Continuing Human Enabling, Enhancing, Restoring, and Sustaining (CHEERS) Multiple Authority Announcement (MAA) Technical Requirements - Statement of Objectives (SOO)

United States Air Force School of Aerospace Medicine

1.0 Background

The Air Force Research Laboratory's (AFRL) United States Air Force School of Aerospace Medicine (USAFSAM) is one of the mission units within the 711th Human Performance Wing (711HPW). The USAFSAM mission is to ensure ready Airmen, ready Guardians, and ready Medics in any environment, and is composed of globally recognized experts in Aerospace and Operational Medicine. This expertise is leveraged to provide relevant operational medical solutions that support current and future DoD missions by anticipating and meeting the future demands of the Air Force Aerospace Operational Medicine Enterprise (AOME), through a combination of consultation, education and training, and knowledge generation through Studies & Analysis (S&A), and research, within the areas of Aerospace Medicine, En Route Care, Occupational and Environmental Health, and Public Health and Preventative Medicine. These focus areas typically align with the USAFSAM departments.

2.0 Technical Requirements

The AOME seeks to maximize Airman performance and readiness, as well as the development of mitigation measures for physical and psychological stressors, illness and injuries during Airman training and operations by executing S&A as well as R&D studies. Focus areas for these studies can be broadly categorized into the following areas of interest for both S&A as well as R&D: Aerospace Medicine and Physiology, Public Health and Preventative Medicine, Occupational Medicine and Bioenvironmental Engineering, and En Route Care/Expeditionary Medicine/Prolonged Field Care. Collectively, these areas can be referred to as the AOME. S&A studies must be appropriate for one-year (12 month), short- term investigations and not be basic research.

Submitted white papers and/or proposals should target specific research challenges and exactly identify the technical requirement(s) (by nomenclature below) to which the white paper/proposal aligns.

2.1 Aerospace Medicine and Physiology

2.1.1 Aerospace Physiology: Solutions relating to physiologic assessment of aircrew in high altitude Fighters/Trainers.

2.1.1.1 Assessments of the physiologic response to exposures and stressors from the fighter/trainer environment; can cover any of the following: including effects of fluctuating pressure, high O2, air quality, breathing resistance, thermal burden, dehydration, rest/sleep (physical fatigue), cognitive fatigue, Aircrew Flight Equipment (AFE) integration (how AFE impacts in-flight physiology, and how AFE components interact with each other to impact physiology and aircrew performance), and combined stressors on performance and decision making in ground-based testing and operational environments, including the analysis of potential countermeasures to optimize pilot performance and eliminate sources of risk.

2.1.1.2 Solutions to sustain Aircrew performance in extreme environments.

2.1.1.3 Conduct comprehensive technology assessments of the current military health system simulators that can monitor and track physiologic responses from training student pilots.

2.1.1.4 There is a strong demand for wearables that are cross compatible across multiple systems to collect physiologic data, that are reliable and validated in the operational environment. Offerors are to conduct a comprehensive technology assessment of commercial off the shelf products, including their suitability for use in the operational

environment and their validated measurement capabilities, to help aid aircrew and decision makers on what can be flown in the aircraft and what can be accurately collected from those sensors.

2.1.1.5 Musculoskeletal Injury Prevention and Treatment for Aircrew and Maintainers: Neck and back pain is a known occupational hazard for the high-performance aircraft community. The government seeks solutions, including tools to prevent, reduce, screen and diagnose musculoskeletal condition as well as alternative/integrative medicine approaches, for prevention or treatment of musculoskeletal injuries. Proposed solutions shall focus on providing reliable measurements to determine platform-specific neck/back dysfunction and improvements due to embedded care.

2.1.1.6 Gender-specific operational aircrew considerations

2.1.1.7 Assessment, modeling, detection, and/or mitigation Aircrew and Operator fatigue

2.1.2 Aerospace Medicine

2.1.2.1 Precision Medicine and Medical Standards: Development of solutions relating to the following areas:

2.1.2.1.1 Surveillance of conditions, indications, clinical practice guideline adherence, and outcomes to support cost benefit analyses for Air Force population.

2.1.2.1.2 Genomics for mishap investigations (gene expression, subtracting human and molecular autopsy).

2.1.2.1.3 Studies providing data to support evidence-based aerospace medicine standards and waivers.

2.1.2.1.4 Psychological Performance and Mental Health (solutions should relate to at least one of the following areas)

2.1.2.1.4.1 Mental health and psychological disorders amongst airmen and potential influence on readiness and retention.

2.1.2.1.4.2 Neurocognitive diversity; cognitive testing and correlates with mental health and other outcomes.

2.2.2.1.4.3 Assessment of the feasibility of integrating the use of personality data and wearable technology to facilitate adjustment and success during career specific training. Personality assessments and wearables both as tools to facilitate readiness via positive change, well-being, and performance by increasing self-awareness.

2.2 Public Health and Preventative Medicine

2.2.1 Development, optimization, and validation of pathogen detection methodologies

2.2.2 Cancer analysis in the Air Force population

2.2.2.1 Development and evaluation of prototypes that can identify carcinogenic toxins or hazardous materials associated with military flight operations from shipboard or land bases or facilities.

2.2.2.2 Development and evaluation of prototypes that can identify exposures to ionizing radiation and nonionizing radiation from which airmen could have received increased radiation amounts.

2.2.2.3 Establishment of guidelines for carcinogen exposure as it relates to demographics for each airman to include duty stations, duties and aircraft flow.

2.2.2.4 Establishment of guidelines that outline the duties and potential exposures of airmen that are associated with higher incidence of cancer.

2.2.2.5 Development and evaluation of screening tools and/or methods that relate to carcinogen exposure to airmen.

2.2.3 Assess methodologies to prevent wound infection.

2.2.4 Assess infectious disease conditions in Air Force populations.

2.3 Occupational Medicine and Bioenvironmental Engineering

2.3.1 Enhancement of capabilities to detect, measure, and assess occupational and environmental health hazard contaminants and extreme environmental conditions.

2.3.1.1 Assess technologies to enhance capabilities to detect and identify chemical, biological, toxins, radiological, directed energy, poisons and physical hazards on surfaces (including soil and powder), in liquids and in the air in near real-time at the detector's point of operation and notify end user of risk.

2.3.1 2 Assessment of Aviation-Specific Exposures

2.3.1.3 Develop, test and evaluate real-time health threat surveillance and reporting system inclusive of all available health information/databases to identify risks/outbreaks and provide decision support to operational commanders.

2.3.2 Evaluation/development of mitigation technology capable of reducing or eliminating occupational and environmental health hazard risks.

2.4 En Route Care/Expeditionary Medicine/Prolonged Field Care: Needs in this area include medical capabilities to support in route care to/from remote, austere settings, and in extreme environments.

2.4.1 Training methodologies to improve operational readiness for individuals and teams responsible for delivering basic and advanced en route care capabilities within the aeromedical evacuation system.

2.4.2 Technology assessment/development to support the Air Force Surgeon General's medical modernization priorities with a focus on modernizing outdated technologies and techniques to promote en route care growth/preparation for future peer/near-peer conflicts involving mass casualty care.

2.5 Education and training technologies and methodologies to support efforts to generate, develop, and maintain skillsets across the AOME.

2.6 Applications of data science to analyze medical and operational data and outcomes across the AOME, which may include implementation of AI and machine learning to answer operationally relevant questions.

3.0 Other Requirements:

3.1 O&M Fiscal Considerations: To satisfy the Purpose Statute, proposed funding must be proper for the work to be performed (31 USC Sec. 1301 & DoD FMR, vol. 14, Ch. 2, para. 020202.B.). The scope/purpose of the contract must be analyzed to ensure the use of O&M funds is proper and not an Anti-Deficiency Act violation. IAW the DoD Financial Management Regulation, RDT&E will finance research, development, test and evaluation efforts, including procurement of end items, weapons, equipment, components, materials and services required for development of equipment, material, or computer application software.