

NATIONAL STRATEGIC RESEARCH INSTITUTE

ANNUAL REPORT 2014



**NATIONAL STRATEGIC
RESEARCH INSTITUTE**
at the University of Nebraska

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Who We Are

The National Strategic Research Institute (NSRI) at the University of Nebraska provides mission-essential research and development capabilities in five distinct core competencies:

- Nuclear detection and forensics
- Detection of chemical and biological weapons
- Passive defense against weapons of mass destruction
- Consequence management
- Space, cyber and telecommunications law

An NSRI partnership with United States Strategic Command (USSTRATCOM) and the Department of Defense aims to ensure the United States' safety and preparedness in response to threats to national security.

Our Vision

To be the lead Combating Weapons of Mass Destruction (CWMD) Research Institute, delivering relevant and timely research solutions directly impacting Department of Defense (DoD) operations and our national security.

On the cover: Dr. Donald Umstadter, Extreme Light Laboratory, University of Nebraska–Lincoln

National Strategic Research Institute
984238 Nebraska Medical Center
Omaha, NE 68198-4238
nsri.nebraska.edu

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Our Logo

The National Strategic Research Institute is the only University Affiliated Research Center (UARC) dedicated to deliver research solutions for Combating Weapons of Mass Destruction to USSTRATCOM, the Department of Defense and the nation.

Our logo highlights our identity, showing the strength and leadership NSRI provides in CWMD research and nodding to the military nature of the work. The five point stars in the design are a visual reminder of our five core competencies. The stars also denote the excellent work we do, exemplify the military nature of the Institute, and are a patriotic tribute to our nation.

The hidden star creates a sense of discovery, engaging the viewer and paralleling the research NSRI conducts—research that discovers answers that solve CWMD problems.





From The Executive Director

This National Strategic Research Institute (NSRI) Annual Report details the accomplishments of the faculty, staff, and researchers of the NSRI and University of Nebraska, as well as other partnering universities and industries,

in advancing the science of countering weapons of mass destruction and the threats to our national security. 2014 was another successful year for the NSRI and the University of Nebraska, not only in funding of new research projects, but also in the development of new opportunities and relationships with our Department of Defense (DoD) sponsors.

NSRI stood up in 2012 as the newest of the 13 established University Affiliated Research Centers (UARCs) in the country. Sponsored by United States Strategic Command (USSTRATCOM), NSRI is in its third year of operation. Mr. Steve Callicutt, USSTRATCOM Director for Capability and Resource Integration, best described the reason for creating the organization:

"The United States Strategic Command is charged with combating weapons that present the gravest danger to the American public, namely weapons of mass destruction. From sensing the threat to eliminating the materials, we face a challenge that is multi-dimensional and complex. We recognize this is a long-term problem that will require focused research, analysis, experimentation and testing. To that end, we established the University-Affiliated Research Center (UARC) to build the body of knowledge this Nation will need to maintain security both at home and abroad."

Our established core competencies reflect very real mission areas of concern for USSTRATCOM and other federal agencies with assigned roles and responsibilities for addressing significant national security requirements to combat weapons of mass destruction (CWMD). These include:

- Nuclear detection and forensics
- Detection of chemical and biological weapons
- Medical passive defense against weapons of mass destruction
- Consequence management
- Space, cyber and telecommunications law

Our NSRI vision is to be the lead institute combating weapons of mass destruction research delivering relevant and timely research solutions directly impacting Department of Defense operations and our national security.

Our NSRI strategy is to:

- Conduct required research to address CWMD mission gaps
- Anticipate emerging/unexpected CWMD threats and through NSRI, rapidly respond with focused, collaborative concepts and capabilities
- Leverage the NSRI UARC sole source contract to expedite required CWMD research
- Exploit University of Nebraska capabilities and its ability to collaborate with other universities to deliver effective research solutions
- Deliver potential "game changing" solutions to the toughest CWMD mission problems and requirements

I am very pleased at the progress the NSRI has made to date, but our journey is still long. We have repeatedly proven we can deliver first class results on every task order and as a result, we have been given numerous follow-on tasks. We continue to strengthen our partnerships with USSTRATCOM and other Federal Agency sponsors through the successful completion of tasks within our defined core competencies. We continue to add key personnel to the NSRI staff to advance our pursuit of required CWMD research projects and support of our sponsors. Additionally, we have diligently expanded our communications, marketing and brand initiatives to promote the broad range of experienced faculty, major capabilities represented across the University of Nebraska, and the partnerships established with other universities and industry -- (Look for our new website in early 2015 to broaden our outreach to our partners and sponsors at nsri.nebraska.edu). We have completed two successful years as the newest UARC, but we are now in a transition year where we must continue to demonstrate and expand our leadership to tackle some of the toughest CWMD challenges. I'm confident we are committed, capable and ready to meet and exceed every expectation.

Robert C. Hinson, Lt Gen, USAF (Ret)
Executive Director, NSRI

NSRI Research

As of September 30, 2014, the NSRI successfully completed 15 projects while currently performing research for 18 projects. The NSRI does not receive any appropriated funding by the DoD or USSTRATCOM, therefore we rely completely on task order contracts generated through our sole-source, Indefinite Delivery Indefinite Quantity contract with USSTRATCOM and other contracts and grants. The NSRI continues to demonstrate its value to the nation as evidenced by the research supported by USSTRATCOM, other DoD agencies and the Department of Homeland Security.

Research Core Competencies



Nuclear Detection and Forensics



Detection of Chemical and Biological Weapons



Medical Passive Defense Against Weapons of Mass Destruction



Consequence Management



Space, Cyber and Telecommunications Law

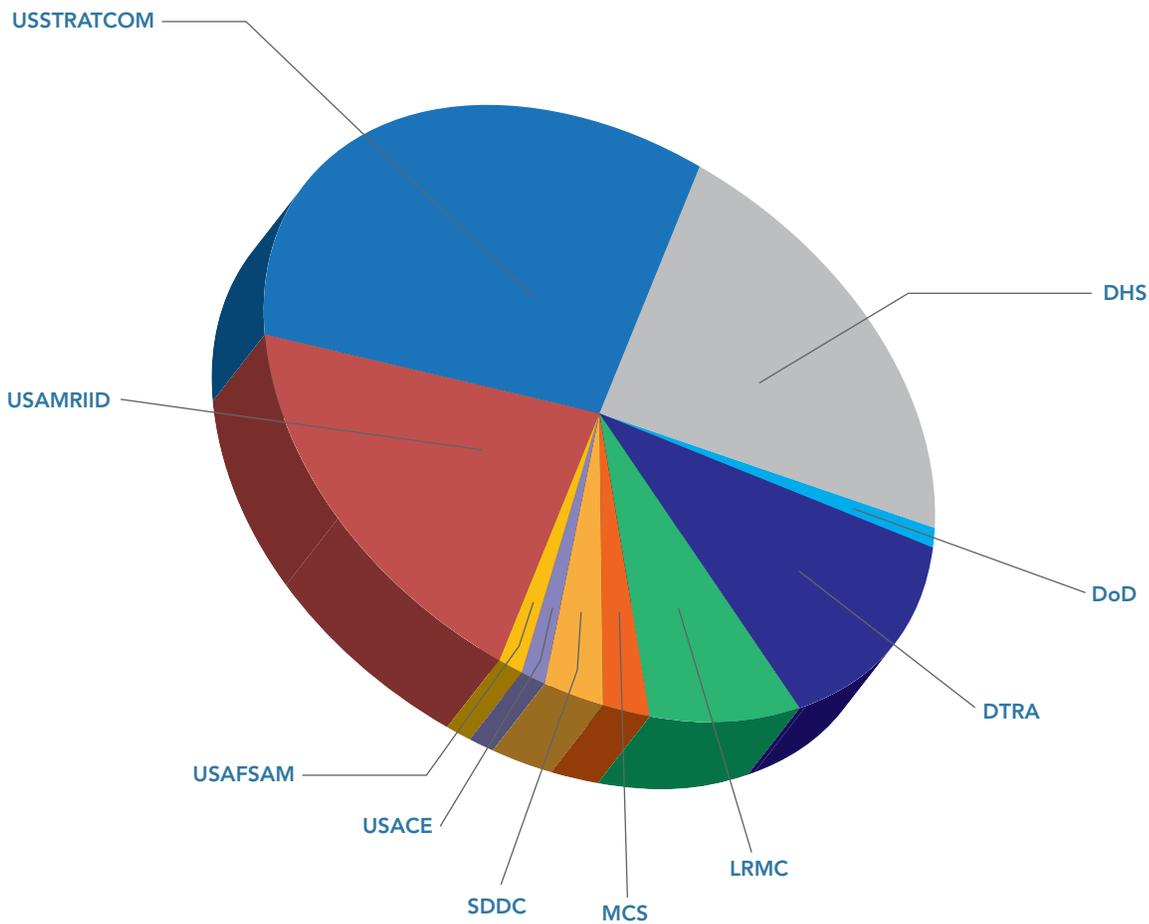


The Jack & Stephanie Koraleski Commerce and Applied Behavioral Laboratory is a state-of-the-art biometric facility housing physical and neuro-physiological feedback technology. University of Nebraska Omaha

Summary of Activity by Core Competency Research Area 2012-2014

Core Competency Research Area	No. of Projects	Funding
Nuclear Detection and Forensics	3	27%
Detection of Chemical and Biological Weapons	7	24%
Medical Passive Defense Against Weapons of Mass Destruction	5	26%
Consequence Management	18	23%

Award by Customer 2012-2014



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Post-Nuclear Detonation Debris Forensics

Principal Investigator: Dr. Donald Umstadter

Nuclear forensics can greatly benefit from the development of new methods for efficient identification of trace amounts of material, with a device that is capable of remote operation and field-deployment, as well as one that poses reduced radiological hazard to operators. Narrow-band and tunable high-energy x-rays have the unique potential to efficiently and selectively activate specific nuclei of interest, via excitation of the giant dipole resonance, and can do so without activating the accompanying refractory materials. Until recently, however, the only facilities capable of generating such x-rays were the size of a football field and consequently could only be operated at a fixed location. The objective of this project is to provide a laboratory demonstration of a capability to use an x-ray source with photo-nuclear activation for sensitive and efficient identification of actinides, with elemental and isotopic sensitivities that are relevant to nuclear forensics.



Risk Analysis of Extended Nuclear Deterrence

Principal Investigator: Dr. Rupal Mehta

Rising tensions in East Asia, Eastern Europe, and the Middle East have sparked concerns about the ability of the United States to maintain, uphold, and potentially extend its commitments in deterring foreign aggression against its allies. For U.S. extended deterrence to operate, however, allies seeking protection under the U.S. nuclear security umbrella must confer some degree of military decision-making and tactical operations to the United States to ensure a consistent and focused deterrence strategy. The objective of this effort is to better understand the risk to the United States in maintaining and/or extending nuclear security guarantees to U.S. allies in East Asia and the Middle East in light of increasing threats from regional and global adversaries. This project will examine whether extended nuclear deterrent commitments can influence allies under the U.S. nuclear umbrella to become more revisionist and aggressive, thereby increasing the risk of war rather than deterring it.



Low-Dose Radiographic System — Low-dose Radiographic System Based on a Novel, Narrowband, Tunable, Multi-MeV X-ray Source

Principal Investigator: Dr. Donald Umstadter

A critical need exists for the design, development, and demonstration of a novel radiographic system capable of rapidly and safely scanning the contents of shielded containers with the lowest possible dose. During this project the objective is to design, develop, and demonstrate a novel low-dose radiographic imaging system for rapidly scanning the contents of shielded containers.



◀ *The Extreme Light Laboratory houses the Diocles laser which is putting our research at the forefront of international high field physics and laser research. University of Nebraska–Lincoln*



Nanogel-based Bio-agent Sensing System

Principal Investigator: Dr. Serguei Vinogradov

The DoD is developing biological point and standoff detection in order to provide rapid and accurate warning to troops. Point and standoff detectors have different abilities to determine whether a plume contains a biological warfare agent (BWA). The objective of this research is to provide novel, confirmatory analysis which could contribute to the advancement of the overall standoff detection of BWAs.



Microbial Field Forensics

Principal Investigator: Dr. Jeyamkondan Subbiah

Foodborne illness outbreaks occur in the United States with an annual frequency of approximately 76 million events (individuals, reported/diagnosed illnesses), 300,000 hospitalizations and 5,000 deaths each year. Standard food safety and epidemiological technical and investigative methods are used to determine origin and locations, source, etiologic agent, effects and impacts in order to inform public health response, outbreak management, recovery, and subsequent mitigation and prevention. The scope of the project is to provide an all-inclusive assessment that will serve as a baseline for roles and capabilities in responding to an outbreak of foodborne illness affecting DoD or Department of State personnel at outside continental U.S. (OCONUS) locations.



BioSurveillance Baseline Assessment Support

Principal Investigator: Mr. Anthony Sambol

DoD seeks a robust biosurveillance capability to address all hazards threats encountered as weapons of mass destruction, naturally-occurring biological events and emerging infectious diseases. The objective of the project is a fundamental assessment of non- federal biosurveillance stakeholders' lines of communication, policies, roles, processes and capabilities, as it pertains to DoD entities. Additionally, the research will provide an assessment of preventing, preparing for and responding to a biological incident, naturally occurring or intentional, of concern to the DOD. This assessment will be used to assimilate into an overall government/ global assessment of DoD's BSV lines of communication.





***Francisella tularensis* Differentiation Assays**

Principal Investigator: Dr. Marilyn Larson

Tularemia is a zoonotic disease caused by the facultative intracellular pathogen *Francisella tularensis*, and can be easily disseminated with a lethal dose as few as 10 organisms, thus making it a potential bioweapon able to cause major health impact. While appropriate medical management is key for all exposures, rapid subspecies identification is imperative to ensure that respiratory protection is considered when appropriate; however, this capability is currently lacking. Each aim within this project will independently be capable of identifying and subspeciating *F. tularensis* to guide appropriate PH/FHP/medical response, and the progression of the aims also forms a spectrum of increasing capabilities likely scalable and adaptable to meet “Next Generation” requirements.



Bio-agent Sensing System Integration

Principal Investigator: Dr. Serguei Vinogradov

The DoD is continually improving biological point and standoff detection in order to provide warning to troops that is as soon and as accurate as feasible. Biological point and standoff detection can be used to warn of a possible tactical use of a Biological Warfare Agent by either a State or Non-state actor. Point and standoff detectors have different abilities to determine if there is a biological threat. Biological detection can also be used to avoid or mitigate an epidemiological outbreak. The specific aim of this project is to explore the potential for synergy in commercial off the shelf systems as well as mature systems and accessories not yet available commercially (i.e., still considered in research phase).



◀ *U.S. Marines put their gas masks on for a simulated chemical attack during a training mission. (Photo Courtesy: U.S. Marine Corps/ Sgt. Andrew D. Pendracki)*



Screening for BoNT/A Inhibitors Using the BoTest® A/E BoNT Detection Assay

Principal Investigator: Dr. Kenneth Bayles

Small molecule countermeasures against Botulinum Toxin Serotype A have featured a two pronged chemistry strategy: structure-based drug discovery and pharmacophore modeling. The primary objective of this research is to identify novel chemical scaffolds with BoNT/A inhibitory activity that are suitable for the initiation of active chemistry designed to improve the potency, selectivity, and ADME (absorption, distribution, metabolism, and excretion) properties of hit compounds.



Filovirus Vaccine Adjuvant Formulations

Principal Investigator: Dr. James Talmadge

The potential for the development of weaponized filoviruses makes the development of medical countermeasures (MCMs) against this viral pathogen a DoD priority. No licensed, safe, and effective vaccine is available to prevent acute hemorrhagic fever disease caused by filoviruses. The objective of this project is to design, execute, and report developmental and analysis studies to optimize alum-adsorbed filovirus VLPs.



Manufacture of Recombinant Ricin Vaccine

Principal Investigator: Dr. Wallace Buchholz

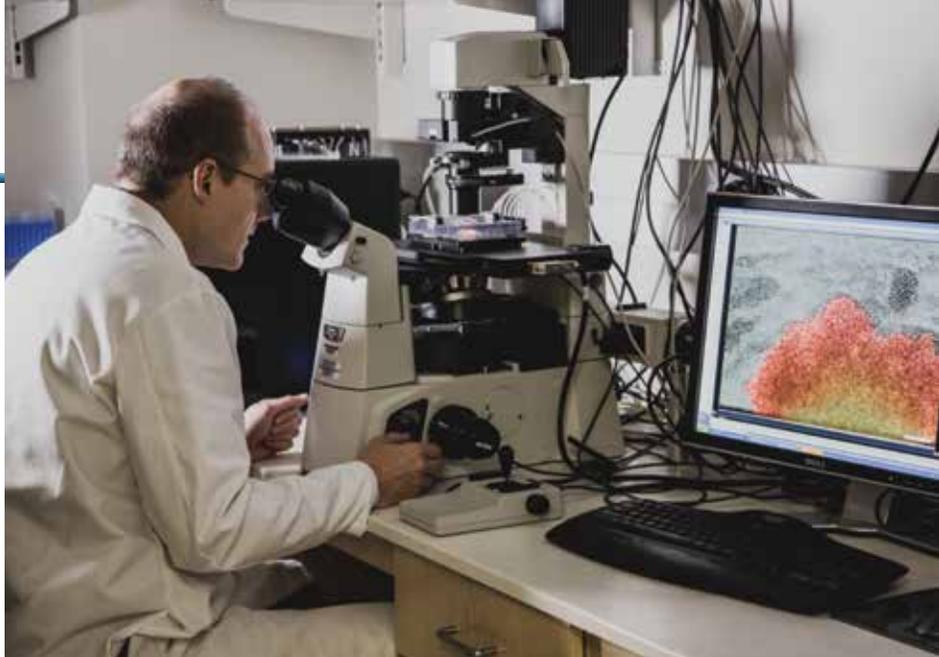
The United States Army Medical Research Institute of Infectious Diseases (USAMRIID) has been engaged in the research and development of a ricin vaccine since the late 1980s. Early attempts at developing a ricin vaccine resulted in the production of a ricin toxoid, in which formalin was used to inactivate the toxin, and a chemically deglycosylated ricin A subunit was used as a second-generation vaccine candidate. Further efforts have led to a third-generation vaccine candidate using recombinant DNA technology, recombinant ricin A-chain toxin (rRTA1-33/44-198) vaccine, RVEc™ Vaccine. The objectives of this research are to test and evaluate the manufacturing processes for a third-generation recombinant ricin A-chain toxin vaccine in support of USAMRIID nonclinical and clinical studies.



Medical Countermeasures Against Nerve Agents

Principal Investigator: Dr. Steven Hinrichs

A critical need exists for field deployable measures to protect military personnel and civilians from nerve agent. Human butyrylcholinesterase (hBChE) is capable of providing protection from lethal doses of nerve agents. The objective of this research is to develop an hBChE formulation that can be injected intramuscularly (IM) and protect against a 2 LD₅₀ of nerve agent. The requirement for the nerve agent bioscavenger will be for a high dose formulation more than four times what is currently available in a form that is stable for prolonged periods under defined conditions.



▲ Dr. Ken Bayles in the Center for Staphylococcal Research utilizes the BioFlux *in vivo* microscopic imaging system which allows NSRI researchers to accurately study pathogenic bacterial behavior and metabolism under flow conditions. University of Nebraska Medical Center, Omaha



Research Initiative for Next-Generation Anthrax Vaccine

Principal Investigator: Dr. Ken Bayles

The current anthrax vaccine (Biothrax) is produced by generating lysates of *Bacillus anthracis* cells and performing a crude purification of the protective antigen present. This vaccine is far from ideal due to its inability to produce high titers of protective antibodies, the requirement for multiple boosters, and the high incidences of adverse reactions to the vaccine. Although much has been invested in the production and use of recombinant PA (rPA) to replace the Biothrax vaccine, animal studies indicate that rPA is not as protective as Biothrax, strongly suggesting that other components within the Biothrax formulation act synergistically to enhance immunoprotection against anthrax infection. The objective of this research is to identify these factors responsible for enhancing the efficacy of rPA and provide an advanced, next generation anthrax vaccine for the protection of persons against both weapon grade and occupational exposure to anthrax. Ultimately, these studies will lay the groundwork for the development of a next-generation anthrax vaccine formulation that will have both improved efficacy and safety, as well as a reduced frequency of scheduled administration required to maintain efficacy.



Development and Assessment of Narrative and Counter-Narrative within a Deterrence Framework

Principal Investigators: Dr. Mario Scalora, Dr. Gina Ligon

Deterrence and assurance strategies involve a complex coordination of communication and military strategies. Recent research has begun to look at decision making strategies for the appraisal of adversarial activity. Drawing on perspectives on persuasive narrative offered by narratology, psychology, marketing, and military influence operations, this project will summarize the relevant research on the psychological and behavioral effects of narratives and counter-narratives on behavior and apply it to relevant deterrence frameworks. This project will also draw upon relevant literature addressing leadership and decision-making characteristics pertinent to communication strategies and problem solving style. Particular efforts will focus upon definition or relevant narrative and counter-narrative components (e.g., relevant contextually, resonate emotionally, consistent) as well as modeling narratives in a manner that would be useful for development of a counter narrative to assist with deterrence planning. Further attention will focus upon the delineation of metrics to assess the impact of such narrative and counter-narrative development.

*Durham Research Center at
the University of Nebraska
Medical Center, Omaha*





Assessing USSTRATCOM Critical Needs

Principal Investigator: Mr. Marc Warburton

The Department of Defense’s Unified Command Plan identifies USSTRATCOM as the combatant command responsible for, among other things, operations in space and cyberspace, synchronizing plans for combating weapons of mass destruction, and advocating for capabilities. The objective of this project is to evaluate and assess the Command’s mission areas to determine current capability gaps regarding Combating Weapons of Mass Destruction and Space and Cyber Policies.



Expansion of a Multi-Disciplinary, Joint-Service Advanced Telemedicine Service for Military Medical Care in Deployed Regions

Principal Investigator: Dr. Benjamin Boedeker



▲ *Airmen in Mission-Oriented Protective Posture Level 4 prepare to transport an exercise victim to a medical facility. (Photo Courtesy: U.S. Air Force/ Airman 1st Class Matthew Flynn)*

In the event of an attack using a weapon of mass destruction or in response to a natural disaster, there is an immediate shortage of medical personnel and support. Telemedicine can help overcome many of those issues by projecting the full spectrum of medical care into multiple locations without the delays inherent in transporting a physician to each location. This project will validate that concept and create a model for such tele specialty care by establishing 3 telemedicine clinics in Africa and Afghanistan. Distant primary care personnel (medics, nurses and primary care physicians) will be trained in the use of various endoscopic instruments, airway management and basic telemedicine examination devices. Tele Ear Nose Throat, Intensive Care Unit, Pain management, infectious disease and Internal Medicine specialists will conduct tele clinics at

the remote sites. Capabilities that will be validated with this project include virtual infectious disease reach to facilitate rapid diagnosis and treatment of bioweapons attack, airway management for a nerve agent strike and general ICU support for a nuclear weapon attack.



Creation of a Pilot Tele Preoperative Medicine Clinic at Landstuhl Regional Medical Center (LRMC)

Principal Investigator: Dr. Benjamin Boedeker

In the event of an attack using a weapon of mass destruction there is a high probability that the normal medical response infrastructure will be destroyed or severely degraded. In a military scenario, an attack using a weapon of mass destruction will dramatically increase the number of casualties while putting the providers at risk of becoming casualties themselves. The introduction of the concept of a telemedicine triage and preoperative evaluation will allow the coordination of scarce resources in sites that are remote from the disaster or area of contamination. The objective of this project will be to create a virtual tele preoperative clinic at LRMC as a model for support for perioperative care during catastrophic events such as attacks with weapons of mass destruction, large conventional attacks within populated areas and the results of natural disasters. Various methods of telecommunication connectivity will be tested, validated and the best method selected.



Decision Support Capabilities for National Leadership

Principal Investigator: Dr. Doug Derrick

Current Cold War systems, to include conferencing and warning systems, do not utilize modern information processing and display capabilities for delivering decision-quality information to senior leaders. This capability would enable more rapid situational understanding and provide additional time for Course of Action development, risk assessment and decision making for mitigating the impact of potential hostile enemy actions and man-made and natural disasters. The objective of this project is to conduct technical discussions and research activities as directed by USSTRATCOM to pursue an independent academic/professional-based assessment of data integration capabilities to support decision-making and assess risks during National leadership decision making.



Traffic Calming Elements for Entry Control Facility Threat Delay and Containment

Principal Investigator: Dr. Laurence Rilett

United States military installations at home and abroad have been required to implement additional security measures to protect military and civilian personnel from ever-present terrorist threats. To focus on threat containment, DoD started the process to upgrade all entryways using both passive and active barriers. It has since become evident that many of the installed active vehicle barriers within entry control facilities (ECF) fail to provide enough reaction time for force protection guards to contain a threat vehicle. The scope of this task order is to perform and document physical tests and simulations on different types of traffic calming elements and determine their effectiveness in delaying and/or debilitating a threat vehicle within the ECF containment area. The objective is to provide force protection authorities operating the ECF the ability to immediately use the results of these tests to develop policies and preferred practices to increase the amount of reaction time available to ensure the threat vehicle does not penetrate installation perimeters.



Convergence of CyberSpace and CWMD Pathways (Phase I and Phase II)

Principal Investigator: Dr. Gina Ligon

The scope of this two phase project is to provide a study that will serve as a baseline understanding of an adversary's use of cyber assets to proliferate and employ WMD materials, technology, and expertise. WMD as a weapon may cause massive destruction or kill large numbers of people. Similarly, the use of cyber assets may cause disruption to critical infrastructure with economic and socio-political implications. The objective of this task is to provide an analytical study that addresses not only the nexus between Non-State Actors (i.e., Violent Extremist Organizations/ VEOs) in the proliferation of WMD but also consequences and response capabilities of a simultaneous WMD cyberterrorism attack on national instruments of power.



Command and Control Facility (C2F) Capabilities Assessment

Principal Investigator: Mr. James Taylor

USSTRATCOM and Control (C2) Facility Program Management Office (PMO) is charged to lead and manage integration of the USSTRATCOM C2 Facility Military Construction (MILCON) with Command, Control, Computer, and Communications, Intelligence (C4I) Systems and Information Technology (IT) infrastructure, and ensure a smooth transition from the current USSTRATCOM LeMay complex to the USSTRATCOM C2 Facility (C2F) with minimal mission impact. A modernized C2 enterprise within the C2F shall increase efficiencies and leverage capabilities for all mission areas, as well as reduce IT replacement and maintenance costs and provide expansion for potential future missions. The purpose of this project is to enhance the effectiveness of the USSTRATCOM C2F, potentially resulting in faster and more effective senior leader communications and decisions.



“Setting the Stage”— Strategies for Priming an Adversary During a CWMD Deterrence Strategy

Principal Investigator: Dr. Mario Scalora

Deterrence strategies relevant to weapons of mass destruction involve a complex coordination of communication, military, and diplomatic strategies. Underpinning such strategies are facts and assumptions about the adversary, including if and how they receive deterrence messages, whether they understand them given their cultural and behavioral characteristics, and whether they believe the messages in the context of the scenario, actors, and relevant history. This project will provide USSTRATCOM WMD deterrence planners with a comprehensive review of the relevant behavioral and decision-making literature relevant to the heuristics and related activity to assess proactive strategies for setting the stage or “priming” the adversary regarding the acceptance and response to strategic interactions.



USSTRATCOM Strategic Leaders Fellows Program I & II

Principal Investigator: Dr. Gina Ligon

The USSTRATCOM Strategic Leaders Fellows Program is a graduate-level, professional education program that targets command-specific needs which includes countering Chemical, Biological, Radiological, and Nuclear (CBRN) weapons, and national and international cyberspace law. The objective of the program is to educate a STRATCOM civilian workforce capable of synthesizing diverse issues of national security in order to effectively plan, synchronize, and advocate for global operations and capabilities.

Admiral Cecil D. Haney, Commander for the United States Strategic Command, addressing students of the USSTRATCOM Strategic Leaders Fellows Program. (Photo Courtesy: The University of Nebraska Omaha)



Tele Spine and Neurosurgery (Virtual Spine Consult): A Model for Access to Care Across the European Regional Medical Command

Principal Investigator: Dr. Benjamin Boedeker

In the event of an attack using a weapon of mass destruction or in response to a natural disaster, there is an immediate shortage of medical personnel and support. The logistics of responding with the right level of medical support to the region is time consuming, costly, and creates operational risk. The operative and non-operative standard of care for treating spinal disease or injury can differ substantially overseas and at deployed locations and may render the spine more vulnerable to injury. Virtual spine consultation via telemedicine is the most effective means for extending the opportunity to receive spine consultation and treatment at the highest standard of care in a critical consequence management scenario. This project will evaluate telemedicine capabilities that impact medical response to natural disasters and large mass casualty events in rural and urban environments. The research will inform best practices and guide creation of telemedicine capabilities which can be expanded worldwide for DoD improving cost effectiveness, quality of medical care, and patient satisfaction.



Intelligence Support to Deterrence Operations

Principal Investigators: Dr. Gina Ligon, Dr. Mario Scalora

The objectives of this research are to examine indicators and markers of State-Level Leader behavior and create a behavioral model. In an intelligence lexicon, indicators are activity based information sets that fuse observable and collectable data within the context of a conflict, region, or other contested environment in order to inform command decision making. The set of indicators forming the behavioral model will serve as a baseline for intelligence planning, to include collection strategies and intelligence analysis tradecraft.



Teledermatology: Developing Methods to Provide Virtual Theater, Far Forward Medical Care and Provide Soft Power Projection Through Medical Partnering

Principal Investigator: Dr. Benjamin Boedeker

In the event of a mass casualty event from conventional warfare, burn injuries are a significant proportion of the injuries. For chemical and biological weapon attacks, dermatology pathology is either the primary method of injury (such as a vesicant like mustard agent) or useful in diagnosis due to the skin being involved (ie. smallpox). The objective of this project is to assist in the research and development of a Tele Dermatology Consult Clinic which will support the LPMC patient catchment area in deployed areas of responsibility and improve medical response to catastrophic events to include the use of weapons of mass destruction.



Developing Perioperative Telementoring Capability to Support Deployed Telemedicine and Sustainment Training in Support of a Multi-Disciplinary, Joint-Service Advanced Telemedicine Service for Military Medical Care in Deployed Regions

Principal Investigator: Dr. Benjamin Boedeker

To accomplish telemedicine care of patients in a WMD scenario, basic airway management skills and early perioperative support must be provided. This project will validate a method to provide sustainment training to continually upgrade skills for deployed medical providers in accomplishing these life-saving tasks. This project expands upon the objectives/scope of previous task orders to develop, demonstrate and validate a perioperative mentoring capability to be used in deployed locations in the United States Africa Command (AFRICOM) area of responsibility. This research will focus on telehealth-assisted medical care including intraoperative surgical protocol management, tele cystoscopy, tele bronchoscopy and tele video intubation.



Vehicular Threat Delay Calculator

Principal Investigator: Dr. Laurence Rilett

United States military installations at home and abroad have been required to implement security measures to protect military and civilian personnel from ever-present terrorist threats. To focus on threat containment, DoD started the process to upgrade all entryways using both passive and active barriers. The objective/scope of this project is to validate the U.S. Army Corps of Engineers Protective Design Center's defined theoretical approach to the threat delay calculation process and design & develop a vehicular threat delay calculator.

NSRI Researchers

Discovery through innovative research is critical to answering the CWMD challenges faced by USSTRATCOM, DoD and other federal agencies. NSRI researchers bring diverse views, ideas, and world-renowned expertise in solving some of our nation's most pressing CWMD problems. Our researchers are formulating vaccines against biological threats such as Ebola and anthrax, investigating terrorist organizations' strategic management and communications, identifying novel treatments for exposure to neurotoxins, and developing diverse tele-health solutions for our armed forces. These are just a few of the challenges our researchers have addressed. It is these individuals who drive the success of NSRI and who work diligently to deliver solutions for our national security.

▼ *Biological Process Development Facility (BPDF).
University of Nebraska–Lincoln*



Nuclear Detection and Forensics

Donald P. Umstadter, Ph.D. completed his doctorate in physics at UCLA and a post-doctoral fellowship at AT&T Bell Laboratories. He is currently the Leland and Dorothy Olson Professor of Physics at the University of Nebraska–Lincoln. He founded and directs the Extreme Light Laboratory, where he is pioneering the science, technology, and applications of extreme light with the petawatt-peak-power Diocles laser.



Projects

- Post-Nuclear Detonation Debris Forensics
- Low-Dose Radiographic System — Low-dose Radiographic System Based on a Novel, Narrowband, Tunable, Multi-MeV X-ray Source



Rupal N. Mehta, Ph.D. is the Stanton Nuclear Security Postdoctoral Fellow in the Belfer Center's International Security Program and Project on Managing the Atom. She is an Assistant Professor in the Department of Political Science at the University of Nebraska–Lincoln. Dr. Mehta's research interests lie in international security and conflict, with a specialization in nuclear security, nonproliferation, force structure, and deterrence theory, and her book project explores the conditions under which states that have started nuclear weapons programs stop their pursuit.

Projects

- Risk Analysis of Extended Nuclear Deterrence

Detection of Chemical and Biological Weapons

Steven H. Hinrichs, M.D. is the Stokes-Shackleford Professor and Chair of the Department of Pathology and Microbiology at the University of Nebraska Medical Center. He was the founding director of the university-wide Center for Biosecurity and was responsible for developing a statewide laboratory system for detection and response to high risk organisms.



Projects

- Medical Countermeasures Against Nerve Agents



Marilynn A. Larson, M.Sc., Ph.D. is an assistant professor and principal investigator in the Department of Pathology and Microbiology at the National Strategic Research Center-University of Nebraska Medical Center.

Projects

- *Francisella tularensis* Differentiation Assays

Serguei Vinogradov, Ph.D. graduated from Moscow State University in the former USSR. He came to the University of Nebraska Medical Center in 1996 as a research faculty and is now a full professor. His experience is in the area of oligonucleotide chemistry, nucleotide diagnostics, and antisense technology and of research on the development of innovative drug molecules, drug delivery systems, and nanomedicine.



Projects

- Nanogel-based Bio-agent Sensing System
- Bio-agent Sensing System Integration



Jayamkondon Subbiah, Ph.D. is a Kenneth E. Morrison Distinguished Professor of Food Engineering at the University of Nebraska–Lincoln. He has joint appointments in the Department of Biological Systems Engineering and Food Science and Technology.

Projects

- Microbial Field Forensics

Tony Sambol is an assistant professor at the University of Nebraska Medical Center. He serves as an assistant director of the Nebraska Public Health Laboratory, and is the Manager of the NPHL's Special Pathogens & Biosecurity Laboratory sections.



Projects

- BioSurveillance Baseline Assessment Support

*Biosafety Level 3 (BSL-3)
Containment Facility.
University of Nebraska
Medical Center, Omaha*



Medical Passive Defense against Weapons of Mass Destruction



Kenneth W. Bayles, Ph.D. received his doctorate in bacterial genetics at Kansas State University, and performed post-doctoral studies at the University of Maryland. His research is in the area of next generation anthrax vaccine.

Projects

- Research Initiative for Next-Generation Anthrax Vaccine
- Screening for BoNT/A inhibitors using the BoTest® A/E BoNT Detection Assay



James E. Talmadge, Ph.D. obtained his M.S. and doctorate degrees at Washington State University in bacteriology and veterinary pathology respectively. Initially, he worked at NCI-Frederick Cancer Research Facility and SmithKline Beecham before moving to UNMC.

Projects

- Filovirus Vaccine Adjuvant Formulations

Wallace Buchholz, Ph.D. is a Professor and Director of the Biological Process Development Facility at the University of Nebraska–Lincoln. Before joining UNL, he served as the Microbiology Program Manager at the Army Research Office from 2007-2013.

Projects

- Manufacture of Recombinant Ricin Vaccine



◀ Biocontainment Unit.
University of Nebraska
Medical Center, Omaha



Mario Scalora, Ph.D. is a professor of psychology at the University of Nebraska–Lincoln. He leads the Targeted Violence Research Team who collaborates with a range of mental health and law enforcement professionals to 1) research relevant risk factors for targeted violence and 2) devise prevention strategies that can be applied in real-world settings. His team investigates targeted violence across various types and settings. Types of violence include sexual assault, stalking, threatening behaviors, and extremist activity. The settings in which they study these behaviors involve government institutions, the workplace, college campuses, and the community at large.

Projects

- “Setting the Stage”—Strategies for Priming an Adversary During a CWMD Deterrence Strategy
- Development and Assessment of Narrative and Counter-Narrative within a Deterrence Framework



Douglas C. Derrick, Ph.D. is an assistant professor of IT Innovation at the University of Nebraska Omaha. Dr. Derrick is the head researcher of the Applied Innovation Laboratory in the School of Interdisciplinary Informatics. The lab is funded through government and private research projects as well as businesses funded projects. Dr. Derrick’s research interests include: artificially-intelligent, adaptive agents in the areas of human-agent interaction in security tasks, human-agent collaboration in decision making, automated deception detection, automated interrogation/interviewing, and automated sensor monitoring/ data mining of human interactions.

Projects

- Decision Support Capabilities for National Leadership

Gina Ligon, Ph.D. is an assistant professor of management at the University of Nebraska Omaha and serves as the director of research and development in the Center of Collaboration Science and a co-director of the Commerce and Applied Behavior Lab in the College of Business. Dr. Ligon researches both productive and destructive forms of collaboration among individuals. Under this umbrella, she is particularly interested in developing leaders to manage creative individuals and teams, unconventional leadership, the performance and markers of violent ideological groups, organizational innovation, leadership assessment, and succession planning.



Projects

- Convergence of CyberSpace and CWMD Pathways (Phase I)
- Convergence of CyberSpace and CWMD Pathways (Phase II)
- USSTRATCOM Strategic Leaders Fellows Program - I (2013)
- USSTRATCOM Strategic Leaders Fellows Program - II (2014)
- Intelligence Support to Deterrence Operations

James Taylor, M.S.E.E., Lt Col (Ret.) USAF, is the research coordinator for the University of Nebraska's Peter Kiewit Institute, director of the PKI Advanced Computer Visualization and Modeling Laboratories, and lead for PKI's entrepreneurial activities.



Projects

- Command and Control Facility Capabilities Assessment



Laurence R. Rilett, Ph.D. P.E. a Distinguished Professor of Civil Engineering at the University of Nebraska–Lincoln. He also serves as the Director of the UNL Mid-America Transportation Center, which is the U.S. Department of Transportation Region VII University Transportation Center, and the Nebraska Transportation Center, which is the umbrella organization for all transportation research at the University of Nebraska. Dr. Rilett's research interests include: multimodal transportation systems analysis, transportation planning and operations, dynamic network modeling and optimization, and intelligent transportation systems.

Projects

- Traffic Calming Elements for Entry Control Facility Threat Delay and Containment
- Vehicular Threat Delay Calculator

Ben H. Boedeker, DVM, M.D., PhD, MBA, CPE is the Vice Chair for Research in the Department of Anesthesiology at UNMC.

Projects

- Expansion of a Multi-Disciplinary, Joint-Service Advanced Telemedicine Service for Military Medical Care in Deployed Regions
- Creation of a Pilot Tele Preoperative Medicine Clinic at Landstuhl Regional Medical Center
- Tele Spine and Neurosurgery (Virtual Spine Consult): A Model for Access to Care Across the European Regional Medical Command
- Teledermatology: Developing Methods to Provide Virtual Theater, Far Forward Medical Care and Provide Soft Power Projection Through Medical Partnering
- Developing Perioperative Telementoring Capability to Support Deployed Telemedicine and Sustainment Training in Support of a Multi-Disciplinary, Joint-Service Advanced Telemedicine Service for Military Medical Care in Deployed Regions



NSRI Staff

The NSRI staff and Core Competency Research Coordinators (CCRCs) ensure research excellence, management oversight, and adherence to security and compliance requirements. The Executive Director and NSRI staff are the primary interface to USSTRATCOM, DoD, and other federal agencies, with CCRCs providing research expertise within their assigned NSRI core competency. The NSRI staff is committed to supporting a long-term, trusted agent relationship with DoD and fulfilling the following characteristics in accordance with the DoD UARC management plan:

- Responsiveness to evolving sponsors requirements
- Comprehensive knowledge of sponsors requirements and problems
- Broad access to information, including proprietary data
- Expansive corporate knowledge
- Independence and objectivity
- Quick response capability
- Current operational experience
- Freedom from real and/or perceived conflicts of interest

▼ Mammel Hall, College of Business Administration, Location for USSTRATCOM Strategic Leaders Fellows Program. University of Nebraska Omaha



Director of Contracts

John Tencer serves as the director of contracts for the National Strategic Research Institute. Prior to joining NSRI, he served in the U.S. Navy Supply Corps, retiring at the rank of Commander in October 2012. While serving, he was selected as a member of the Defense Acquisition Corps and earned Defense Acquisition Workforce Improvement Act Level III certification in contracting. He holds an MBA from Georgetown University.



Director of Finance

William M. Lawlor, certified public accountant (CPA), is NSRI's director of finance. Mr. Lawlor currently serves as director of financial compliance and cost analysis at UNMC. He has 25 years of experience in cost analysis, financial compliance, and budget management. He has an active CPA license and has extensive history in finance management and compliance for public, private, and nonprofit entities.

Facility Security Officer

Anna Ravnholdt has been the facility security officer (FSO) for the National Strategic Research Institute since its inception in October 2012. As the FSO, Ravnholdt has overall accountability for design, coordination, oversight, and implementation of NSRI's security programs. Ravnholdt is certified through the Defense Security Service in the FSO Program Management for Possessing Facilities.



Business Development

Christopher G. Warner is the business development director for University of Nebraska's National Strategic Research Institute. He was previously employed by Booz Allen Hamilton Engineering Services LLC, ARINC, and Northrop Grumman following a distinguished career in the U.S. Air Force. He holds a Bachelor of Science degree in physics from the University of Louisiana at Lafayette and earned his masters degree from Embry-Riddle University.

NSRI Staff (Continued)

Director of Research Compliance

Marsha Morien is Interim Director of Research Compliance for the National Strategic Research Institute and the Export Control Compliance Officer for the University of Nebraska Medical Center (UNMC). She holds appointments in Business & Finance and the College of Public Health at UNMC. She was program director for the university-wide Center for Biosecurity. She has been responsible for coordinating projects involving health information exchange and minimally invasive surgical technologies for the CDC, DoD and NASA. She is co-chair of the EHealth Council for the State of Nebraska.



Executive Assistant

Stephanie Smith serves as the Executive Assistant to the Director of NSRI; facilitates coordination for all customer, sponsor, staff, and researcher interactions; reviews, coordinates and formats every NSRI Proposal; and manages the calendar of events for the Director and staff. She directs internal and external connections for research collaboration and work statement development; and manages and documents a master copy of all contracts correspondence related to NSRI Task Orders. Prior to joining NSRI, she served as the Executive Assistant to the Northrop Grumman Corporate Lead Executive in Nebraska.

Core Competency Research Coordinators

Nuclear Detection and Forensics

Kurt Preston, Ph.D. is the Associate Vice Chancellor for Research at the University of Nebraska–Lincoln. He leads faculty development efforts to improve research competitiveness, strategically plans for development of initiatives that draw upon the strengths of the faculty, collaborates with academic departments and colleges, and works to build collaboration between the University of Nebraska–Lincoln and the National Strategic Research Institute.



Detection of Chemical and Biological Weapons

Steven H. Hinrichs, M.D. is the Stokes-Shackelford Professor and Chair of the Department of Pathology and Microbiology at the University of Nebraska Medical Center. He was the founding director of the university-wide Center for Biosecurity and was responsible for developing a statewide laboratory system for detection and response to high risk organisms.

Core Competancy Research Coordinators

Medical Passive Defense against Weapons of Mass Destruction

Kenneth W. Bayles, Ph.D. received his doctorate in bacterial genetics at Kansas State University, and performed post-doctoral studies at the University of Maryland. His NSRI research focuses on the formulation of a next-generation anthrax vaccine and discovery of small molecule inhibitors for botulinum toxin. Dr. Bayles serves as the Associate Vice Chancellor for Basic Research and the Director for Staphylococcal Research at UNMC.



Consequence Management

Ann Fruhling, Ph.D., MBA is a Mutual of Omaha Distinguished Professor of the College of Information Science and Technology and the founding Director of the School of Interdisciplinary Informatics at the University of Nebraska Omaha. Dr. Fruhling's research focuses on evaluating and improving human – computer interaction efficiency and effectiveness. She is the lead author of the "Best Practices in Implementing and Managing Agile Information System Development Processes for Defense Warfighter Operations," IBM for e-government professional series. Since 2002, she has been the principal investigator of an emergency response system and bioterrorism surveillance system for public health laboratories called STATPack™ which is deployed in over 60 health laboratories across the Midwest.

Space, Cyber and Telecommunications Law

Matt Schaefer, J.D. is the chaired Law Alumni Professor of Law at the University of Nebraska–Lincoln College of Law. He teaches in the areas of international, foreign relations, international business, international trade, cyber, and space law. He is director of the space, cyber and telecom law program (since its inception in 2006) and developed the curriculum for the LL.M. program in 2007 and created the online LL.M. in 2012. He is co-chair, American Branch of International Law Association Space Law Committee and member, International Law Association Space Law Committee.



Board of Directors

The NSRI Board of Directors serve in an oversight role and have the authority and responsibility to commit personnel, facilities, and other required resources to support the needs of NSRI in completing projects awarded by USSTRATCOM and other DoD and federal agencies. Board members are appointed with proven leadership and expertise in government, military, industry, and university sectors.

Three board positions are held by the University of Nebraska's chief research officers – Vice Chancellor of Research and Economic Development at the University of Nebraska–Lincoln, Associate Vice Chancellor for Research and Creative Activity at the University of Nebraska Omaha, and Vice Chancellor for Research at the University of Nebraska Medical Center. This ensures the integration of NSRI and NU research strategies in support of the NSRI mission.



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NATIONAL STRATEGIC RESEARCH INSTITUTE
at the University of Nebraska

National Strategic Research Institute
984238 Nebraska Medical Center
Omaha, NE 68198-4238

nsri.nebraska.edu

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