning (ML) for Natural Language Processing (NLP) for Process Management:Training and Simulation projects use large amounts of structured and unstructured data in the form of contracts, technical requirements, training requirements, regulations and instructions. Contracting officers, buyers, engineers and program managers spend hundreds to thousands of hours yearly reviewing contract submissions and their adherence to DFARS clauses and requirements. Simulators is looking for solutions with Machine Learning, Natural Language Processing, and other like tools to analyze acquisition and proposal documents, in order to assist the program management team in focusing assessment tasks or developing data visualization of document content. Ideally tools will be compatible with SharePoint repositories, AF NIPRnet and can support redaction and restrictions on sensitive data.

POC: Patrick Kawonczyk
POC Email: patrick.kawonczyk@us.af.mil

13. Focus Area: Immersive Training Solutions

As our Air Force advances in its technological and operational capabilities, it has never been more important to continue to develop our airman using the most effective tools and processes. This has raised the profile and importance of several training missions including pilot training to address the current pilot shortage, maintenance training and training in general to keep up with the sustainment of advanced technologies, or other types of training for support personnel and general personnel development. The solutions can address any aspect(s) of any training type and should seek to improve a form of measurable effectiveness. Proposed solutions may also seek to use technology solutions to bridge the gap between training and job aids. Solutions can range from being very broad (applying to a number of training types/aspects) to being very specific (applying to a specific training/aspect) or somewhere in-between. It is not required that all of the aspects, types of training or measures are addressed in one solution. It is required that any solution is able to integrate well with other existing and potential solutions. It is also important that any potential solutions have a high probability of keeping pace with the technological change and thus should be closely tied to commercial technologies and solutions that will help support the development of the solution. Increasing continuous improvement cycle of content, maximizing feedback/modification cycles between content curators (schoolhouses) and units/students in the field.

- Address “Big Data” problem – Establish Data collection system – move away from stand alone systems
- Sharing Medium / Crowd-sourcing
- One logical digital location for training Data Analytics
- Data solution to collect, consolidate & analyze data to validate offsets and their effectiveness
- Objective data for streamlining decision making today
- Data access to all units to make informed training/syllabus decisions based off data and not historical guesses
- Shareable measurement libraries
- Leverage Technology – AI
- Data Strategy Across the Training Pipeline - Validation of training efforts and human performance
- Assist in decreasing CSI workload / offset for CSI manning. Instructor Pilots to think along the lines of a new model of training

All proposed technology must include a description of its ability to be upgraded in the future. Custom software will ideally be delivered with unlimited government use rights to fully commented source code. Ordinarily, all software should be delivered with unlimited government use rights to well documented API’s. Hardware will maximize use of COTS solutions wherever possible. Vendors will document their proposed system architecture and annotate their ability to comply with the above requirements.

POC:Matthew Scott
Email: SBIR@afwerx.af.mil

14. Focus Area: Theater Battle Control Division

We deliver battle control capabilities to the warfighter by developing, acquiring, fielding and sustaining hardware and software solutions efficiently, effectively and with a sense of urgency. Battle control capabilities include C2 systems (at the operational and tactical levels), ISR radars, and global HF communications. The problems we seek creative solutions for center around data communications connectivity, C2 system modernization, improved manufacturing processes, camera modernization, virtual reality training, and autonomous maintenance.

A. **Tactical Air Control Party – Modernization (TACP-M)**

The objective of this topic is to explore innovative solutions to enhance the functionality of legacy vehicular-mounted TACP communications systems by becoming software and end-user device agnostic and by developing transportable, temporarily mounted vehicle agnostic solutions. Items 1a-3a below are the 3 areas of interest with the following required communication capabilities:

- MUOS/Legacy SATCOM
- DATA Encryption
- LOS/BLOS Transmission
- UHF/VHF
- GPS
- ISR

1a. Software and End-User Device Agnostic Mobile Communications System (MCS) – Remote At-The-Halt Operations

The currently fielded TACP Mobile Communications System (MCS) requires a Windows-based laptop to conduct data communications at 100 meters using the TACP CASS software. As software requirements evolve, alternative software and end-user device solutions are becoming more viable, creating a greater need for a software and end-user device agnostic system.

- Design a data communications connectivity concept (i.e. Android, Windows, iOS, etc.) to end-user device remoted 100 meters from the vehicle.

2a. Software and End-User Device Agnostic Mobile Communications System (MCS) – Vehicle On-The-Move Operations

This area of interest involves providing seamless, automatic connectivity for all types of end-user devices within TACP vehicles so that users do not have to reconfigure settings or input information upon entering vehicles. The AF is interested in solutions that include the following based laptops and tablets: Windows OS, Android OS, and potential unknown OS in the future.

- Provide auto-connect (similar to Blue Tooth), secure (US SECRET), cable free Ethernet and USB connectivity between the end User devices and the communication equipment in the TACP vehicle when the User is in or in the proximity of the vehicle.

3a. Transportable, Temporarily Mounted, Vehicle Agnostic TACP-M Communications System

The transportable, vehicle mountable communication system shall provide voice, data, and video communications via AM/FM/HF/SATCOM using 4 channels while complying with MIL-STD for vehicle applications. The final solution shall be packaged to be quickly installed in any Army vehicle without vehicle modifications and shall include all cabling and antennas required for operation.

- Provide design concepts for a portable communication system (voice, video, and data capable) for mounted TACP operations that allows for temporary installation into any tactical military vehicle without permanent vehicular modifications.

B. MAF Aircraft C4 Sub-System

The objective of this topic is to explore the modernization or replacement of a legacy C4 sub-system used during missions on the fleet of mobility USAF aircraft. The required capabilities might possibly be integrated into one sole sub-system or they may be integrated into other existing, planned, or innovative aircraft sub-systems and/or ground stations. Below are the particular areas of interest and/or capabilities for inclusion in pursuit of materiel solution development or research:

- Explore the modernization, replacement, or upgrade of the Combat Track II system capabilities
    - MUOS or Integrated Waveform (IW) SATCOM
    - Data Encryption
    - Aircraft Tracking & Reporting
    - LOS/BLOS Transmission
    - Off-Board Chat and File Exchange
    - SIPRNet Integration
    - GPS
    - Hard Install vs Roll-on/Roll-off (RORO)
    - Mission Planning Integration
    - Aircraft Integration and Compatibility

Capability solutions must integrate with existing aircraft design, specifications, and all data/information/materiel/energy inputs, and outputs. A proposed solution must comply with applicable MIL-STD requirements for airborne applications.

C. MAF Airborne Sub-System Enclosure

Current manufacturing processes for metal racks incur significant costs to the Government and prolong integration projects. The Air Force is seeking innovative solutions, whether it be material choice, manufacturing processes, or expedited supply chains, to deliver capability on-time and on-cost. These enclosures must comply with applicable MIL-STD requirements for airborne applications. Specific topics of interest include, but not limited to:

- Explore innovative manufacturing technologies that reduce lead times and costs.
    - 3-Dimensional printing capabilities
    - Lean manufacturing processes and implementation
    - Cutting-edge, high-strength and lightweight materials
    - Shortening the timeline for raw material procurement and delivery
    - Design for high-speed automatic assembly and robot assembly
    - Design for machining and sheet metalworking

D. Assessing Camera Options to Support Current National Capital Region-Integrated Air Defense System

The objective of this topic is to explore new camera systems and phenomenologies (i.e. infrared, LIDAR, etc.) that enhance visualization of airborne objects in the Special Flight Rules Area (SFRA) in the National Capital Region (NCR). The SFRA essentially covers a 30-miles radius around the District of Columbia (DC).

- Investigate use of modern camera system technologies of any type of phenomenology (i.e. infrared, LIDAR, visual) to support high resolution visualization and automated tracking of aircraft operating within the SFRA.

E. HBDH- Training and Efficiency

High Frequency Global Communication System (HFGCS) consists of more than 300 antennas at 13 stations and is the DOD's world-wide high power, high frequency global command, control, and communication (C3) and nuclear command, control, communications (NC3) network that provides beyond line of sight (BLOS) interoperable voice and data communications for strategic, tactical and air mobility forces.

1e. Virtual Reality Simulators for High Frequency Antenna's Preventative Maintenance

The objective of this focus area is to investigate the applicability of Virtual Reality (VR) training for the HFGCS program as follows:

- Preventative Maintenance Inspection (PMI) Training for High Frequency (HF) antennas
    - Visual acuity and fidelity of objects at long ranges within a HF antenna Field simulator environment
    - Interoperability amongst networked simulators and visualization on LAN computers
    - Cloud-Based Simulators for PMI training on HF Antennas
    - Performance Based Training, Data Collection and Analysis on PMI for HF antennas
    - Artificial Intelligence aided instruction in Simulator
    - Shortening the timeline for maintenance on HF antennas

2e. Feasibility of Remote or Autonomous High Frequency Antenna Inspection and Preventative Maintenance Capability

The objective of this focus area is to provide innovative solutions for Preventive Maintenance Inspection (PMI) of High Frequency antennas under extreme environmental conditions. UAVs/UASs are not able to be used on/near base due to potential for damaging antenna cables with propellers and must obtain flight clearance in foreign countries. The USAF currently conducts maintenance on all antennas every 5 years due to cost and location constraints. The AF is interested in solutions for the following HF antennas: HOBA TCI 540-2-05, SPIRA-CONE GRANGER 300l-2VL, RLPA APC AS-3642A.

- Solutions that are remote control or can autonomously perform PMI on HF Antennas by going up/down/crawl around HFGCS antennas to document condition of structure and all connections and bolts, and apply corrosion preventive compound and or paint

POC: Kerryn Loan
Email: Kerryn.Loan@us.af.mil
Pitch Day: Yes

15. Focus Area: eVTOL/UAM (Electric Vertical Takeoff and Landing/Urban Air Mobility)

The objective of this topic is to explore potential commercial products being developed in the emerging eVTOL/UAM market for potential disaster response, humanitarian aid, and logistics missions. This sub-topic is intended survey a large scope of technologies to include: autonomy; advanced aircraft materials and manufacturing; novel acoustics techniques; subsystem, aircraft, and portfolio design tools; rapid mission planning for dense air environments and logistics efficiencies; command and control of air vehicles; robotic landing gear; large flotation devices; modular payload designs; air vehicle data networks and RF waveforms; sense and avoid architectures, algorithms, and sensors; electrical power storage, generation, charging; distributed electric propulsion control techniques.

POC: Austin Delorme
Email: SBIR@AFWERX.af.mil