

## **Airman Readiness Medical Research (ARMR)**

### **Science & Technology (S&T)**

#### **Statement of Objectives**

#### **1. Scope**

The Warfighter Medical Optimization Division (RHM) research focus is to conduct medical research in support of optimizing of the warfighter by enabling, enhancing, restoring, and sustaining the Airman to more effectively execute the Air Force mission. This medical research objective is dual natured: (1) ensure medical availability of Airmen by analyzing attributes (sensory, behavioral, physiologic) and operational environments (chemical, physical, psychological, biological, radiological stressors) to drive optimal performance of Airmen engaged in high-demand, high-impact mission tasks (2) investigate how the flight environment affects the process of life, the ability to maintain homeostasis, and the risk for injury or secondary insult, seeking to ameliorate these stressors to optimize Airman health and performance.

#### **2. Specific Research Objectives**

##### **OBJECTIVE 1: Aeromedical Evacuation (AE)**

The objective of the Aeromedical Evacuation (AE) research program is to develop standards for high-risk and frequently performed medical procedures performed "en route". While in-flight, AE crews and patients are subject to the stressors of flight that create potentially adverse conditions for patient treatment.

Additionally, stressors such as gravitational forces, low humidity, low oxygen partial pressures, vibration, low or high temperatures, barometric pressure changes, fatigue, and noise can have a significant cumulative effect and aggravate patient conditions. En Route Care (ERC) is the Air Force research capability required to accomplish this objective and is described in the following four aims:

- **Aim #1: Clinical En Route Care (Clinical ERC)**

Advancement of care during transport or staging of the sick and wounded with the goal of improved short and long-term outcomes. Clinical care research will be translational to improve or develop Clinical Practice Guidelines (CPGs) and tactics, techniques, and procedures, to ensure patients receive the same level of care in a transport environment, as would be expected in a comparable cutting-edge patient care facility.

- **Aim #2: En Route Care Medical Technologies (ERC Med Tech)**

Technology that leverages existing materiel solutions and develops

innovations to advance care capabilities in order to improve safety and outcomes while transporting patients across the AE continuum of care.

- **Aim #3: Impact of Transport (IoT)**

Investigates the impact of AE on injury and disease, pathophysiology and clinical management. IoT focuses on understanding the stressors of flight and characterizes baseline factors (e.g., flight duration, vibration, lighting, noise, altitude) as required to facilitate mitigation development to counter negative effects of transport.

- **Aim #4: Patient Safety**

Supports “Trusted Care” through continuous process improvement in the development of evidence-based Clinical Practice Guidelines (CPGs), standardized work processes and training, and intelligent database support modules to reduce variability, prevent harm and improve care and outcomes across the AE continuum of care.

## **OBJECTIVE 2: Optimization of Human Capital (OHC)**

Optimization of Human Capital (OHC) is an overarching framework that encompasses efforts targeting the Airman life cycle. The broad focus areas for research include: (1) Precision-Based Airmen Optimization (PBAO); (2) Enhanced screening techniques for a healthy and fit force; (3) Prevention, mitigation, and worker hardening for a High-Functioning Force.

### **Precision-Based Airmen Optimization (PBAO)**

The aims of PBAO are broken down into three main capability subareas for research.

- **Force Support** – The ability to establish, develop, maintain, and manage a mission ready Total Force
- **Human Capital Management** – The ability to ensure, within the life cycle management of total force human resources, the availability of highly motivated personnel equipped with required skill sets and capabilities to achieve mission success
- **Personnel Management** – The ability to provide the oversight and provision of human resource policies and programs that contribute to the retention of total force members fully equipped to execute national strategy.

### **OBJECTIVE 3: Airman Exposure Health**

The Airman's exposure to all operation environments may induce immediate and latent health effects. The capture and characterization of these exposures for protection, risk mitigation, and warning is of vital importance to operations and monitoring commands. The core capability research aims for Airman Exposure Health are: (1) Exposure Anticipation and Recognition; (2) Exposure Monitoring; (3) Exposure Assessment; (4) Exposure Analytics; (5) Exposure Prediction; (6) Exposure Mitigation.

- **Aim #1: Exposure Anticipation & Recognition**

This aim seeks to synchronize exposure science with the lifecycle of airmen. The airman operational environment exposures are unique and the science to anticipate and recognize exposure threats is needed to sustain and enhance medical readiness.

- **Aim #2: Exposure Monitoring**

This aim seeks to capture individual and mission relevant population-based exposure data en route to the development of a comprehensive exposure health profile for the lifecycle of the airman and targeted mission environments.

- **Aim #3: Exposure Assessment**

This aim seeks to assess the information received through exposure monitoring and understand the relationship between the exposure and the effects on the human system. This objective seeks to leverage epidemiology, bio-monitoring, and other techniques to properly assess the airman within his/her lifecycle and mission space.

- **Aim #4: Exposure Analytics**

The research data from all Airman Exposure Health objectives requires the development and continuous learning of an exposure data analytics platform. This platform requires the ability to collect, transfer, store, and distribute relevant data from various disparate and unstructured clinical and non-clinical data sources. This aim seeks to integrate existing and emerging data platforms to detect environmental, occupational, and lifestyle exposures in near/real-time en route to a comprehensive exposure record of health risk factors.

- **Aim #5: Exposure Prediction**

This aim seeks to develop the machine language and algorithms to deliver predictive tools from an exposure scenario with a quantified uncertainty to two main users. User set one is the military planner/operational decision maker and/or healthcare provider and the need to receive a prediction of health outcomes for populations of

interest and/or individual personnel based on anticipated operations to inform and potentially mitigate compromising health effects. The second user set is the individual and the need to receive a predictive assessment to understand a particular risk to a given hazard beyond general population level mitigation.

- **Aim #6: Exposure Mitigation**

This aim seeks to combine all the exposure phases into actionable solutions to enhance prevention and protect military members from chronic and adverse exposures. Successful mitigation will include such means as removing the hazard, adjusting/changing the operational process, instituting engineering controls, and implementing corporate/personal protective countermeasures to include gear and/or vaccinations/prophylaxis. Knowledge from relevant exposure phases will be used to develop medical studies to verify and validate mitigation protocols for individuals and populations. Evaluating the effectiveness of Personal Protective Equipment (PPE) may be necessary to provide the appropriate mitigation strategy. Biological mechanisms of mitigation are also required in many mission environments. The end state of this objective is a healthy, ready force.

#### **OBJECTIVE 4: Expeditionary Medicine (EM)**

Air Force medics support a variety of expeditionary missions, including deployment to long-standing sustainment expeditionary medical facilities, multiple Areas of Responsibility (AORs), special operations, remotely piloted aircraft operations, and joint combat & humanitarian operations across the globe. This Expeditionary Medical Support system is to be enhanced by four key research aims.

- **Aim #1: Combat Casualty Care**

This aim optimizes survival and recovery in service members injured in combat. This effort encompasses research on the spectrum of care from the point of injury (POI) through en-route care, and treatment at medical facilities from deployed field hospitals to definitive care facilities. Areas of focus include but are not limited to traumatic brain injury (TBI), hemorrhage control and resuscitation, and blood products.

- **Aim #2: Medical Logistics**

This aim seeks to understand the activities required to develop and

sustain shared medical logistics situational awareness, synchronize the provision of integrated medical logistics capabilities, and provide medical logistics support

- **Aim #3: Preventive Medicine (PVNTMED)/Primary Care**

This aim seeks methods to anticipate, prevent, and control communicable diseases, illnesses, and exposure to endemic, occupational, and environmental health hazards. PVNTMED activities include communication, education, field sanitation, medical surveillance, pest and vector control, disease risk assessment, environmental and occupational health monitoring and surveillance, medical countermeasures, health threat controls for waste disposal (human, hazardous, and medical), food safety inspection, and potable water surveillance. Primary care begins with the employment of basic or advanced first-aid (via self-aid or buddy-aid), followed by non-physician medical care, and in some instances, physician primary care. Emergent care services offer basic pre-hospital trauma life support to include paramedic emergency care, initial resuscitative and fluid therapy, and cardiac life support. First responders provide initial treatment for injuries.

- **Aim #4: Ancillary Support**

This aim will provide relevant research in support of the wide range of health care services provided to support military gound-based medicine. These healthcare services include laboratory, radiology, and pharmacy services and other medically related services that operate in an expeditionary environment.

## **OBJECTIVE 5: Cognitive and Physiologic Performance (CPP)**

CPP research is required to enhance cognitive and physiologic performance for Distributed Common Ground System (DCGS) operators, Aircraft Maintenance, Aviators, Battlefield Airmen, Special Operators, and Air Force Global Strike Command (AFGSC) Missileers in the workplace. These following two research aims will yield an increase in knowledge to assist commanders and clinicians in ensuring the health readiness of the operating force and/or strategies and techniques that transition to other non-materiel or materiel solutions.

- **Aim #1: Maintain Health Readiness of Operating Force**

This aim seeks to maintain and/or enhance physical, physiological, and psychological fitness and readiness for missions across the range of DCGS operating environments and military operations. This also

includes providing recommendations to restrict/re-direct personnel incapable of performing mission duties.

- **Aim #2: Control Occupational & Environmental Threats:**

This aim seeks to provide risk assessments, preventive medicine, occupational health, and public health activities to implement required individual and collective protection and safety measures.

## **OBJECTIVE 6: Medical Countermeasures of Directed Energy (Med CDEE)**

Med CDEE research seeks to enhance capabilities that will facilitate effective operations in Directed Energy Weapon (DEW) environments. These environments include peace-time, humanitarian, and war-time arenas. These are the five aims to meet this requirement.

- **Aim #1: Protect/Prevent**

This aim seeks to prevent illness and promote health to reduce the need for secondary or tertiary health care in a DEW environment.

- **Aim #2: Diagnose**

This aim seeks to determine the type and cause of health condition rendered in the DE environment on the basis of signs and symptoms of the patient; data obtained from laboratory analysis of fluid, tissue specimens, and other relevant tests

- **Aim #3: Treat**

This aim seeks to manage disease by medicinal, surgical, or other measures

- **Aim #4: Medical Surveillance**

This aim seeks to systematically survey and assess employees exposed or potentially exposed to DE occupational hazards. The research efforts will provide individual and aggregate surveillance data with the goal of reducing and ultimately preventing occupation DE illness and injury.

## **OBJECTIVE 7: Airman Systems Medical Research**

Airman Systems research includes three other key areas essential to the Aeromedical operations, warfighter readiness capability. These areas are Training, Bioengineering, and Adaptive Warfighter Interfaces. The medical aspects of these areas are to be explored through research, development, test, and evaluation efforts.

**OBJECTIVE 8: Space Exploration Research**

The medical effects of space travel and orbit transfer on the human need to be understood for the successful execution of the air and space mission.

Research in this domain is desired to help quantify medical mission success parameters in this austere environment.

**3. Clinical Investigation Research**

Clinical investigations also referred to as studies & analysis (S&A) are a vital part of medical readiness research, development, test and evaluation (RDT&E) efforts. Department of Defense Instruction (DoDI) 6000.08 established the policy, assigned the responsibilities, and provides procedures for funding and administration of Research and Clinical Investigation Programs funded by the Defense Health Program (DHP) appropriation. These investigations are conducted at multiples intervals of the RDT&E process.

- Pre-RDT&E – Examination of medical phenomenon to understand the appropriate medical research approach for development of relevant medical RDT&E plan
- Inter-RDT&E – Examination of non-medical research to understand medical applicability of the research effort for given medical requirement
- Post-RDT&E – Examination of research completed to understand medical generalizability of findings.

**4. Security Requirements**

**4.1 Operations Security (OPSEC):** The contractor shall provide OPSEC protection for all sensitive/critical information and indicators involved in execution of efforts, as defined by AFI 10-701 (Operations Security). 711 HPW Critical Information and Indicators are protected under the 711 HPW Operations Security Program and the 711 HPW Critical Information and Indicators List (CIIL). Contractor employees granted access to critical information and indicators will be provided initial OPSEC training by the 711 HPW OPSEC Coordinator upon in-processing and prior to being granted access to CIIL items related to the contract/Task Order. The contractor will also participate in 711 HPW's annual OPSEC training and education programs, which includes periodic updates and refresher training on CIIL items applicable to the contract/Task Order. The 711 HPW OPSEC coordinator will evaluate the OPSEC posture of AF contract activities and operations.

**4.2 Highest Security Classification: TOP SECRET**

This effort may require Top Secret facility clearance and Top Secret safeguarding capability. It is anticipated that the majority of awards under the open period and Calls of this BAA will be unclassified. Security classification will be addressed at individual award level.