



U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND

2019 COMMAND ACCOMPLISHMENTS

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USAMRDC 2019 Command Accomplishments

Welcome to the USAMRDC Command Accomplishments Booklet, where you will find our defining moments and achievements.

While the desire to continuously advance military medicine is at the very heart of the U.S. Army Medical Research and Development Command's mission, it is also important to pause and review our achievements in order to see just how far we have come.

USAMRDC continues to push the limits of military medicine. From achievements in the field of infectious disease research to progress in the world of health monitoring to advancements in clinical practice guidelines for blood storage, USAMRDC ensures the health and readiness of the U.S. military's most important asset: the Warfighter.

Forge the Future!



U.S. Army Medical Research And Development Command Laboratories, Research Programs, and Project Management Offices

U.S. Army Aeromedical Research Laboratory
USAARL

U.S. Army Institute of Surgical Research
USAISR

U.S. Army Medical Materiel Development Activity
USAMMDA

U.S. Army Medical Research Institute of Chemical Defense
USAMRICD

U.S. Army Medical Research Institute of Infectious Diseases
USAMRIID

U.S. Army Research Institute of Environmental Medicine
USARIEM

Walter Reed Army Institute of Research
WRAIR

Congressionally Directed Medical Research Programs
CDMRP

Telemedicine and Advanced Technology Research Center
TATRC

Combat Casualty Care Research Program
CCCRP

Joint Trauma Analysis and Prevention of Injury in Combat
JTAPIC

Blast Injury Research Coordinating Office
BIRCO

Radiation Health Effects Research Program
RHERP

Joint Program Committee-1
JPC-1

Clinical and Rehabilitative Medicine Research Program
CRM RP

Biotechnology High Performance Computing Software Applications Institute
BHSAI

Military Operational Medicine Research Program
MOMRP

Office of Research Protections
ORP

Warfighter Expeditionary Medicine and Treatment Project Management Office
WENT PMO

Warfighter Health, Performance and Evacuation Project Management Office
WHPE PMO

Warfighter Protection and Acute Care Project Management Office
WPAC PMO

USAMRDC CUTTING EDGE SCIENCE AND TECHNOLOGY: SOLDIER READINESS AND LETHALITY

Ensuring the Warfighter's ability to operate at peak physical condition in their efforts to secure operational success in any scenario.

Handheld Device Offers Real-time Exposure Assessment

An invention titled "Point-of-Care In-Vitro Diagnostic Device for the Amperometric Detection of Cholinesterase Activity in Whole Blood for Indication of Exposure to Cholinesterase Inhibiting Substances" was approved for U.S. Patent filing. Immediately following possible exposure, this hand-held, low-cost invention will allow the Warfighter to quickly assess a blood sample during the pre-symptomatic window, providing early warning of a suspected exposure and a possible trigger-to-treat with a medical countermeasure.

USAMRICD //

ICD Develops Innovative Model for the Treatment of Nerve Agent Casualties

Scientists have developed an intensive care unit model for treatment of severe nerve agent exposure. This model focuses on development of effective treatments for nerve agent-induced seizures at the definitive care level. By using basic science to establish that nerve agent-induced seizures require an extremely aggressive treatment plan that breaks away from accepted clinical doctrine, scientists are pushing the Army toward a modern and innovative approach to care at the earliest possible stage of development.

USAMRICD //

ISR Hemorrhage Detection Tool Submitted for FDA Consideration

The U.S. Food and Drug Administration (FDA) has recognized the lower body negative pressure (LBNP) as a valid experimental model of human hemorrhage. As a result, USAISR – along with a support team from the MRDC Office of Regulated Activities – has been invited to submit a proposal to the incubator phase for consideration of FDA certification of LBNP as a Medical Device Development Tool. The LBNP Tool will be certified for use to assess and/or support demonstration of medical device safety, effectiveness, or device performance while providing support to regulatory decision making.

USAISR //

Expertise Leads to Groundbreaking Development in Military Blood Operations

Work performed at USAISR and with collaborators provided the data that convinced the FDA to grant the extended shelf-life of platelets in military blood operations from five days to 14 days, greatly facilitating medical care in future operations.

USAISR //

Data Provides Justification for Blood Storage On, Off the Battlefield

Work performed at USAISR generated the data on whole blood hemostatic function during storage that provided justification to switch from 21 days to 35 days, thus dramatically increasing the availability of whole blood on the battlefield.

USAISR //

Research Supports Increased Use of Whole Blood in Military, Civilian Settings

Work with cold-stored whole blood has supported the increased use of whole blood, both in military and civilian settings and has contributed to guidance for expanded use of walking blood banks in the battlefield. Further research is aimed at increasing cold-stored whole blood's shelf-life beyond 35 days.

CCCRP, USAISR //

Innovative Device Brings Multi-Organ Support Closer to the Point of Injury

The Combat Resuscitation Organ Support System (C.R.O.S.S.) works to advance efforts in multi-organ support capabilities. This effort currently is focused on techniques that will bring extra corporeal lung and renal support closer to the point of injury. Development of new technologies for liver support (sub-effort) will leverage these engineering successes. This effort will decrease the logistical footprint of complex, and bulky machinery and limit died of wound rates and morbidity.

CCCRP, USAISR //



USAMRDC CUTTING EDGE SCIENCE AND TECHNOLOGY: SOLDIER READINESS AND LETHALITY

Research Leads to the Refinement of Guidelines for Blood Storage

Blood platelet storage lifetimes have been increased from five to ten days at ambient temperature. This is important as currently many platelet bags must be thrown away, if they cannot meet the current five day criterion. Important advances have been made in extending platelet lifetime using cold storage.

CCCRP, USAISR //

Novel Sensor Ensures Correct Airway Placement on the Battlefield

Research has led to the development of a novel sensor for use in ensuring correct initial placement of an endotracheal tube and maintenance of correct placement during transport. This will allow quicker and more reliable airway placement on the battlefield and help ensure that the airway is maintained during casualty transport.

USAISR //

Device Aids in Complete Trauma Care for Soldiers in Remote Settings

The Reactor Thoracostomy device provides the benefits of needle thoracostomy with the efficacy of tube thoracostomy. Reactor Thoracostomy is a new device that can rapidly gain entry into the chest; where once inside a preloaded trocar can be slid into the chest – thereby evacuating the pressure building up inside and facilitating long-term placement of a chest tube if desired. The device presents an opportunity for more complete care of injured Soldiers in a far-forward setting.

TATRC

Efforts Lend Insight on Hand Movements During Ranger Training

The cold weather hand dexterity device completed field validation studies for the impact of swamp movements on the risk of hypothermia during Ranger training.

USARIEM //

USARIEM Completes Study on Altitude Sickness Prevention Medicine

Updated the Army's medical guidance on preventing and mitigating heat stress and heat casualties and completed a laboratory study that validated the use of acetazolamide, the FDA's only approved altitude sickness prevention medicine, as an effective pharmaceutical that prevents acute mountain sickness without impairing physical performance during rapid altitude deployments.

USARIEM //

Efforts Address Prolonged Field Care Gaps in Remote Environments

The Sonivate Medical, Ultra wide-Band, Wearable Ultrasound Probe for Battlefield Use aims to capture, process, and disseminate real-time information from the point of injury through the roles of care. The project expanded on extensive product development and technical refinement to transition from a laptop display to a wireless ultra wide-band smart phone display to display real-time ultrasound images.

CDMRP //

Mobile App Successfully Deployed to Aid in Water Estimation

Successfully deployed the Soldier Water Estimation Tool (SWET) Mobile App to the U.S. Army Training and Doctrine Command (TRADOC) App Gateway. The SWET app is used to anticipate the amount of water needed to sustain Soldier hydration (in liters per hour), while at the same time seeking to minimize the volume of water that needs to be carried.

USAMMDA //

ARMS App Deployed to Manage Altitude-Related Illnesses

Successfully deployed the Altitude Readiness Management System (ARMS) app to the U.S. Army TRADOC App Gateway. ARMS is an integrated Mobile App on handheld devices providing squad leaders the ability to plan, monitor and manage unit altitude illness risk, and predict task performance. The app will provide acclimatization status, aid in acclimatization to high altitudes and provide suggestions to prevent altitude sickness to ensure mission success.

USAMMDA //

Research on Musculoskeletal Injury Reduction Continues at USARIEM

The ARIEM Reduction of Musculoskeletal Injury (ARMI) study, which aims to reduce musculoskeletal injury in trainees during initial military training has exceeded the halfway mark by collecting bone and muscle data from 2,150 recruits; the team's total goal is four thousand recruits.

USARIEM //



USAMRDC CUTTING EDGE SCIENCE AND TECHNOLOGY: SOLDIER READINESS AND LETHALITY

Groundbreaking Testosterone Study Published by USARIEM Researchers

This study focuses on developing biomedical enhancement strategies that can reduce Warfighter muscle loss and fatigue during combat operations, as well as safely and ethically enhancing Warfighter nutritional status and performance. The research team completed and published a study that demonstrated the effectiveness of taking supplemental testosterone over a short-term period to minimize weight loss and promote lean mass during periods of caloric deficit that military personnel unavoidably experience during strenuous military training and combat operations.

USARIEM //

USARIEM Embarks on Exploratory Study of Female Elite Warfighters

An exploratory study to classify the defining characteristics of female elite Warfighters, an emerging demographic of females who have been the first in history to successfully graduate from the most physically and mentally challenging training courses in the military. Research findings will help modernize biomedical studies aimed at developing and applying new methods to understand how body composition, fitness, nutrition and exercise influence fuel metabolism and performance in extreme training and operational environments.

USARIEM //

Algorithm Offers World's First Performance Prediction Model

The 2B-Alert Performance Model, now in advanced development, represents the world's only performance prediction model that can directly provide individualized caffeine dosage and timing recommendations. 2B-Alert optimizes the benefits of caffeine: providing caffeine-consumption guidance for multiple sleep-deprivation and shift-work scenarios.

WRAIR, TATRC – BHSAI //

Study Sites Meditation as Option for PTSD Treatment

The research article, "Transcendental Meditation (TM) Study Finds Meditation Non-inferior to Prolonged Exposure Therapy" indicated that Transcendental Meditation is non-inferior to Prolonged Exposure therapy in reducing symptoms of Post Traumatic Stress Disorder (PTSD) and depression. This study's results provide evidence for an effective non-trauma-focused alternative treatment for PTSD, and further comparative effectiveness with the current evidence-based trauma-focused therapy.

MOMRP //

Scientists Uncover MREs Minimal Effects on Gut Health

Scientists found that consuming a Meal, Ready-to-Eat (MRE) diet for 21 days had minimal effects on gut microbiota composition, did not cause gut leakiness or inflammation, and maintained multiple measures of micro-nutrient status. Findings demonstrate that MRE consumption is not the predominant driver of increased gut leakiness and inflammation, or decrements in nutritional status previously observed during military training. The results have supported the development of nutrition interventions that can make the microbiome more resilient, improving performance and lethality during multi-domain operations.

USARIEM //

USAMRDC's Vaccine Efforts Mitigate Infectious Disease Threats Around the World

Developing new vaccines to mitigate infectious disease threats of concern, supporting Soldier medical readiness and the ability of Commanders to calibrate force requirements in the face of disease and non-battle injury casualties. The following human vaccine trials advanced products to combat pervasive infectious diseases that do not have a U.S.-licensed vaccine.

- A. MERS — Successfully completed and published findings from the first-ever clinical trial of a Middle East Respiratory Syndrome (MERS) vaccine and only the third-ever trial of a coronavirus vaccine. These promising results advance this countermeasure forward to licensure. Developed a site in the Middle East for Phase 2 trials where MERS is endemic.

WRAIR //

- B. Malaria — Successfully completed a Phase 2 trial to evaluate two adjuvant combinations of RTS,S in extended dose schedules in the largest controlled human malaria infection (CHMI) trial ever performed worldwide. Results from this trial demonstrated that these regimens provided protection against malaria infection three months after final vaccination.

WRAIR //



USAMRDC CUTTING EDGE SCIENCE AND TECHNOLOGY: SOLDIER READINESS AND LETHALITY

Consortium Study Shows Shifts in Mental Health Standards

The Systems Biology consortium for PTSD published research which shows the potential for a shift in mental health issues toward standards like those used in cardiology or cancer in which lab tests enable accurate diagnoses based on molecular measures instead of on self-reporting or interviews with inherent biases. The article demonstrates why the specific collection methodology is unique and regimented while the data illustrate why these procedures are critical when carrying out sample collection with the purpose of defining underlying molecular signatures.

MOMRP //

TATRC's Mobile Healthcare Delivery System Supports Army Readiness

The Mobile Healthcare Environment (MHCE) was leveraged for its first non-research deployment through a partnership with the Army National Guard. The Guard's request, to provide a secure way for their citizen-soldiers to both monitor their current Combat Deployment Readiness status, as well as submit Part A of a Periodic Health Assessment from their own smartphone, represented the first instantiation of MHCE capabilities on an enterprise .mil server.

TATRC //

New Model Helps Researchers Better Understand Eye Trauma in Combat

The Surrogate Human Eye is an innovative, fluid-filled model intended to mimic the living human eye's bio-mechanical and anatomical properties. The model, which can be instrumented with sensors, is helping Army researchers understand the physics of ocular trauma experienced in combat.

USAARL //

Tester Offers Rapid Assessment of Soldier's Vision

The Glare Tester is an Army-designed product that assesses acuity, contrast sensitivity, target detection, and glare discomfort. The Tester offers a rapid assessment of Soldier vision across multiple lighting and glare conditions for post-surgical screening, return to duty assessment, and other safety-related applications. Currently, Army research is using the Tester to evaluate an individual's ability to detect objects under various lighting conditions.

USAARL //

Unit Conducts Worldwide Surveillance of Disease Threats

The Walter Reed Bio-systematics Unit (WRBU) sequenced whole genomes for three New World Anopheles species using cutting-edge technologies at WRAIR - to date, WRBU has sequenced 160 whole genomes (110 new species). Moreover, three WRAIR/WRBU authors published a one thousand page, two-volume book - entitled "Mosquitoes of the World" - which stands as the only resource of its kind developed within the last 35 years. The WRBU also co-authored an article in the journal Nature showing that blood-fed, malaria vectors can migrate hundreds of kilometers and can spread malaria to areas where infection may have been previously controlled.

WRAIR //

Discovery of 'Super-Bugs' in Wounded Service Members Informs Healthcare Decisions

Through close relationships with Air Force microbiologists at Bagram Air Force Base, researchers were able to identify the presence of high levels of "super-bugs" in wounded Service Members in Afghanistan, leading to increased awareness of this threat throughout the Military Healthcare System (MHS) and the CENTCOM AOR. This real-time surveillance is critical in alerting healthcare providers to emerging threats and ensuring appropriate responses.

WRAIR //

FDA Approves Tafenoquine for the Prevention of Malaria

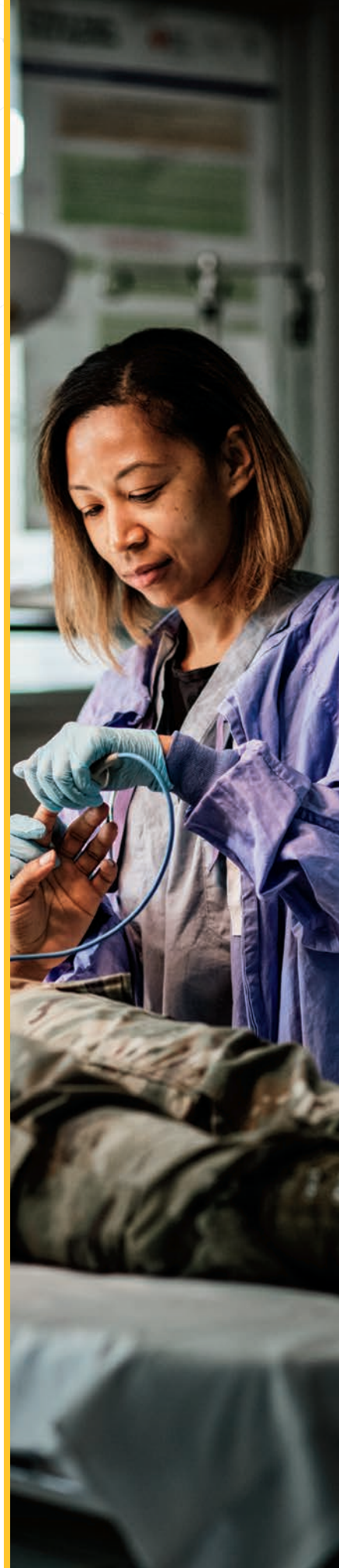
The FDA approved the weekly prophylactic drug Tafenoquine for the prevention of malaria in non-immune adults with normal enzymatic activity. Tafenoquine prevents mission-degrading illness, prolonged convalescence, development of chronic symptoms (recurring fever) in deployed troops, and optimizes performance, ensuring the Warfighter can remain in the fight by providing protection from malaria. No other anti-malarial drug offers the same comprehensive protective coverage.

USAMMDA //

Expandable Foam Waiver Supports Survivability from Battlefield Injury

SECARMY approved the MRDC request for waiver of advanced informed consent for the ResQfoam™ trial. More than 90% of potentially survivable deaths on the battlefield are associated with severe bleeding. ResQFoam™ may provide an option to enable subjects to survive to surgical treatment of their injuries.

ORP //



USAMRDC CUTTING EDGE SCIENCE AND TECHNOLOGY: SOLDIER READINESS AND LETHALITY

BIRCO Leads Nine-Nation NATO Group Dedicated to Blast Injury Solutions

Translating laboratory blast injury research findings into fielded solutions to protect and treat Service Members can be expedited when researchers use the same methods and terminology. The Blast Injury Research Coordinating Office (BIRCO) chaired a nine-nation NATO Task Group to help define Environmental Toxicology of Blast Exposures: Injury Metrics

BIRCO //

Working Group Addresses Blast-Related Threats

To effectively protect Service Members from blast threats in a rapidly changing battlefield environment, we must be able to predict the effect of those threats on the human body. The DOD Working Group on Computational Modeling of Human Lethality, Injury, and Impairment from Blast-related Threats addresses this need. The Working Group is creating a framework of the available computational models capable of predicting the effect of blast on one or more human body systems from across the DOD and other federal agencies. This framework will allow for rapid prototyping and testing of novel protective equipment in a virtual environment, and reduce expensive and time-consuming dynamic testing and evaluation.

BIRCO //

Linking the Human Brain, Bionic Body Parts

Humans can precisely sense the position, speed, and torque of their body parts. This sense is known as proprioception and is essential to human motor control. Proprioception is lost following amputation resulting in significant limitations in control of prosthetic and resulting function/performance. USAMRDC funding has led to the development of the Agonist-Antagonist Myoneural Interface (AMI). The AMI is composed of:

- A. A surgical construct made up of two muscle-tendons—an agonist and an antagonist—surgically connected in series so that contraction of one muscle stretches the other.
- B. A bi-directional efferent-afferent neural control architecture. The AMI preserves the dynamic muscle relationships that exist within native anatomy, thereby allowing proprioceptive signals from mechanoreceptors within both muscles to be communicated to the central nervous system.

CRM RP //

Spotlight on Battlefield Opioid Exposure

Pivotal research was completed to establish a model of opioid intoxication, with an emphasis upon the ultra-potent synthetic opioid carfentanil. The Rapid Opioid Countermeasure System (ROCS) Translational Team and the ROCS Integrated Product Team (IPT) worked with experts to select a 10 mg naloxone auto-injector based on this data.

USAMRICD //

Lab Tapped to Provide Key Threat Analysis

Having successfully completed the Organization for the Prohibition of Chemical Weapons (OPCW) annual biomedical proficiency testing with top marks and meeting other stringent quality requirements, the USAMRICD became an officially recognized Designated Laboratory capable of performing real threat analysis of biomedical samples on behalf of OPCW.

USAMRICD //

Bio-Engineering Breakthrough at Walter Reed

Supported Humacyte for the development of human acellular vessels (HAV) to be used in the stabilization of vascular injuries in both military and civilian personnel. In May of 2019, surgeons at the Uniformed Services University and Walter Reed National Military Medical Center performed the first bio-engineered blood vessel transplant on a military patient.

USAMMDA, CCCRP, CDMRP //

PBF Pays Immediate Dividends

The WRAIR Pilot-Bioproduction Facility (PBF) helped prepare a bacteriophage therapeutic cocktail as an experimental treatment, under an emergency Investigational New Drug, against a multi-drug resistant *P. aeruginosa* infection. The PBF filled 100 vials of *P. aeruginosa* mixture to initially be administered to a patient with a deep *P. aeruginosa* infection in a leg wound that is not responding to antibiotic treatment.

WRAIR //



USAMRDC CUTTING EDGE SCIENCE AND TECHNOLOGY: SOLDIER READINESS AND LETHALITY

Research Leads to New Smallpox Vaccine

Conducted a Phase 3 clinical trial leading to FDA approval of a new smallpox vaccine in 2019. The vaccine will have a direct impact on improving force health protection for U.S. troops required to be immunized against smallpox. Current smallpox research focuses on developing vaccines, drugs and diagnostic tests to protect against the virus should it be used as an agent of bioterrorism. While enhancing the medical readiness of U.S. fighting forces, the new smallpox vaccine also has been selected for inclusion in the Strategic National Stockpile, the nation's largest supply of potentially life-saving pharmaceuticals and medical supplies.

USAMRIID //

Testing Efforts Drive New Ebola Vaccine

An investigational Ebola vaccine known as V920, developed by Merck Research Laboratories and tested by USAMRIID, reached a significant regulatory milestone. The FDA accepted the Biologics License Application and granted priority review for the product, which was evaluated in four pivotal studies to evaluate its protective efficacy.

USAMRIID //

Experimental Ebola Vaccine Hits New Milestone

Research led to an experimental Ebola virus treatment's being recommended for further clinical trials. An independent monitoring board announced that the treatment, mAb114, should be prioritized for future studies based on its success in treating Ebola patients in the Democratic Republic of Congo (DRC). The foundation for this effort was laid by demonstrating that mAb114, an antibody isolated from a human Ebola survivor, protected against Ebola virus infection.

USAMRIID //

Paving the Way for ARS Treatments

Engaged with the University-Affiliated Research Center at the University of Nebraska's National Strategic Research Institute to develop a drug discovery and development pipeline for candidate medical countermeasures (MCMs) to prevent and/or treat Acute Radiation Syndrome (ARS). The effort has focused on 23 candidate MCMs.

RHERP //

Decades of Blast Data Hit Web, Inform the Future

The Historical Blast Bioeffects Research Data Recovery Project has been made available online. This effort allows program managers, researchers, and decision makers to use existing knowledge to address current and future blast injury problems. Applying past lessons learned to current research and product development efforts prevents wasteful duplication of effort and allows the DOD to focus scarce blast injury research resources on other critical knowledge gaps.

BIRCO //

Blast Research Goes International in First-Ever Forum

Organized the first International Forum on Blast Injury Countermeasures (IFBIC) in 2019. At IFBIC 2019, participants shared information about ongoing research efforts, identified knowledge gaps, and facilitated research collaboration to improve prevention, diagnosis, and treatment of blast injuries.

BIRCO //

Boosting Skills, Brainpower with DOD SMARTS

Executed an effort titled "A Modular Set of Mixed Reality Simulators for Blind and Guided Procedures," that produced a suite of five instructor-less skills trainers currently being used both by civilian and military health providers. Simulators include Central Venous Access, Regional Anesthesia, Ventriculostomy, Prostate biopsy, and Chest Tube Insertion models. Overall, more than two thousand residents, fellows, and faculty have been trained using DOD SMARTS.

JPC-1 //

Virtual Technology Finds New Home at MAST

(MAST) Portfolio was successfully established and is comprised of two research areas: Medical Robotic and Autonomous Systems and Virtual Health. MAST will invest in prototype medical robotics, machine learning and artificial intelligence algorithms, manned-unmanned teaming solutions, and digital health concepts that will enable development of intelligent data driven, autonomous and virtual health capabilities.

JPC-1 //

