AT THE HEART OF THE MISSION

NDIA

1919 2019

2019 CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR (CBRN) DEFENSE CONFERENCE & EXHIBITION

Modernizing the Future Fight: Accelerate & Adapt

July 23 – 24 | Wilmington, DE | NDIA.org/CBRN


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TABLE OF CONTENTS

WHO WE ARE

The National Defense Industrial Association is the trusted leader in defense and national security associations. As a 501(c)(3) corporate and individual membership association, NDIA engages thoughtful and innovative leaders to exchange ideas, information, and capabilities that lead to the development of the best policies, practices, products, and technologies to ensure the safety and security of our nation. NDIA's membership embodies the full spectrum of corporate, government, academic, and individual stakeholders who form a vigorous, responsive, and collaborative community in support of defense and national security. NDIA is proud to celebrate 100 years in support of our warfighters and national security. The technology used by today's modern warfighter was unimaginable 100 years ago. In 1919, BG Benedict Crowell's vision of a collaborative team working at the intersection of science, industry, government, and defense began what was to become the National Defense Industrial Association. For the past century, NDIA and its predecessor organizations have been at the heart of the mission by dedicating their time, expertise, and energy to ensuring our warfighters have the best training, equipment, and support. For more information, visit **NDIA.org**

JOINT PROGRAM EXECUTIVE OFFICE FOR CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR DEFENSE

The Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense (JPEO-CBRND) is headquartered at Aberdeen Proving Ground, Edgewood Area, and manages our nation's investments in chemical, biological, radiological and nuclear (CBRN) defense equipment and medical countermeasures. JPEO-CBRND supports all services, from the soldiers walking the streets of a battle-torn country to our Airmen flying in our skies. JPEO-CBRND works closely with various government agencies that need CBRN defense equipment.

Co-host of this event does not imply endorsement of NDIA, its services, products or its affiliates by the United States Government, the Department of Defense, or the JPEO-CBRND.

SCHEDULE AT A GLANCE

MONDAY, JULY 22

Registration
12:00 – 5:00 pm

TUESDAY, JULY 23

Registration
7:00 am – 6:00 pm

Continental Breakfast
7:00 – 8:00 am

General Session
8:00 am – 4:30 pm

Exhibit Hall Open
9:00 am – 6:00 pm

Networking Break in Exhibit Hall
9:45 – 10:15 am

The Honorary William C. Baugh CBRN Defense Excellence Award
11:15 – 11:45 am

Networking Lunch
11:45 am – 1:00 pm

Networking Break in Exhibit Hall
2:00 – 2:30 pm

Networking Reception in Exhibit Hall
4:30 – 6:00 pm

WEDNESDAY, JULY 24

Registration
7:00 am – 3:00 pm

Continental Breakfast
7:00 – 8:00 am

General Session
8:00 am – 3:15 pm

Exhibit Hall Open
9:00 am – 1:30 pm

Networking Break in Exhibit Hall
10:15 – 11:00 am

Networking Lunch
12:00 – 1:00 pm

Conference Adjourns
3:15 pm

LEADERSHIP

COL Armando "Mandy" Lopez, USA (Ret)
Division Chair

CBRN DEFENSE DIVISION

WHO WE ARE

The Division promotes the exchange of information — technical and operational — related to defenses against weapons of mass destruction among the Defense Department and other government agencies, industry, and academia. The Division addresses various functional areas: traditional defensive measures, chemical weapons demilitarization, treaty compliance, industrial base issues, and domestic preparedness.

WELCOME TO THE 2019 CBRN DEFENSE CONFERENCE & EXHIBITION

Welcome to the 2019 CBRN Defense Conference and Exhibition where our focus is "MODERNIZING THE FUTURE FIGHT: ACCELERATE AND ADAPT."

One of the CBRN community's top priorities is collaboration with government and industry to create a one-team concept that modernizes the future fight in such a way that provides the American warfighter with superior capabilities. With the support of the Department of Defense, we must accelerate processes to improve readiness and achieve modernization goals, all while combating current and future threats as efficiently and effectively as possible—even in a CBRN environment. Likewise, we must adapt our current training methods with future technologies to enhance the lethality, protection, and survivability of our combat systems.

In support of these efforts, the 2019 CBRN Defense Conference and Exhibition has a multifaceted agenda that convenes government, industry, and academia with regards to all aspects of CBRN defense. As a one-team concept can only be created by collaboration, the Conference features not only government keynotes but also academic presentations and industry exhibitions, all of which offer the opportunity to hear from key leaders and discover CBRN defense requirements.

Such interdisciplinary discussion is the foundation of the CBRN community's one-team objective: assure the American warfighter's advantage in all settings.

Accordingly, this Conference spotlights emerging CBRN defense technologies from around the world, medical solutions, advanced development and manufacturing needs, and promising research from our interagency partners. Like last year, there will be an exciting and interactive Aberdeen Proving Ground Team CBRNE booth at which representatives from both the medical and non-medical DoD programs will be available to answer questions and host presentations.

This Conference is co-hosted by the NDIA CBRN Defense Division and the Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense.

We thank the exhibitors and sponsors of this event for having provided the support necessary to create a quality experience for all participants. We appreciate their partnership and urge you to learn more about their organizations' capabilities.

Please enjoy the 2019 CBRN Defense Conference and Exhibition. I look forward to speaking with you.

COL Armando "Mandy" Lopez, USA (Ret)
Chair, NDIA Chemical, Biological, Radiological and Nuclear Defense Division
Vice President, Tex-Shield, Inc.

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EVENT INFORMATION

WI-FI

Network: Chase Center
No password is necessary

SLI.DO

To submit questions during the general sessions, visit Slido.com, enter event code "CBRN," and then click "Join."

LOCATION

Chase Center on the Riverfront
815 Justison Street
Wilmington, DE 19801

EVENT WEBSITE

NDIA.org/CBRN

EVENT THEME

Modernizing the Future Fight: Accelerate & Adapt

ATTIRE

Attendees: Appropriate dress for the Conference is business casual for civilians and class B uniform for military personnel.

Speakers: Appropriate dress for the Conference is business for civilians and the equivalent of the U.S. Army Class A/Army Service Uniform.

SURVEY AND PARTICIPANT LIST

You will receive via email a survey and list of participants (name and organization) after the Conference. Please complete the survey to help make our event even more successful in the future.

EVENT CONTACT

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PLANNING COMMITTEE

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LTC Lauren Ishmael, USA (Ret)
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SPEAKER GIFTS

In lieu of speaker gifts, a donation is being made to the Fisher House Foundation.

HARASSMENT STATEMENT

NDIA is committed to providing a professional environment free from physical, psychological and verbal harassment. NDIA will not tolerate harassment of any kind, including but not limited to harassment based on ethnicity, religion, disability, physical appearance, gender, or sexual orientation. This policy applies to all participants and attendees at NDIA conferences, meetings and events. Harassment includes offensive gestures and verbal comments, deliberate intimidation, stalking, following, inappropriate photography and recording, sustained disruption of talks or other events, inappropriate physical contact, and unwelcome attention. Participants requested to cease harassing behavior are expected to comply immediately, and failure will serve as grounds for revoking access to the NDIA event.

VENUE MAP

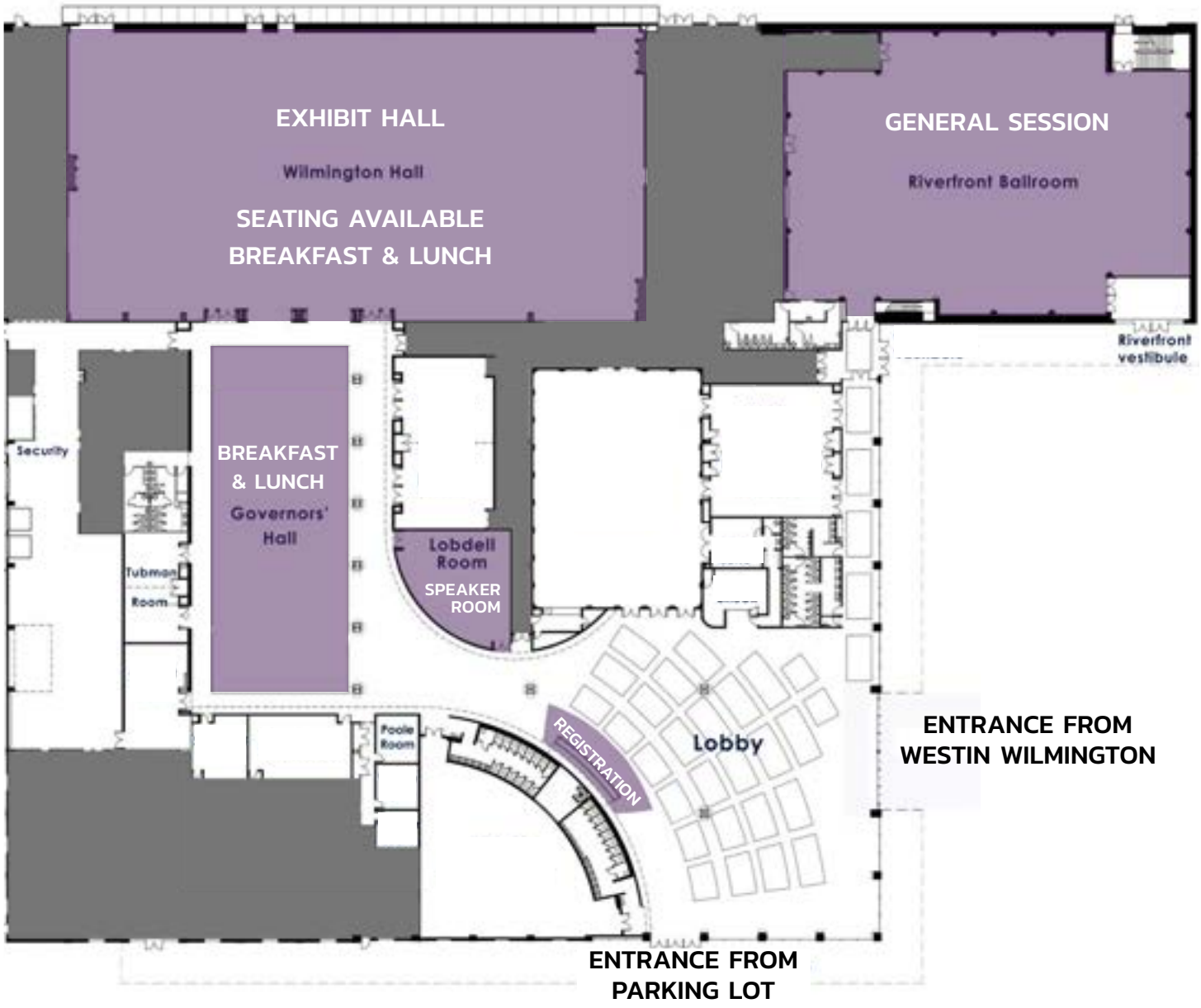
EXHIBIT HALL
Wilmington Hall
SEATING AVAILABLE
BREAKFAST & LUNCH
GENERAL SESSION
Riverfront Ballroom
Riverfront vestibule
Security
BREAKFAST & LUNCH
Governors' Hall
Lobdell Room
SPEAKER ROOM
Tubman Room
Poole Room
REGISTRATION
Lobby
ENTRANCE FROM WESTIN WILMINGTON
ENTRANCE FROM PARKING LOT

AGENDA

MONDAY, JULY 22

12:00 – 5:00 pm	**REGISTRATION** LOBBY

TUESDAY, JULY 23

7:00 am – 6:00 pm	**REGISTRATION** LOBBY
7:00 – 8:00 am	**NETWORKING CONTINENTAL BREAKFAST** GOVERNORS' HALL
8:00 – 8:10 am	**WELCOME & OPENING REMARKS** RIVERFRONT BALLROOM **COL Mandy Lopez, USA (Ret)** Chair, NDIA Chemical, Biological, Radiological and Nuclear Defense Division **Doug Bryce** Joint Program Executive Officer, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense
8:10 – 8:15 am	**WELCOME TO WILMINGTON** RIVERFRONT BALLROOM **Honorable Michael Purzycki** Mayor, Wilmington, DE
8:15 – 8:45 am	**FUTURE DIRECTIONS OF THE JPEO** RIVERFRONT BALLROOM **Doug Bryce** Joint Program Executive Officer, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense

SESSION I: THREAT – FOCUS ON THREAT IS REAL & EVERYWHERE

8:45 – 9:45 am	**EMERGING THREATS** RIVERFRONT BALLROOM **BG William King, USA (Ret)** Countering Weapons of Mass Destruction Senior Fellow-Executive Advisor, Booz Allen Hamilton, Inc. *Moderator* **Dr. James Madsen** Lead Clinical Consultant and Clinical Laboratory Director, Chemical Casualty Care Division, U.S. Army Medical Research Institute of Chemical Defense **Dr. Andrew Kilianski** Chief Intelligence Officer, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense

9:00 am – 6:00 pm	**EXHIBIT HALL OPEN** WILMINGTON HALL
9:45 – 10:15 am	**NETWORKING BREAK IN EXHIBIT HALL** WILMINGTON HALL
SESSION II: PRODUCT/CAPABILITY - FOCUS ON FUTURE CAPABILITY & NEEDS	
10:15 – 11:15 am	**WARFIGHTER NEEDS** RIVERFRONT BALLROOM **Ed Lawson** Director of Integration, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense *Moderator* **MAJ Jay Kopcha, USA** NATO Strategic Chemical Biological Radiological Nuclear Defense Staff Officer, U.S. European Command **Col James Hickman, USAF** Associate Deputy Director of Logistics, Engineering, & Force Protection/AFR Command Civil Engineer, U.S. Air Force
11:15 – 11:45 am	**THE HONORARY WILLIAM C. BAUGH CBRN DEFENSE EXCELLENCE AWARD** RIVERFRONT BALLROOM **MG James Boozer, USA (Ret)** Executive Vice President, NDIA **COL Mandy Lopez, USA (Ret)** Chair, NDIA Chemical, Biological, Radiological and Nuclear Defense Division
11:45 am – 1:00 pm	**NETWORKING LUNCH** GOVERNORS' HALL
1:00 – 2:00 pm	**MODERNIZING THE FUTURE FORCE: SCIENCE & TECHNOLOGY** RIVERFRONT BALLROOM **COL Ronald Fizer, USA (Ret)** Fellow, LMI *Moderator* **Dr. Ronald Hann** Director, Research & Development (J9) Chemical & Biological Technologies Department, Defense Threat Reduction Agency **Dr. Eric Moore** Director, U.S. Army Combat Capabilities Development Command, Chemical Biological Center **Dr. Julio Barrera-Oro, PhD** Health Scientist, Division of CBRN Countermeasures, Biomedical Advanced Research and Development Authority **RADM Colin Chinn, USN** Joint Staff Surgeon, The Joint Staff

2:00 – 2:30 pm	**NETWORKING BREAK IN EXHIBIT HALL** WILMINGTON HALL
2:30 – 3:30 pm	**MODERNIZING THE FUTURE FORCE: ACQUISITION** RIVERFRONT BALLROOM **Dr. Matthew Hepburn** Joint Project Leader for Enabling Biotechnologies, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense *Moderator* **Kalpesh Patel** Division Director, Acquisitions Division, Systems Support, Countering Weapons of Mass Destruction **Dr. Jason Roos** Deputy Joint Program Executive Officer, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense
3:30 – 4:30 pm	**INDUSTRY FUTURE EFFORTS** RIVERFRONT BALLROOM **Dave Cullin** Vice President for Research, Development and Programs, FLIR Systems *Moderator* **BG J.B. Burton, USA (Ret)** Strategic Account Executive, Leidos **Michael McGinnis** Partner, Latham BioPharm Group, Inc. **Samuel Lennon, Jr.** President, L2 Defense, Inc. **Matthew Shaw** Vice President & General Manager, Chemical Biological Radiological Nuclear Explosive Defense, Battelle
4:30 – 6:00 pm	**NETWORKING RECEPTION IN EXHIBIT HALL** WILMINGTON HALL
WEDNESDAY, JULY 24	
7:00 am – 3:00 pm	**REGISTRATION** LOBBY
7:00 – 8:00 am	**NETWORKING CONTINENTAL BREAKFAST** GOVERNORS' HALL

8:00 – 8:15 am	**OPENING REMARKS** RIVERFRONT BALLROOM **COL Mandy Lopez, USA (Ret)** Chair, NDIA Chemical, Biological, Radiological and Nuclear Defense Division
8:15 – 8:45 am	**KEYNOTE REMARKS** RIVERFRONT BALLROOM **Lt Gen Richard Clark, USAF** Deputy Chief of Staff, Strategic Deterrence and Nuclear Integration, U.S. Air Force
SESSION III: PROCESS - FOCUS ON DOD EFFORTS TO MOVE THE PRODUCTS FORWARD	
8:45 – 9:45 am	**OTA SUCCESS STORIES** RIVERFRONT BALLROOM **Jeffrey Megargel** Program Manager, Countering Weapons of Mass Destruction Other Transaction Agreement, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense *Moderator* **Ryan Altenbaugh** Systems Engineer, NTA Defense **Dr. David Moore, DVM, PhD** President & Chief Operating Officer, SciTech Services, Inc. **Dave Hanson** Program Manager, D. Wheatley Enterprises, Inc.
9:00 am – 1:30 pm	**EXHIBIT HALL OPEN** WILMINGTON HALL
9:45 – 10:15 am	**ACQUISITION IN ARMY FUTURES COMMAND** RIVERFRONT BALLROOM **MG Patrick Burden, USA** Director for Combat Systems, U.S. Army Futures Command
10:15 – 11:00 am	**NETWORKING BREAK IN EXHIBIT HALL** WILMINGTON HALL
SESSION IV: TRAINING - FOCUS ON TRAINING FOR THE FUTURE FIGHT	
11:00 am – 12:00 pm	**CBRN MODERNIZATION – A HOLISTIC APPROACH** RIVERFRONT BALLROOM **Scott Kimmell** Deputy Commandant, U.S. Army Chemical, Biological, Radiological, Nuclear School

12:00 – 1:00 pm	**NETWORKING LUNCH** GOVERNORS' HALL
1:00 – 2:00 pm	**MULTIMEDIA TRAINING TOOLS** RIVERFRONT BALLROOM **CPT (P) Raheem Rahni, USA** Assistant Product Manager, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense *Moderator* **Jeffrey Meister** Chief Engineer, Program Executive Office Simulation, Training, and Instrumentation **Dr. Barbara Kilthau** Director of Training, U.S. Army Chemical, Biological, Radiological, Nuclear School, Maneuver Support Center of Excellence **Ron Logan** Assistant Product Manager, Project Manager Training Devices **Walt Rant** Director, Army Programs, D2 | Team-Sim
SESSION V: FUTURE BUSINESS OPPORTUNITIES	
2:00 – 3:00 pm	**JPEO-CBRND CONTRACT OPPORTUNITIES** RIVERFRONT BALLROOM **COL Mandy Lopez, USA (Ret)** Chair, NDIA Chemical, Biological, Radiological and Nuclear Defense Division *Moderator* **Nicole Kilgore** Chief of Staff, Joint Project Manager, Medical Countermeasure Systems, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense **Scott Paris** Joint Project Manager, Protection, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense **Dr. Charles Bass** Division Chief, Protection and Hazard Mitigation Branch, Defense Threat Reduction Agency **Christopher Seacord** Joint Project Manager, Nuclear Biological Chemical Contamination Avoidance, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense **Scott White** Joint Project Manager, Information Systems, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense **Col Anna Schneider, USAF** Joint Project Manager, Guardian, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense **Victor Murphy** Joint Project Leader, CBRN Special Operations Forces, Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense

3:00 – 3:15 pm	**CLOSING REMARKS & SUMMARY** RIVERFRONT BALLROOM **COL Mandy Lopez, USA (Ret)** Chair, NDIA Chemical, Biological, Radiological and Nuclear Defense Division
3:15 pm	**CONFERENCE ADJOURNS**

NDIA and its affiliates have a policy of strict compliance with federal and state antitrust laws. The antitrust laws prohibit competitors from engaging in actions that could result in an unreasonable restraint of trade. Consequently, NDIA members must avoid discussing certain topics when they are together at formal association membership, board, committee, and other meetings and in informal contacts with other industry members: prices, fees, rates, profit margins, or other terms or conditions of sale (including allowances, credit terms, and warranties); allocation of markets or customers or division of territories; or refusals to deal with or boycotts of suppliers, customers or other third parties, or topics that may lead participants not to deal with a particular supplier, customer or third party.

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Patricio Enterprises (PE) provides day-to-day expertise for our nation's mission critical support areas where customer success is the only option. Our people are our strength. Experience and capabilities gained from decades of service to Department of Defense and civilian agencies combine to deliver dynamic integrated solutions to our customers. Our understanding of the Federal market and a relentless commitment to customer success drive our mission to be a force multiplier and trusted resource for the Government. At PE, there is no substitute for quality service. Our time-measured and tested quality management system provides policies, processes, and procedures that drive the continual improvement of the mission critical services we provide to our customers. Our quality management system is certified to the ISO 9001:2015 standard. We provide systems engineering and technical assistance, including lifecycle logistical support, engineering, hardware/software operations, and support services to our clients in Federal, state, and local Government agencies. PE provides tailored solutions for the most demanding requirements, supporting mission critical requests throughout the USMC, US Army, DLA, and other Federal agencies and organizations.

ANSER is a not-for-profit, public service research institute dedicated to informing decisions that shape the nation's future. Since 1958, ANSER has provided objective studies and analyses for national security, homeland security, and public policy communities through a diverse set of skills and capabilities to address a broad range of challenges. ANSER delivers purposeful guidance and forward-thinking analyses to help build effective teams and trusted relations for DoD's Chemical-Biological Defense and Countering Weapons of Mass Destruction missions. This includes decision analytic support to the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense, with direct support to Deputies for Chemical and Biological Defense, Threat Reduction and Arms Control, and Nuclear Matters. Our analysts also support the Joint Requirements Office, Chemical Biological Radiological Nuclear Defense; Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense; and Defense Threat Reduction Agency. ANSER supports business process engineering reform for the Program Executive Office, Assembled Chemical Weapons Alternatives. Our customers receive service-oriented analytic research support that is tailored to their agency's needs through objective, multidisciplinary approaches to address complex problems.

BIOGRAPHIES

DOUG BRYCE

Joint Program Executive Officer
Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense

Mr. Douglas Bryce was designated the Joint Program Executive Officer for Chemical, Biological, Radiological and Nuclear Defense (JPEO-CBRND) in October 2015. As the JPEO-CBRND, he has materiel acquisition decision authority for the services on chemical, biological, radiological, and nuclear defense equipment. He provides acquisition management and professional leadership on complex issues related to joint service CBRN defense acquisition programs. He plans, directs, manages, and coordinates the JPEO-CBRND's mission while being responsible for the development, acquisition, distribution, and deployment of highly specialized and dynamic joint CBRN defense devices, as well as medical diagnostic systems, drugs, and vaccines.

For 10 years prior to his current role, Mr. Bryce served as the Deputy Joint Program Executive Officer for Chemical and Biological Defense, overseeing a diverse team of acquisition professionals and technical subject matter experts to effectively manage the CBRN defense acquisition process. From 2003 to 2005, he served concurrently as the Joint Project Manager for Individual Protective Equipment and the Project Manager for Marine Corps CBRN Defense Equipment. Prior to 2005, he was the Project Manager for Individual Marine Combat Equipment and NBC Defense Equipment, and the Product Manager for NBC Defense Equipment for Marine Corps Systems Command. Mr. Bryce served 20 years in the U.S. Marine Corps, retiring as a Chief Warrant Officer 3.

Mr. Bryce attended Los Angeles Community College, holds a Level III Program Management Certification from the Defense Acquisition University, and is a member of the Navy Acquisition Corps. He authored articles published in Military Medical Technology Magazine, Marine magazine, and the Marine Corps Gazette.

Mr. Bryce's awards include the Navy Unit Commendation, Marine Corps Systems Command; the David Packard Excellence in Acquisition Award; the Commander's Roundtable Team Excellence Award; the Navy Certificate of Excellence; the Meritorious Service Medal (Gold Star in lieu of second award); and the Navy Commendation Medal (Gold Star in lieu of second award).

MG PATRICK BURDEN, USA

Director for Combat Systems
U.S. Army Futures Command

Major General Patrick Burden is the Director for Combat Systems at the U.S. Army Futures Command. He was commissioned in the U.S. Army Field Artillery from Alabama A&M University and entered active duty in 1987. His tactical assignments include the 2d Battalion 3d Field Artillery Regiment (3d Armored Division) in Kirchgoen, Germany, serving as a Company Fire Support Officer, Firing Battery Platoon Leader and Assistant S-3 (Operations Officer) – deploying with the battalion to Saudi Arabia in January 1991 and participating in Operations Desert Shield/Storm as the Assistant S-3; and the 210th Field Artillery Brigade at Fort Lewis, WA, serving as the Brigade Counter Fire Officer and later Firing Battery Commander for B Battery, 3d Battalion 11th Field Artillery Regiment.

MG Burden entered the Army Acquisition Corps in 1994 and held acquisition assignments as: Project Officer, U.S. Army Information Systems Software Development Center–Lee; Assistant Project Manager for the Aviation Electronic Combat and Comanche Program Management Offices, Program Executive Office Aviation; Assistant Product Manager for the Information Warfare Program Management Office, Deputy for Systems Acquisition for the Communications and Electronic Command; Program Analyst later Program Manager for the Global Transportation Network Program Management Office, U.S. Transportation Command; Program Analyst for the Assistant Secretary of the Army for Acquisition, Logistics and Technology-Pentagon; Product Manager for the Joint Automatic Identification Technology, Program Executive Office Enterprise Information Systems; Project Manager for the General Fund Enterprise Business System, Program Executive Office Enterprise Information Systems; Deputy Program Executive Officer for Ammunition; and Program Executive Officer for Enterprise Information Systems. He also served as the Deputy Commanding General at the Combined Security Transition Command – Afghanistan (CSTC-A) for Headquarters, Resolute Support in Kabul, Afghanistan.

MG Burden holds a Bachelor's Degree in Computer Science from Alabama A&M University and a Master's Degree in Management Information Systems from Florida Institute of Technology. He is also a graduate of the U.S. Army Command and General Staff College; the Armed Forces Staff College; the Advanced Program Management Course at the Defense Systems Management College; and the U.S. Army Senior Service College Fellowship Program at the University of Texas-Austin.

MG Burden's awards and decorations include the Defense Superior Service Medal with one oak leaf cluster, the Legion of Merit with two oak leaf clusters, the Bronze Star Medal, the Defense Meritorious Service Medal, the Army Meritorious Service Medal with four oak leaf clusters, the Army Commendation Medal with two oak leaf clusters, the Army Achievement Medal with one oak leaf cluster, and several other awards and decorations including the Parachutist Badge and Army Staff Badge.

LT GEN RICHARD CLARK, USAF

Deputy Chief of Staff, Strategic Deterrence and Nuclear Integration
U.S. Air Force

Lieutenant General Richard Clark is Deputy Chief of Staff for Strategic Deterrence and Nuclear Integration, U.S. Air Force Headquarters, Arlington, Virginia. General Clark is responsible to the Secretary and Chief of Staff of the Air Force for focus on Nuclear Deterrence Operations. He provides direction, guidance, integration, and advocacy regarding the nuclear deterrence mission of the U.S. Air Force while engaging with joint and interagency partners for nuclear enterprise solutions.

General Clark graduated from the U.S. Air Force Academy in 1986. His commands include the 34th Bomb Squadron, Ellsworth Air Force Base, South Dakota, 12th Flying Training Wing, Randolph AFB, Texas, 8th Air Force, and Joint Functional Component Commander for Global Strike, Offutt AFB, Nebraska. He has also served as the Vice Commander, 8th Air Force, Barksdale AFB, Louisiana, and Commandant of Cadets, U.S. Air Force Academy, Colorado Springs, Colorado. Prior to his current assignment, he served as the Commander, 3rd Air Force, Ramstein Air Base, Germany.

SCOTT KIMMELL

Deputy Commandant
U.S. Army Chemical, Biological, Radiological, Nuclear School

Mr. Scott Kimmell is currently assigned as the Deputy Commandant of the U.S. Army Chemical, Biological, Radiological, Nuclear School at Fort Leonard Wood, Missouri. As Deputy Commandant, he is responsible for overseeing all aspects of CBRN defense capabilities development across the DOTMLPF-P spectrum (Army, multi-service, and Joint).

Mr. Kimmell retired from active duty in 2016 after 30 years of service. He has led at all levels—from platoon to brigade—and is a graduate of the School of Advanced Military Studies (SAMS), U.S. Army Command and General Staff College, and the Army War College.

THE HONORARY WILLIAM C. BAUGH CBRN DEFENSE EXCELLENCE AWARD

ABOUT THE AWARD

The Honorary William C. Baugh CBRN Defense Excellence Award acknowledges the lasting impacts that Mr. Bill Baugh tirelessly accomplished through his passion for and persistence in service and excellence, and recognizes an individual who has made the greatest overall contribution to National and International CBRN Defense programs during their lifetime. The achievements for which this award is considered relate to many components of this highly diverse, complex, and vital commodity. Specifically, from Research and Development through the acquisition of capabilities needed by the warfighters and first responders, identification of the ever-growing threats, the innovations for training to the current and future fight, and identifying readiness initiatives for business opportunities.

The award encompasses achievements during the nominee's career and will be presented to the winner at the annual NDIA CBRN Defense Conference and Exhibition. This competition is open to all individuals, regardless of grade or position, in the United States or International CBRN Defense community. All military personnel, government civilians, and contractor employees are eligible.

All executive and service CBRN Defense supervisors of headquarters, plants, depots, laboratories, and proving grounds are asked to seriously consider the contributions of their best qualified subordinates for this prestigious award.

MICHAEL PARKER – AWARD WINNER

For his embodiment of Bill Baugh's excellence in service, passion, and performance, Michael Parker is being recognized as a leader of the CBRN Community with the Honorary William C. Baugh CBRN Defense Excellence Award. Bill and Mike were very close friends, always demonstrating boundless care and concern for the personal well-being of others while upholding our nation's pride and positive policies regarding all CBRN-related matters. Throughout his extensive career in chemical and biological defense, Mike has dealt with professionals in government and industry with the utmost selflessness and dedication to the field's mission. In fact, his body of work with the U.S. government and within the CBRN enterprise has achieved national and international milestones of accomplishment that are unmatched. Whether it be by developing and implementing an incentive program for the U.S. Army Chemical Materials Agency that drastically reduced life cycle cost or by providing business strategy support within the chemical and biological defense market, Mike consistently goes above and beyond both standards and expectations. He provides nothing less than excellence, including the time that he was instrumental in the establishment of the Joint Program Executive Office for CB Defense. In this way, Mike's drive certainly equals that of Bill. As both men have proven to be great leaders, mentors, and examples of what is right for our nation and its CBRN defense mission, Mike has earned the honor of receiving the inaugural William C. Baugh CBRN Defense Excellence Award.

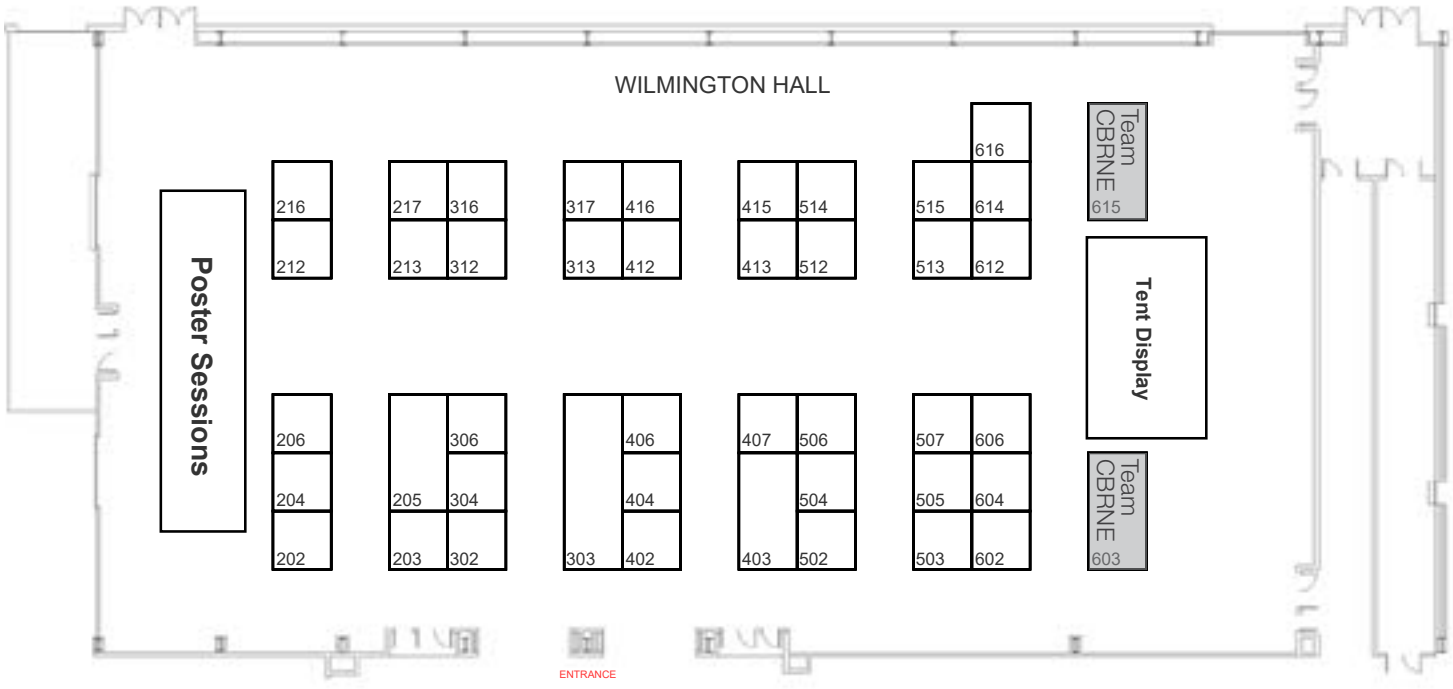
EXHIBIT HALL HOURS

TUESDAY, JULY 23
9:00 am – 6:00 pm

WEDNESDAY, JULY 24
9:00 am – 1:30 pm

EXHIBITORS

EXHIBIT HALL MAP



EXHIBITOR DESCRIPTIONS

908 DEVICES 404

At 908 Devices we are building ridiculously small, and simple purpose-built tools based on remarkable mass spectrometry technology. Our flagship product, M908, is used by leading CBRNE organizations around the world for the fast and accurate confirmation of priority chemical threats, including chemical warfare agents, toxic industrial chemicals, and precursors.

ADS 202

ADS is the world's premier equipment, procurement, and solutions specialist to the US Military. We ensure mission success, operational efficiency, and cost savings for our customers by partnering with leading manufacturers of CBRN equipment. Bring us your mission requirement and we will help you identify the best solutions to meet it. We will offer you a range of contract vehicles for procurement to get your equipment when and where you need it. Our Purpose. Your Mission

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ANP Technologies®, Inc. originally spun out from the U.S. Army Research Laboratory in 2002. The application of our technologies, known as the Nano-Intelligent Detection/ Delivery System (NIDS®), is focused on: -Drug Delivery -Rapid Detection of Biowarfare Agents -Rapid Detection of Pesticides and Chemical Warfare Agents in Water, Food and Beverages -Immunogenicity Tests for Biotherapeutics -Bioanalytical Methods and Assay Components -Protein Extraction and Removal Kit -Rapid Medical Diagnostic Tests

AVON PROTECTION SYSTEMS, INC. 306

Avon Protection is a world leader in Respiratory Protective Equipment (RPE), providing complete solutions for Air, Land & Sea based personnel in Military, Law Enforcement, First Responder, Firefighting & Industrial sectors globally. Our portfolio of innovative, high-performance products include escape devices, full face masks, powered air systems, self-contained breathing apparatus & a full range of filters & accessories to deliver maximum operational flexibility & accommodate changing threats.

BATTELLE 403

For 30 years, government agencies and industry have trusted Battelle to solve their most complex chemical and biological defense challenges. Tap our expertise spanning decades and dozens of interrelated scientific disciplines, unmatched chemical and biological test facilities, advanced product design and manufacturing, and objectivity as the world's largest independent R&D organization.

BREN-TRONICS, INC. 602

Bren-Tronics, Inc. has been supplying the power needs of the CBRN community for over 45 years. Supporting CBRN specialists with batteries and chargers for worn applications, bomb suits, robots, sensors, and anywhere you're off the grid and need power.

BRUKER DETECTION CORPORATION 313

Bruker Detection Corporation is a worldwide leader in supplying high performance CBRNE detection instruments for substance detection and pathogen identification in security, defense, and law enforcement applications.

CALGON CARBON CORPORATION 614

Calgon Carbon, A Kuraray Company, is the world's largest producer of activated carbon products. The company supplies more than 100 types of activated carbon products—in granular, powdered, pellet, and cloth form—for more than 700 distinct applications, which includes military and industrial respirators, collective protection, and CBRN suits. Calgon Carbon has been the sole supplier to the U.S. Department of Defense since 1942 for military respirators. The company operates production facilities in North America, Europe, and Asia. Calgon Carbon maintains the most advanced R&D organization in the industry and manages an expanding network of sales and service centers worldwide. Visit www.calgoncarbon.com for more information.

CBRNE WORLD 604

CBRNe World is the longest established and most widely read magazine for the global CBRNE community. It also organizes the annual CBRNe Convergence conference & exhibition which this year is hosted in Nashville November 5-7. Delivering news, comment and in depth articles via the magazine, website and conferences to assist CBRNE military and civil professionals achieve their mission goals. www.cbrneworld.com

COLLINS AEROSPACE 505

Collins Aerospace, a unit of United Technologies Corp. (UTX), is a leader in technologically advanced and intelligent solutions for the global aerospace and defense industry. Through its Hamilton Sundstrand subsidiary, it has supplied all branches of the US Military with a range of chemical threat detection and air quality monitoring solutions for over 40 years. The latest ThreatShield™ wearable CWA detection product, incorporating SMART nano-sensor array technology, will be on display.

CWMD CONSORTIA, ATI 407

The Countering Weapons of Mass Destruction (CWMD) Consortium and the Medical CBRN Defense Consortium (MCDC) consist of business and academic entities across the medical, CBRN, WMD and defense industries assembled to address the DoD's need for innovative, safe and effective medical solutions to counter CBRN threats and technologies to counter WMD. They operate through an Other Transaction Agreement (OTA) with JPEO-CBRND and are managed by Advanced Technology International (ATI).

CZITEK 316

Czitek is a US company dedicated to developing new and innovative products for spectroscopy. Over the course of thirty years, our team has designed, manufactured, and supported many ground-breaking spectroscopy instruments for leading instrumentation companies. We are using that knowledge and experience to deliver new products focused on customer's needs. Czitek's combination of class leading performance and the highest level of application and service support is certain to satisfy you.

D. WHEATLEY ENTERPRISES, INC. 503

D. Wheatley Enterprises, Inc. (DWE) is an engineering, development and manufacturing company whose core competency is life-support systems design and development supported by capabilities in injection molding and polymer systems for the CBRN protection/detection. Special Projects Operations, Inc. (SPO) is a global leader in the research, development and manufacturing of advanced hybrid life support systems, exothermic cutting torch technologies, and air and oxygen management systems.

DESIGN WEST TECHNOLOGIES, INC. 217

DRÄGER 213

For more than 100 years, Dräger has focused on one goal: human safety. By working closely with military and civil forces, we have learned about the dangers you face on a daily basis. Using state-of-the-art technology, we develop products based on knowledge of your special requirements. Dräger solutions include respiratory protection systems, portable gas detectors and monitors, diving equipment, and NBC/CBRNe protection/detection systems – all backed by service and support points worldwide.

FEDERAL RESOURCES 206

Federal Resources is the premier single source provider of the customized, integrated solutions your team needs to successfully complete it's next assignment. With more than three decades of specialized experience, coupled with industry connections and trusted partnerships, FR helps military, first responders and organizational professionals equip, train and maintain every component of your next mission, program or project.

FIRST LINE TECHNOLOGY, LLC 412

First Line Technology designs, manufactures, and supplies disaster preparedness and response equipment like our medical ambulance bus (the AmbuBus®), our PhaseCore® Cooling Vests, and our line of decontamination equipment (including Dahlgren Decon and FiberTect). We work with first responders and the military to develop innovative products that make their jobs easer and their lives safer.

FLIR SYSTEMS, INC. 302

FLIR Systems, Inc. designs, develops, manufactures, markets, and distributes technologies that enhance perception and awareness. We bring innovative sensing solutions into daily life through our thermal imaging systems, visible-light imaging systems, locator systems, measurement and diagnostic systems, and advanced threat detection systems. Our products improve the way people interact with the world around them, enhance public safety and well-being and enable healthy and entertained communities.

GASMET TECHNOLOGIES, INC. 507

Gasmet Technologies manufactures and supports a complete portfolio of high quality industrial FTIR multi-gas analyzers and their accessories for demanding emissions monitoring applications. The Gasmet FTIR multi-gas analyzers provide IH/Hazmat teams with rapid and accurate solutions for the measurement of demanding gases such as ammonia, acid gases (HCl, HF, HCN), VOC's such as formaldehyde, amines and all GHG's (CO2, N2O, CH4,..)

GHOST ROBOTICS 502

Robots That Feel the World®
Ghost Robotics™ is revolutionizing legged robotics and the market for autonomous unmanned ground vehicles (Q-UGVs) used in unstructured terrain and harsh environments. Our Q-UGVs are unstoppable.

Beyond all terrain operation, a core design principle for our legged robots is size-scalability, and reduced mechanical complexity with total software (SDK) control when compared to other legged and traditional wheeled and tracked UGVs on the market.

GORE 303

For more than 30 years, W. L. Gore & Associates has played a vital role equipping all branches of the military with critical gear and equipment. And over time the military has learned it can count on Gore where it really matters most – in the field.

H3D, INC. 504

H3D offers the world's highest-performance gamma-ray spectrometers and imaging spectrometers. From storage to measurement in less than two minutes, we guarantee 1.1% FWHM energy resolution at 662 keV in a portable package. The H series gamma-ray imaging spectrometers are used for applications in CBRNE and emergency response around the world. The A400 series RIIDs are the new state-of-the-art technology for portable isotope identification in a ruggedized package.

ITL SOLUTIONS 312

ITL Solutions is your source for equipment to meet today's requirements and tomorrow's unknowns. Offering mission specific equipment from Marine Engineering to CBR Decontamination, ITL Solutions is a SDVOSB with the right systems to meet your needs. ITL Solutions is proud to be the US Distributor of the Cristanini S.p.A. line of Chemical, Biological, Radiological Decontamination and Firefighting equipment, a world leader since 1972.

JGW GROUP 317

The JGW Group has spent the last 37 years providing clients with highly specialized support in both the aerospace and defense sectors. Our expertise includes marketing and sales, training, consulting, proposal preparation and management, business development, and contractual intelligence. Our focus areas include CBRNE, Force Protection, and Defense.

KOKATAT, INC. 506

Decades of design and manufacturing experience in waterproof, breathable personal protective equipment.

LOKSAK, INC 413

MANUFACTURING TECHNIQUES, INC. (MTEQ) 205

MTEQ is full-service engineering company and systems integrator with capabilities in passive full spectrum hyperspectral imaging, multi-modal lasers/LIDAR, Bi-static and GMTI radars, acoustic detection, and other sensor modalities. The company is comprised of world-class multi-disciplinary matrixed engineers leveraging in-house modeling and design tools, laboratories, and manufacturing capabilities to provide Quick Reaction Capabilities for the Warfighter and Security Forces.

NDIA 415

The National Defense Industrial Association is the trusted leader in defense and national security associations. As a 501(c)(3) corporate and individual membership association, NDIA convenes forums where thoughtful, innovative leaders exchange ideas and information to ensure America's armed forces enjoy decisive advantage across the spectrum of conflict. NDIA engages with government, industry and academia to ensure development of best policies, practices, products, and technologies to ensure the safety and security of our nation. NDIA's membership embodies the full spectrum of corporate, government, academic, and individual stakeholders who, together, form a vigorous, responsive, and collaborative community in support of defense and national security. For more information, visit NDIA.org.

OPEC CBRNE 616

Scottish- based OPEC CBRNe Ltd, originally set up as the OEM for the former Remploy CBRN suits, was recently awarded the contract for Australian DoD suit supply. We innovate with the latest permeable materials and advanced design enhancements to provide high protection and lower thermal burden for the user.

ORTEC 606

ORTEC will be demonstrating the new Detective X handheld radioisotope identifier, the latest product in the ORTEC Detective product line. ORTEC Detective products are the standard devices deployed by Customs, Defense, and Intelligence agencies and by many state and local First Responders in the US and around the world. Visit the ORTEC booth to learn more about ORTEC's product to support your CBRN application needs.

PENDAR TECHNOLOGIES 512

Pendar is creating intelligent chemistry systems. Our Pendar X10™ offers breakthrough, standoff (up to 3 feet) Raman chemical identification for EOD, HAZMAT, Narcotics and Forensics. It mitigates fluorescence and has minimal ignition risk with black powder and sensitive primaries. Simple point-and-shoot technology requires little training and delivers results within seconds.

PROENGIN INC. 304

Chemical & Biological Detection

QAL-TEK ASSOCIATES 514

Qal-Tek Associates is a Product, Service and Training solutions provider to the CBRN Response Market. Qal-Tek distributes and develops leading edge CBRNE response equipment such as the new RDS (Radiation Detection System). Qal-Tek developed the first IAFF Pro-Board Certified Radiation Response Specialist Course. We also deliver live radiation field training exercises for your responders to challenge their response plan and equipment.

QINETIQ NORTH AMERICA 203

QinetiQ North America's TALON® and Dragon Runner™ robots can be configured for EOD, CBRNE/Hazmat, SWAT/MP, Communications or Surveillance. More than 2,500 already in service worldwide.

QUICK SILVER ANALYTICS, INC. 513

QuickSilver Analytics is the nation's leading provider of CBRN sampling kits and tools. The FAC® line of quality products offer's two distinct advantages over our competitors. First, we are the only CB sampling kit manufacturer that provides certification that kit components are free from interferences. Second, as an original equipment manufacturer (OEM) we routinely design and build custom configured kits and provide item level replacements via our web-based catalog.

TACTICAL DEFENSE MEDIA 204

Security & Border and CST/CBRNE, a Tactical Defense Media publication provides relevant and accurate analysis on policy and technology relating to emergency first response, border and law enforcement, hazmat, counterterrorism, and Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) incident preparation and response. Updates on programs and applications from National Guard, WMD-CST, HRF, and CBIRF operations.

TEAM CBRNE 603, 617

Team Chemical, Biological, Radiological, Nuclear and high-yield Explosives (CBRNE) partners form a consolidated CBRNE defense capability on the Edgewood area of Aberdeen Proving Ground, MD.

Team CBRNE is made up of: CCDC, USAMRICD, USAMRIID, JPEOCBRND, CMA, PEO ACWA, 20th CBRNE, USAPHC, and DTRA/JSTO. Team CBRNE has life-cycle responsibility for the safety and defense of our Joint Forces, civilians and nation against CBRNE threats, providing medical and material solutions, safe destruction of chemical stockpile and recovered material, expertise in technologies and emerging threats, promoting health and preventing disease/injury, and providing countering weapons of mass destruction equipment.

TETRACORE 216

Tetracore is a biotechnology company that develops & commercializes highly innovative technologies for molecular & immuno-detection of infectious diseases & biological warfare threat agents. We offer field portable tests, reagents, lateral flow assays (LFA) & readers, dried down real-time PCR assays, real-time PCR device T-COR 8™ & veterinary diagnostics reagents.

TEX-SHIELD, INC. 402

SARATOGA®,"the most trusted name in chemical protective clothing" Tex-Shield is the exclusive U.S. licensee of the SARATOGA® chemical protective technology, "The most trusted name in chemical protective clothing." SARATOGA® garments are air permeable, adsorptive systems designed to provide optimal protection against chemical agents. Tex-Shield's products include the JSLIST overgarment, HAMMER Suit®, CWU-66/P and the JPACE flight coveralls.

VALENT APPLICATIONS 416

Valent Applications is a world leader in the development and manufacturer of Invasive Technology. We have produced a suite of equipment and applications that can reduce the complexity and cost of working with CBRN, Hazmat and Toxic Industrial Chemical (TIC) threats. Our solutions are safe, fast and flexible, with multiple capabilities for the investigation and disposal of most vessels, munitions and closed systems, regardless of size, shape or material.

VETERAN CORPS – AN INTERFUZE COMPANY 406

Veteran Corps - An INTERFUZE Company delivers the comprehensive, innovative solutions and exceptional performance that our Nation needs to safeguard our freedom and future. With decades of past performance developed in serving Federal missions, we have honed extensive capabilities in engineering, IT and contractor logistics support services needed to address our client's toughest challenges. Our Clients include defense and civil agencies, local first responders across public and private sectors.

POSTER PRESENTATIONS

Wide Spectrum Bio-threats Identification and Classification
Dr. James Baldwin, PhD | Dr. Samina Noorali, PhD | Prof. Ashok Vaseashta, PhD, DSc

Robot Mounting Solutions for Radiation Sensors
John Clemmensen | Arnold Turner

Deployable Biological Surveillance System
Barry Croucher

Decision Support Framework for Automated Chemical Source Term Estimation from Heterogeneous Sensor Streams
Dr. Nikhil Kriplani | Jason Graffius | Dr. Aaron Walker

Peptide-based Receptor Development for Potential Integration into Wearable Bio-sensors
Dr. Sanchao Liu | Dr. Justin Bickford | Dr. Matthew Coppock

GTRI Technologies For Chem/Bio Detection
Dr. True Merrill | Dr. Michael Farrell | Dr. Wade Rellergert | Dr. Jie Xu

Contamination Mapping the Agentase Disclosure Spray Using Simultaneous Localization and Mapping and Augmented Reality
Jessica Milke | Scott Donahue | Deanne Applegate | Dr. Jeremy Walker

Development of Pre- and Post-Countermeasures Against Organophosphate Toxicity in Macaques
Dr. Yvonne Rosenberg | Dr. James Fink | Dr. Ronan MacLoughlin | Dr. Narayanan Rajendra | Dr. Dennis Sullivan | Dr. Palmer Taylor

Low-Cost COTS-based VTOL-UAS for Deep CBRN Sensing Missions
Dr. Robert Serino | Dr. James Frelk

Firefly: A Dynamically Deployable Situational Awareness Platform for Emergency Events
Dr. Matthew Tolentino | Dr. David Hirschberg

NOTES

AT THE HEART OF THE MISSION

NDIA

1919 2019

24TH ANNUAL

EXPEDITIONARY WARFARE CONFERENCE

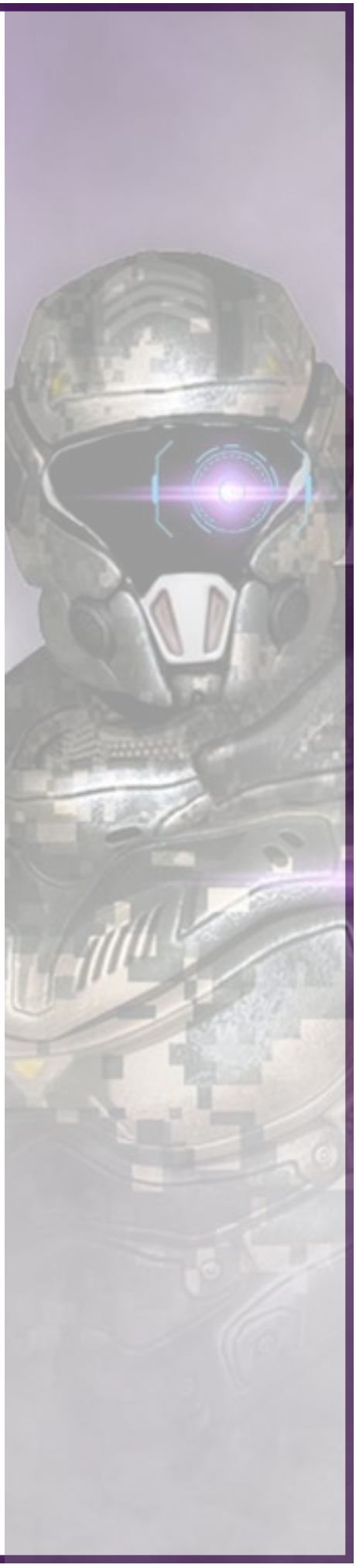
SAVE THE DATE

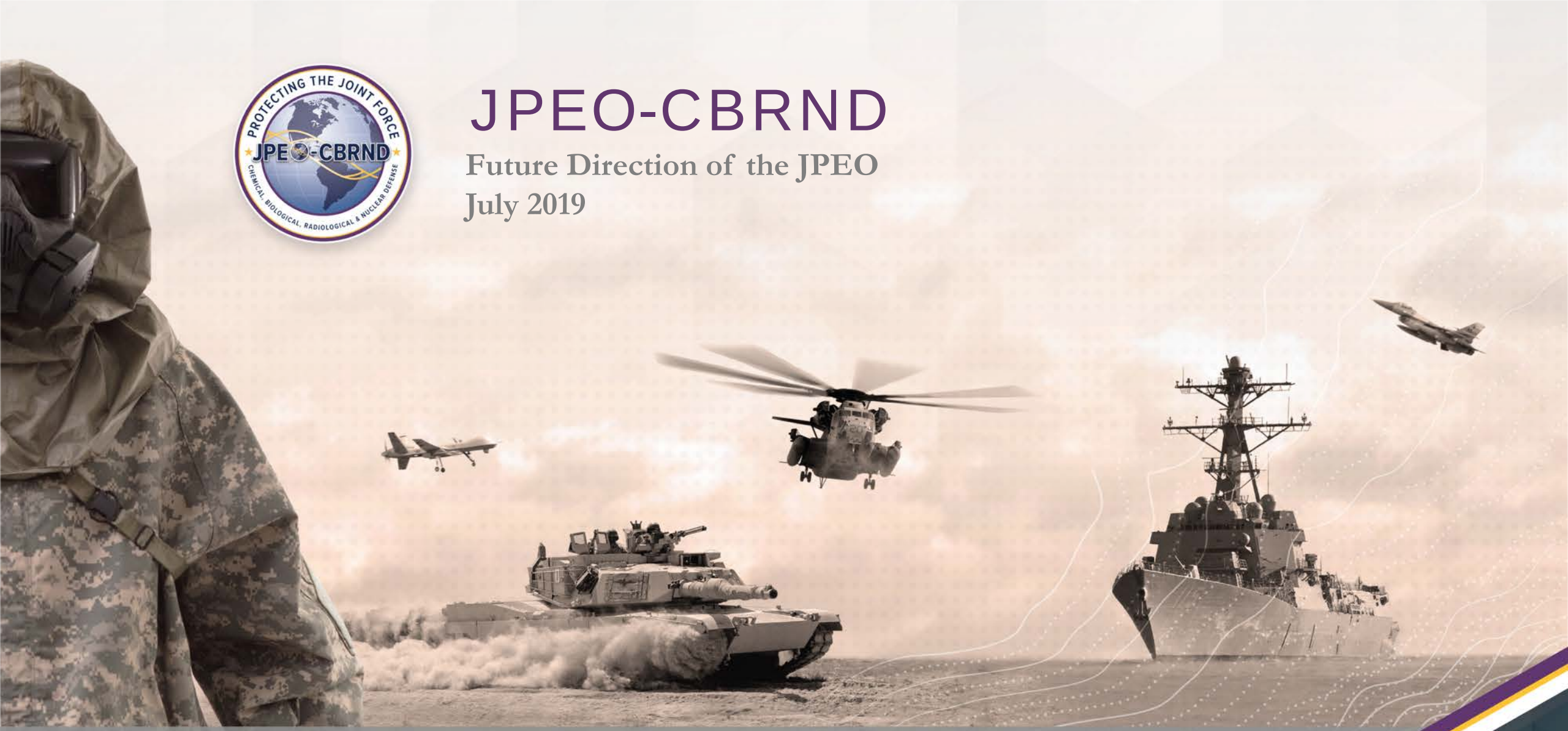
Enhancing Expeditionary Superiority

Join military, government, industry, and academic leaders at the 24th Annual Expeditionary Warfare Conference, an intellectual collaboration that centers on current operations, capabilities development, information warfare, autonomous systems, and more. In addition to dynamic keynote speakers and congressional panels, there will be tabletop displays showcasing the latest technology and information in expeditionary warfare.

October 22 – 24, 2019

Annapolis, MD | NDIA.org/EWC





JPEO-CBRND

Future Direction of the JPEO

July 2019

Mr. Douglas Bryce

Joint Program Executive Officer for Chemical, Biological, Radiological and Nuclear Defense

WHY REORGANIZE?

MISSION

Protect the Joint Force from weapons of mass destruction by generating affordable capabilities.

VISION

A resilient Joint Force enabled to fight and win unencumbered by a chemical, biological, radiological, or nuclear environment; championed by innovative, agile, results-oriented acquisition professionals.

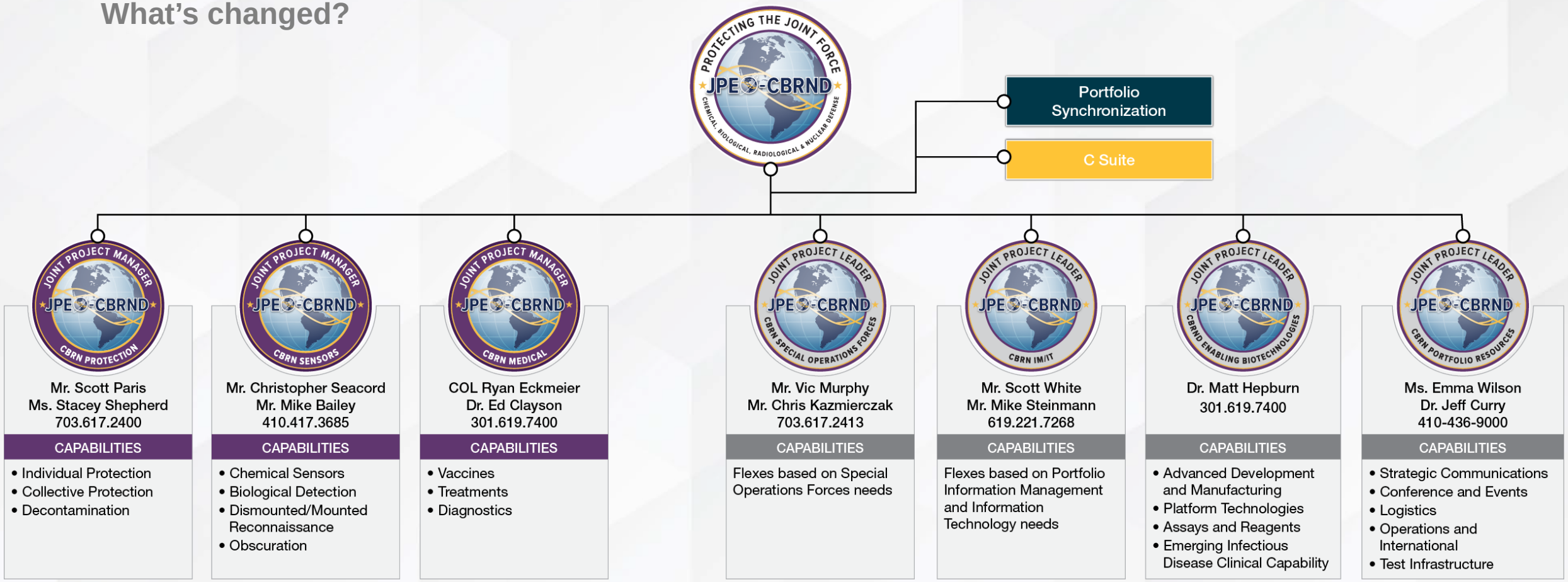
HOW WE REORGANIZED

Portfolio Management

- Moving to portfolio management
- Shifting focus to data analytics and integration efforts
- Managing entire portfolio as a holistic enterprise

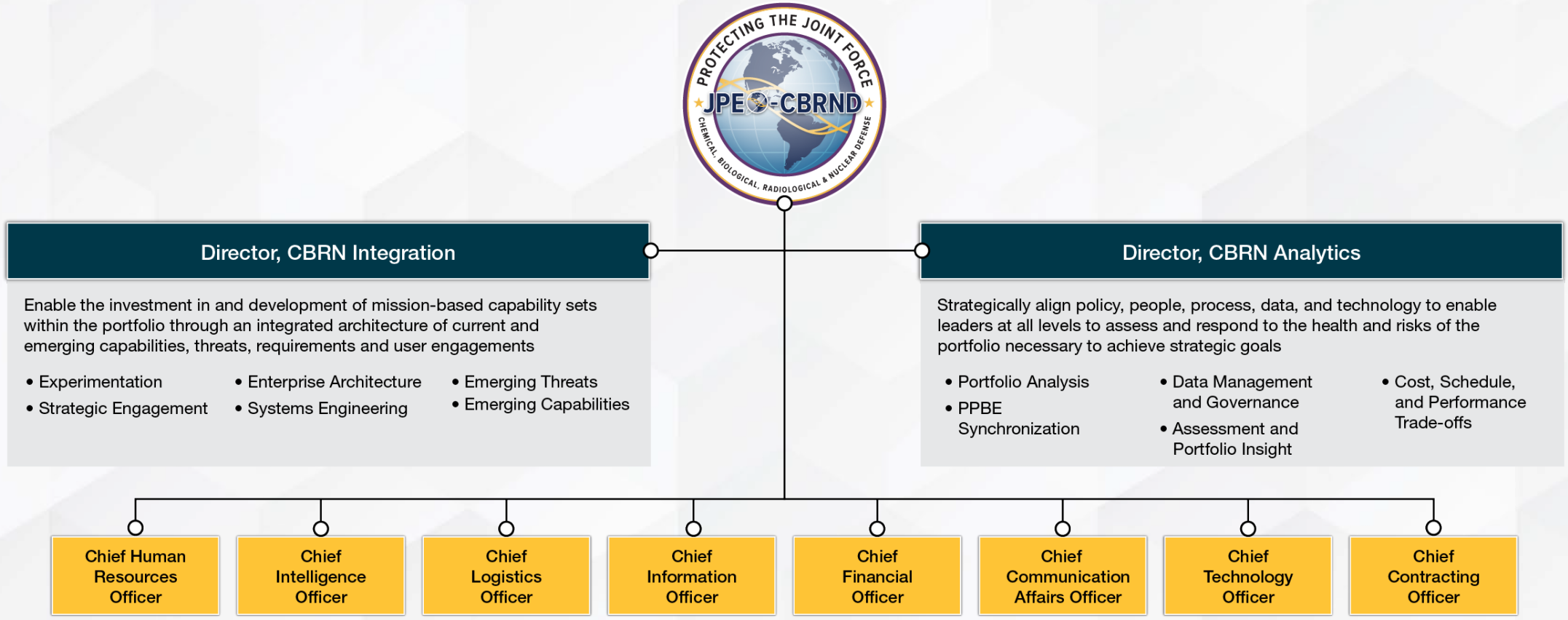
JPEO-CBRND ORGANIZATION

What's changed?



JPEO-CBRND HEADQUARTERS ORGANIZATION

Focus on Portfolio Synchronization



WHAT DOES THIS MEAN FOR INDUSTRY?

- Everyone in this room is committed to the same mission
- Shifting to Portfolio Management will allow JPEO to:
  - Find efficiencies so we can buy smarter
  - Make better-informed decisions about technology insertion
  - Do a better job keeping industry informed about program decisions

FUTURE CAPABILITIES

PROTECTION

- Next generation protective ensemble
- Next generation respiratory and ocular protection
- DECON family of systems
- Integrated contamination mitigation
- Coatings/barriers

SENSORS

- Robotics and autonomous systems
- Decision support tools
- Machine learning and artificial intelligence
- Space and intelligence, reconnaissance, surveillance
- Tactical biodetection

MEDICAL

- One treatment, many threats
- Rapid medical countermeasures response
- Genomic sequencing
- Pre-symptomatic diagnostics
- Agile medical paradigm

Preventing the Worst by Providing the Best

Douglas W. Bryce

Joint Program Executive Officer for
Chemical, Biological, Radiological and Nuclear Defense

410-436-4141
douglas.w.bryce.civ@mail.mil
www.jpeocbrnd.osd.mil

NATO's Military Role in WMD Non-Proliferation Focusing on Future Capabilities and Needs

MAJ/P Joseph KOPCHA, USA-Army
SHAPE/ACO CBRN SO

23 July 2019

NDIA 2019

Wilmington, DE

Agenda

- CONTEXT
- NATO's CBRN Defence Structure
- NATO Military Role

Brussels Summit Declaration

We remain deeply concerned by the proliferation of nuclear weapons and other weapons of mass destruction (WMD), as well as their means of delivery and related materials, by states and non-state actors, which represents a growing threat to our populations, territory, and forces. Addressing this threat remains an urgent international priority. …..Continued use of chemical weapons in Syria, …and the United Kingdom, …. underscore the evolving and increasing WMD threat to the Alliance. … NATO will ensure that Allies can protect their populations, forces, and territories by deterring, defending against, responding to, and mitigating the consequences of the full spectrum of the chemical, biological, radiological, and nuclear threats, including with trained and rapidly-deployable forces.

We call on all states to enhance efforts to effectively combat the proliferation of WMD through the universalisation and full implementation of the CWC and BTWC, the NPT, and through …the UNSC resolutions 1540 and 2325, and initiatives on nuclear disarmament verification.

Building on our DAT POW, we will continue to improve our capabilities and technologies, including to defend against IEDs and CBRN threats, and ….

Political Guidance 2019 (PG19)

- *Just as in 2015 Political Guidance (PG15), CBRN Defence capability planning aspects were considered in PG19*
- *2018 Brussels Summit Declaration, along with real-life incidents (Salisbury), and other emerging threats, facilitated the inclusion of CBRN Defence capability planning aspects into PG19*
- *PG19 sets additional guidance for the conduct of the NATO Defence Planning Process*

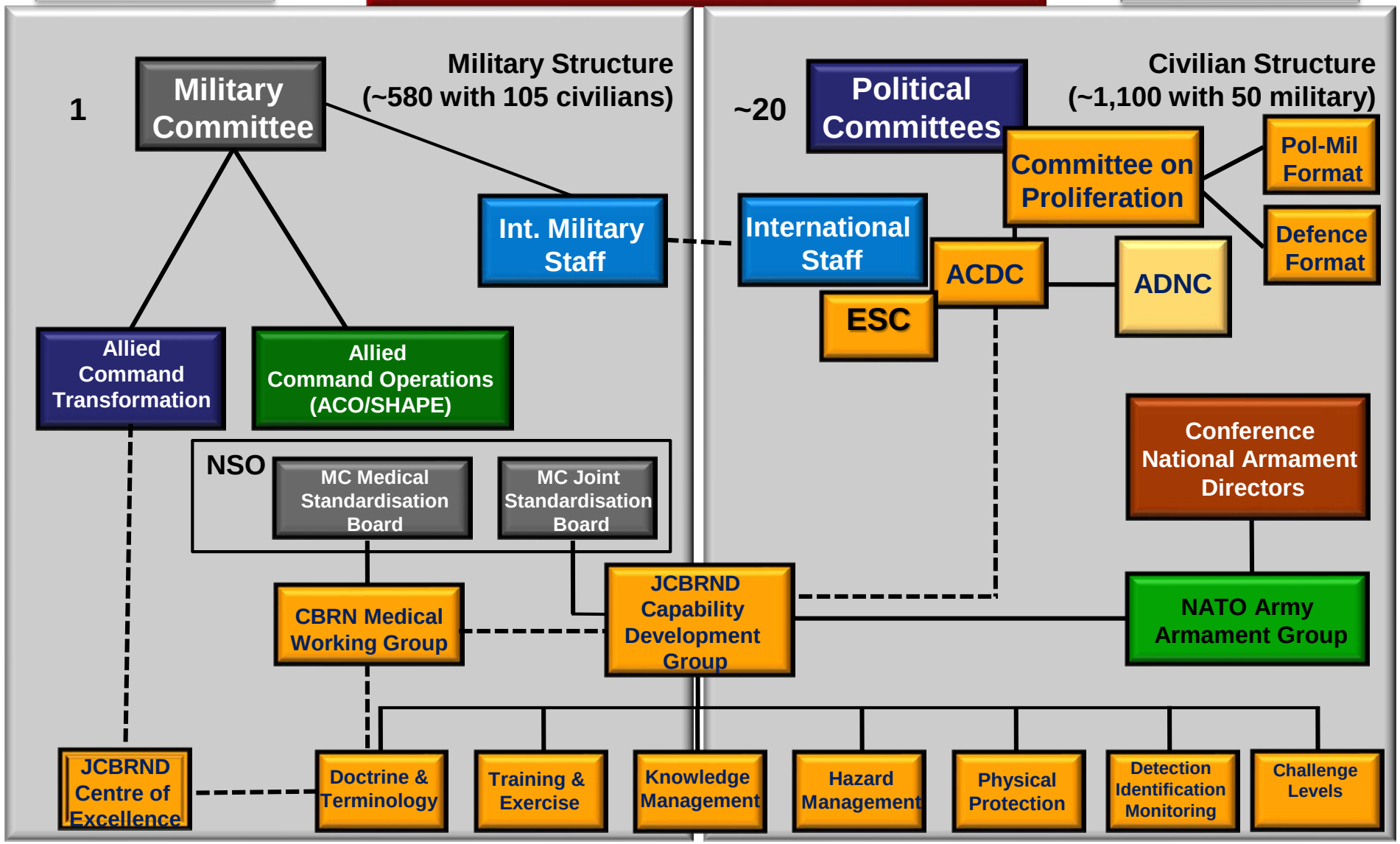
Agenda

- **CONTEXT**
- **NATO's CBRN Defence Structure**
- **NATO Military Role**

North Atlantic Council

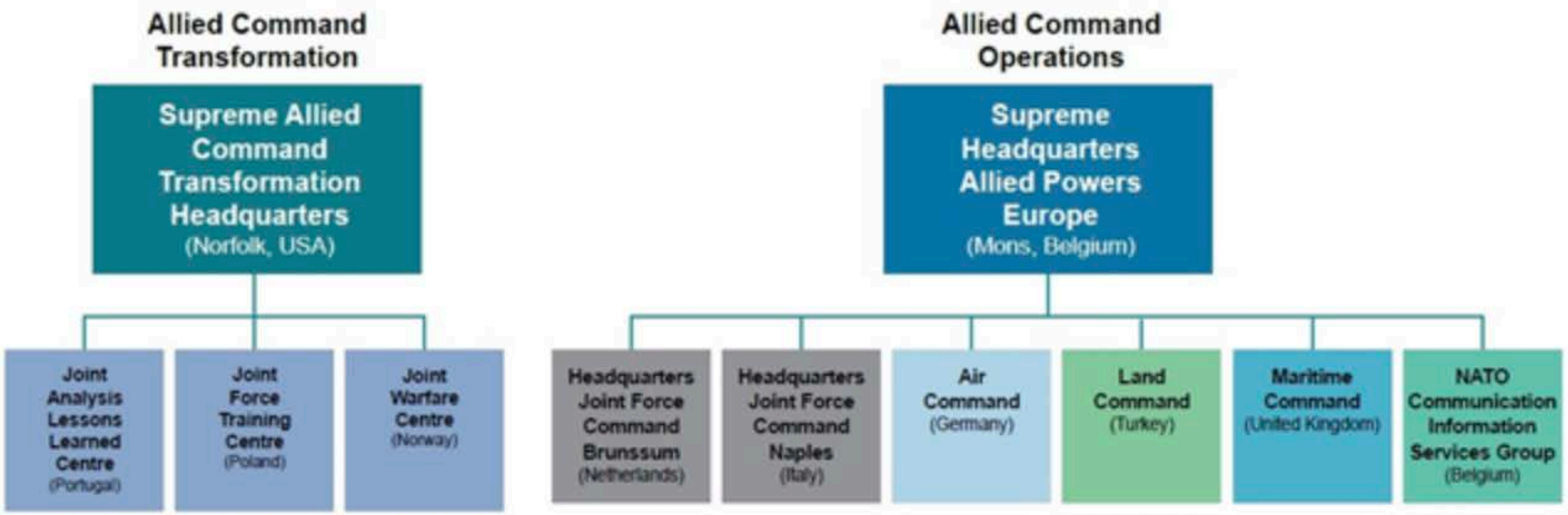
Military Representations to NATO

Permanent Representations to NATO



International Staff

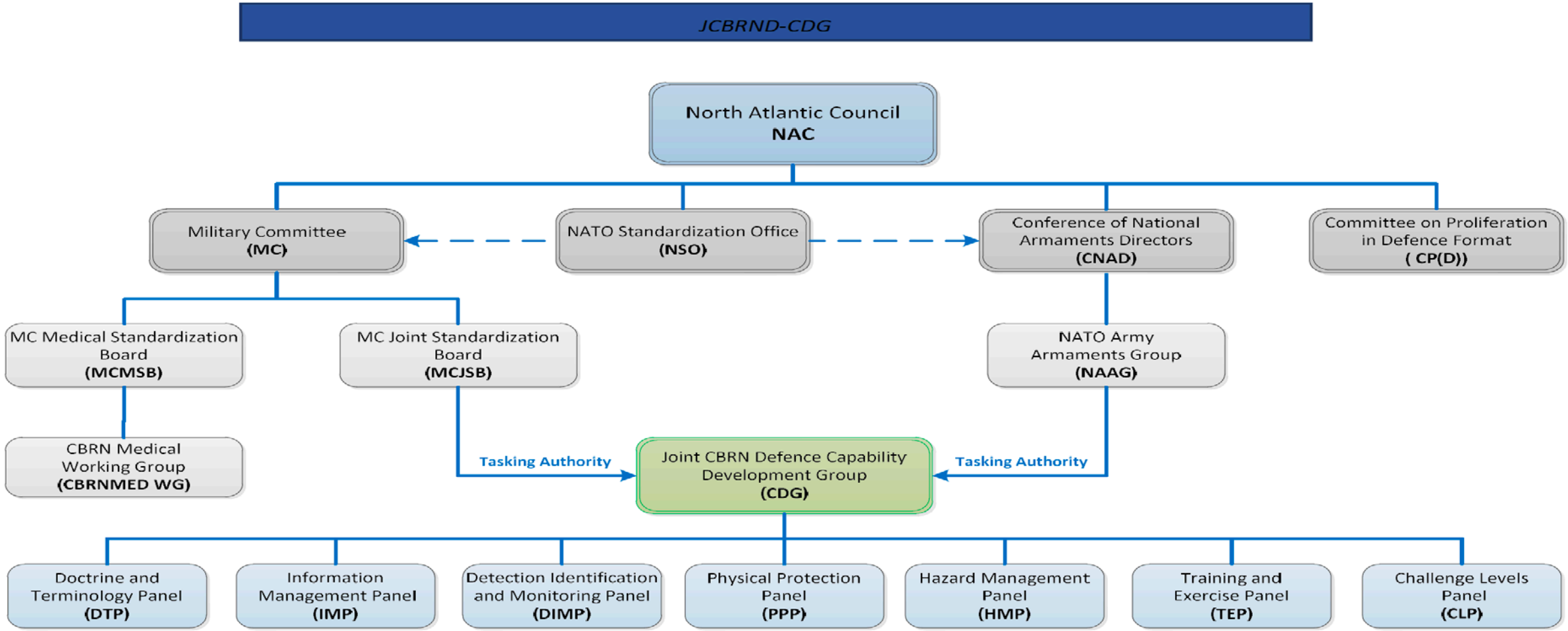
HQ SACT & ACO


Allied Command Transformation
Supreme Allied Command Transformation Headquarters
(Norfolk, USA)
Joint Analysis Lessons Learned Centre
(Portugal)
Joint Force Training Centre
(Poland)
Joint Warfare Centre
(Norway)
Allied Command Operations
Supreme Headquarters Allied Powers Europe
(Mons, Belgium)
Headquarters Joint Force Command Brunssum
(Netherlands)
Headquarters Joint Force Command Naples
(Italy)
Air Command
(Germany)
Land Command
(Turkey)
Maritime Command
(United Kingdom)
NATO Communication Information Services Group
(Belgium)

NATO's Instruments

- Committee on Proliferation (CP) in Defence and Politico-Military format;
- ACDC (former WMD Non-Proliferation Centre);
- IS/IMS CBRN Group;
- Public Diplomacy;
- Centres of Excellence (CBRN, DAT, C-IED, EOD, MilMed) and NMIOTC;
- NATO Programmes (SPS, DAT PoW, etc.).

JCBRND-CDG



ATP 3.8.1 Vol. I ATP 3.8.1 Vol. II	ATP-45 AEP-45	AEP-66	ATP-65 ATP-70	AEP-4 ATP-88	ATP 3.8.1 Vol. III	AEP-72

Agenda

- CONTEXT
- NATO's CBRN Defence Structure
- NATO's Military Role

NATO CBRN StratCom Objectives

a. Build awareness and support for NATO WMD non-proliferation and CBRN Defence in order to reassure Allied populations and demonstrate the Alliance's increasing ability to protect against such threats.

b. Communicate Alliance intent and demonstrate NATO CBRN prevention, protection, and recovery capabilities in order to contribute to deterrence of potential adversaries.

c. Engage and inform audiences in non-NATO countries in Europe, wider Middle East, and Asia on the purpose and importance of WMD non-proliferation and NATO's capabilities in CBRN Defence, including required capabilities, in order to foster their active cooperation.

d. In the context of NATO's narrative on CBRN Defence, counter Russian and other anti-NATO disinformation and hostile information activities in order to maintain the credibility of the Alliance with all audiences.

NATO CBRN Military Role

- (CZE - ACO) Policy – MC, MCM
- (ITA - ACO) Education, Training, Evaluation, Exercise
- (DEU - ACO) Plans & Operations – Annex U, Adv. Plans, CONOPs
- (USA - ACO) Standardization – AJP, ATP, AEP, ANEP, etc
- (USA – ACO) Capability development – MERT, WMD Disablement
- (USA - ACO) Capability review / Capability requirements – CC/CS
- (DEU – HQ SACT) Concepts, Experimentation, Implementation – TRJU, TRJE, Toxic Valley, Toxic Trip, Brave Beduin, etc.

NATO CBRN Military Role

- StratCom Framework
- Civ / Mil cooperation – Civil Emergency Planning
- Land, Sea, Air
- Technical Exploitation
- CBRN-related Intelligence
- Deterrence and Defence
- Liaison efforts – JIntWG, CBRN MedWG

NATO CBRN Military Role

- CJ-CBRND-TF
- CBRN Reachback
- Technology Watch Keeper
  - Strategic Foresight Analysis 2017 Report
  - Technological Trends Report 2017
  - Framework for Future Alliance Operations 2018 (FFAO)
  - Science and Technology Organization (STO)
  - Long Term Aspects (LTA)

Technological Trends Report 2017

Science and Technology Organization

Empowering the Alliance's Technological Edge

NATO SCIENCE & TECHNOLOGY BOARD

STO Tech Trends Report 2017

CONTENTS

Framework for Future Alliance Operations 2018 (FFAO)

INSTABILITY SITUATIONS*

- WMD PROLIFERATION/THREAT/USE
- CONVENTIONAL WAR
- THREAT ESCALATION
- HYBRID WAR
- IRREGULAR WAR
- TERRORISM
- GLOBAL COMMONS DISRUPTION
- CRITICAL INFRASTRUCTURE ATTACK
- INFORMATION WARFARE
- CYBERATTACK
- GOVERNANCE CHALLENGES
- ENDANGERMENT OF CIVILIAN POPULATIONS
- MASS MIGRATION
- PANDEMIC DISEASE
- NATURAL/MAN-MADE DISASTERS

**NOT EXHAUSTIVE*

CENTRAL IDEA

To keep the military edge and prevail in future operations, NATO forces must continually evolve, adapt, and innovate and be credible, networked, aware, agile, and resilient.

Questions ?

MAJ/P Joseph KOPCHA, USA-Army
SHAPE/ACO CBRN SO
23 July 2019
NDIA 2019
Wilmington, DE
JOSEPH.KOPCHA@SHAPE.NATO.INT
JOSEPH.A.KOPCHA.MIL@MAIL.MIL

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND CHEMICAL BIOLOGICAL CENTER

Modernizing the Future Force: Science and Technology Panel

Eric L. Moore, Ph.D.

Director

CCDC Chemical Biological Center

The views expressed in this presentation are those of the speaker, and do not reflect the official policy of the Department of Army, Department of Defense, or U.S. Government

CCDC ORGANIZATION

GEN John M. Murray
CG AFC

DEVCOM

MG Cedric T. Wins
CG CCDC

Mr. John S. Willison
Deputy to the CG CCDC

CSM Jon R. Stanley
CSM CCDC

COL Terrece B. Harris
Chief of Staff CCDC

BG Vincent F. Malone
DCG CCDC

- CCDC Atlantic
- CCDC Pacific
- CCDC Americas

- U.S. Army CCDC Armaments Center
- U.S. Army CCDC Aviation & Missile Center
- U.S. Army CCDC C5ISR Center
- U.S. Army CCDC Chemical Biological Center
- U.S. Army CCDC Ground Vehicle Systems Center
- U.S. Army CCDC Soldier Center
- U.S. Army CCDC Data & Analysis Center

U.S. Army CCDC
Army Research Laboratory

CCDC CHEMICAL BIOLOGICAL CENTER LEADERSHIP

Director

Eric L Moore, Ph.D.

Military Deputy
COL Thomas Saltysiak, Ph.D.

Research & Technology
Director
Frederick J. Cox, Ph.D.

- **Biosciences**
- **Chemical and Biological Detection**
- **Chemical and Biological Protection and Decontamination**
- **Chemical Sciences**
- **Physics and Computational Sciences**
- **Toxicology and Obscurants**

Senior Research Scientist, Chemistry
Augustus Way Fountain, Ph.D

Senior Research Scientist, BioTechnology
Peter Emanuel, Ph.D

Engineering
Director
Suzanne Milchling

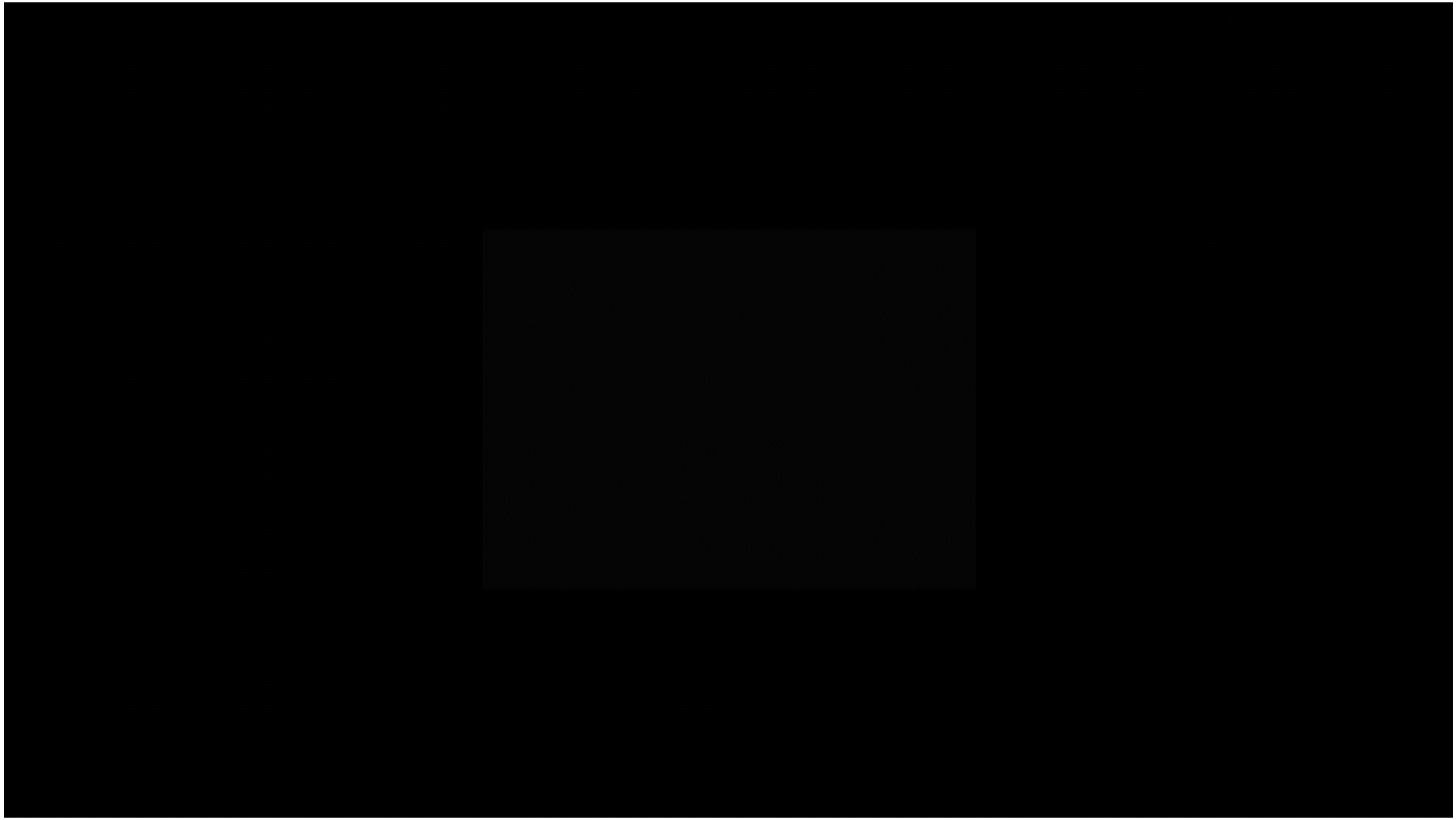
- **JPEO support**
- **Product Engineering**
- **Acquisition Logistics**
- **Advanced Design and Manufacturing**
- **Engineering Test**
- **Special Projects**
- **Engineering Support**
- **Sustainment Engineering**
- **Sustainment Support**

Operational Applications
Director
Paul Tanenbaum, Ph.D.

- **Biological Testing (DPG)**
- **Chemical and Biological Integration**
- **Chemical and Biological Operations**

MISSION:

BE THE NATION'S PREMIER PROVIDER OF INNOVATIVE CHEMICAL AND BIOLOGICAL SOLUTIONS



COLLABORATION OPPORTUNITIES

Technology Transfer Collaborations:

- Enable accomplishment of technology transition objectives for the Warfighter while benefiting U.S. industry
- Enable industry, academia and other organizations to leverage ECBC's unique assets: intellectual property portfolio, science and engineering expertise, and infrastructure

CBC serves as a valuable partner to industry, academia and Other Government Agencies.
Partnering occurs across the life cycle.

COLLABORATION MECHANISMS

Cooperative Research & Development Agreement (CRADA)
Educational Partnership Agreements (EPA)
Technology Support Agreement (TSA)
Patent License Agreement (PLA)
Army Small Business Innovation Research (SBIR)
Chemical Biological Defense (CBD) SBIR
Army Small Business Technology Transfer (STTR)
ECBC Broad Agency Announcement (BAA)
Rapid Innovation Fund BAA
Memorandum of Understanding (MOU)
Memorandum of Agreement (MOA)
Material Transfer Agreement (MTA)
Interagency Agreement – non-DoD (IAA)

Contact our Technology Transfer Office 410-436-4438 for more information

Pre- Contract Award?
CBC will support proposal efforts by supplying a Letter of Intent

CONTACT US

CCDC Chemical Biological Public Affairs Office:

Richard Arndt
410-436-1479
richard.m.arndt.civ@mail.mil

CCDC Chemical Biological Center Technology Transfer Office:

Amanda Hess
(410) 436-5406
amanda.l.hess9.civ@mail.mil

Follow us online:

http://www.ecbc.army.mil/

2019 CBRN Defense Conference & Exhibition

Modernizing the Future Force: Science & Technology Panel

Dr. Ron Hann

Director, Chemical and Biological Technologies Department

Defense Threat Reduction Agency

Unclassified

DTRA Mission

The Defense Threat Reduction Agency enables DoD, the U.S. Government, and International Partners to counter and deter Weapons of Mass Destruction and Improvised Threat Networks

Strategy: Deliver S&T Products

CB Mission: Lead DoD science and technology to anticipate, defend and safeguard against chemical and biological threats for the warfighter and the nation.

Doing Business with DTRA

Grants.gov
Fundamental Research BAA: HDTRA1-14-24-FRCWMD-BAA

FBO.gov
- S&T New Initiatives BAA: HDTRA1-17-S-0002-BAA
- Chem-Bio Technologies BAA: HDTRA1-18-S-0001

cbdsbir.net
Small Business Innovation Research
Small Business Technology Transfer

sbir.defensebusiness.org
All DoD SBIR & STTR proposals (small businesses only) are submitted here.

Submit to: www.dtrasubmission.net
Questions? Email: DTRAInnovation@mail.mil

CBD S&T Conference

SAVE THE DATE

CBD S&T CONFERENCE 2019

Duke Energy Convention Center

November 18 - 21, 2019 | Cincinatti, Ohio

BARDA's Role in Incentivizing Medical Countermeasure Research and Development

Julio Barrera-Oro, PhD
Project Officer, Burn Medical Countermeasures
Biomedical Advanced Research and Development Authority (BARDA)

2019 CBRN Defense Conference & Exhibition
Wilmington, DE
July 23, 2019


U.S. Department of Health & Human Services
ASPR
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE
Assistant Secretary for Preparedness & Response
BARDA
BIOMEDICAL ADVANCED RESEARCH AND DEVELOPMENT AUTHORITY
Biomedical Advanced Research & Development Authority

ASPR Mission

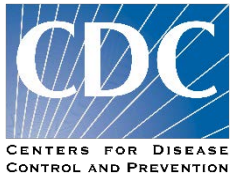
Save Lives and Protect Americans from 21st Century Health Security Threats

ASPR Priorities for Building Readiness for 21st Century Threats

The BARDA Model

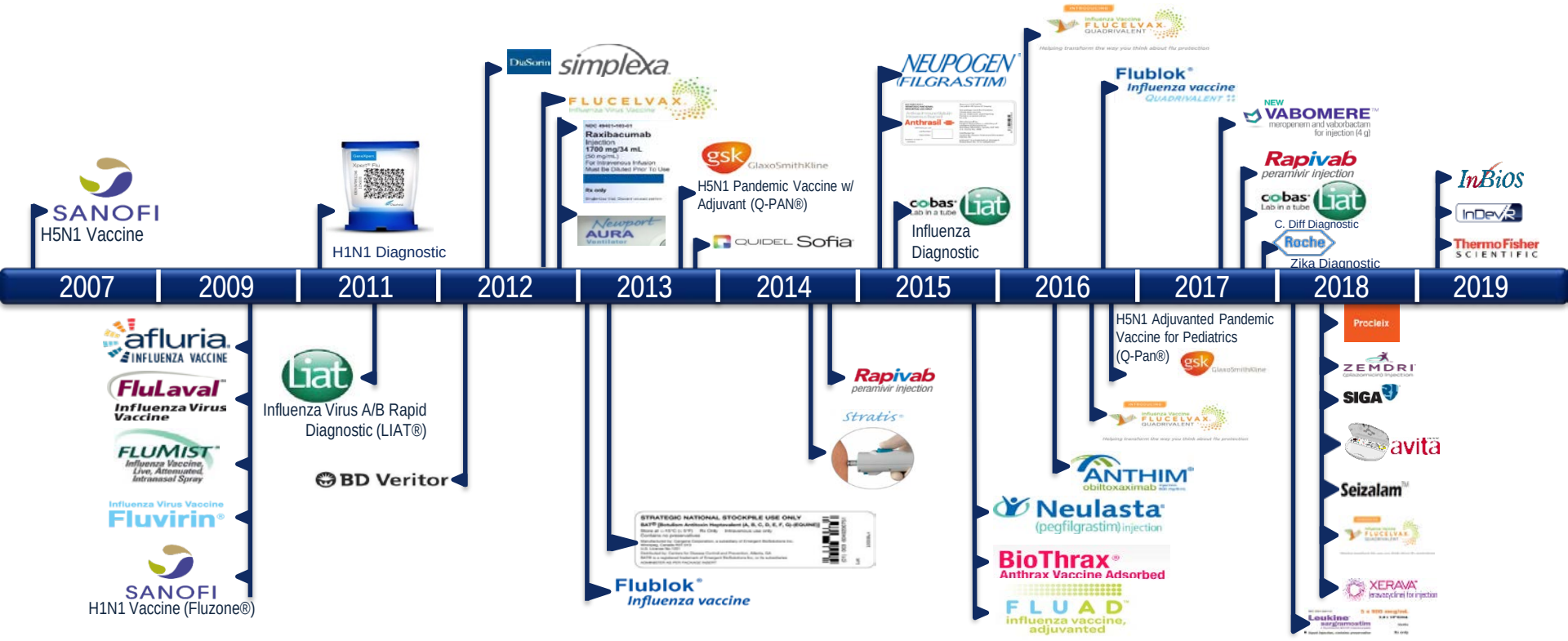
BARDA develops and makes available medical countermeasures **(MCMs)** by forming unique public-private partnerships to drive innovation off the bench to the patient to save lives.

Our Government Partners



Our Industry Partners

45 FDA Approvals, Licensures, and Clearances



Project BioShield

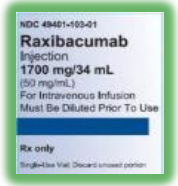
A COMMITMENT

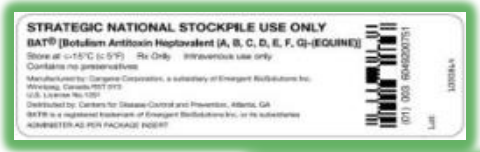
27 Products supported

15 Products added to the Strategic National Stockpile

10 Products taken to FDA approval/licensure/clearance



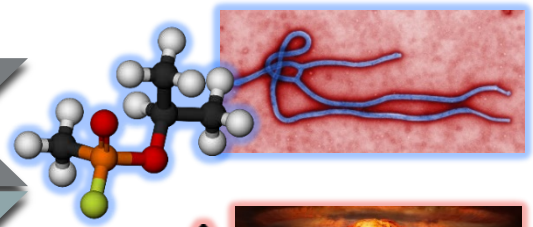


21st Century: An Increasingly Complex & Dangerous World

CBRN Priority Investment Areas

Stockpile at least one countermeasure for all threats that have a material threat determination

- Develop innovative rapid response capabilities to address unknown threats
- Repurpose products to treat injuries from radiological, nuclear and chemical threats
- Invest in new antibacterial agents, vaccines and rapid point of care diagnostics
- Deliver countermeasures against chemical and viral hemorrhagic fever threats



CARB-X

Combating Antibiotic Resistant Bacteria

Biopharmaceutical accelerator: Model partnership to support innovation and early R&D

FUNDERS

ASPR – Assistant Secretary for Preparedness and Response

BARDA – Biomedical Advanced Research and Development Authority

NIH – National Institute of Allergy and Infectious Diseases

wellcome

UKaid from the British people

Bundesministerium für Bildung und Forschung

ALLIANCE PARTNER

Bill & Melinda Gates foundation

ADMINISTRATION

Boston University

OTHER PARTNERS & ACCELERATORS

Boston University

Basel Area. Swiss

BioInnovation Institute

CLSI California Life Sciences Institute

C-CAMP Centre for Cellular and Molecular Platforms

DZIF German Center for Infection Research

FIND Because diagnosis matters

ILSE Institute for Life Science Entrepreneurship

MassBio Massachusetts Biotechnology Council

RTI International

wellcome

BARDA Division of Research, Innovation, and Ventures (DRIVe)

DRIVe Mission: Transforming Health Security

Accelerate the research, development, and availability of transformative countermeasures to protect Americans from natural and intentional health security threats.

DRIVe Transforming Health Security

DRIVe-Ready

CAPTURE
Set targets & research agenda Coordinate with "deep thinkers" across USG, academia, industry, and other stakeholders.

SOLUTION MAPPING
Establish Integrated Solutions for Intelligent Acceleration

DRIVe-X

ACCELERATE
Investors: BARDA, DoD

DRIVe-Launch

INITIAL SUSTAINMENT (1-18 Months)
Investors: BARDA, MCIP

DRIVe VENTURES Investing in National Health Security

STRATEGIC SUSTAINMENT
Corporate Venture Capital Model Investment in Products

PHEMCE 2.0 Industry DoD

BARDA Has Had a Successful Decade

Formed strong partnerships with over 250 industry partners

Supported 45 FDA licensure/ approvals across 40 different medical countermeasures

Supported 27 different projects under Project BioShield,15 products added to the Strategic National Stockpile, 10 FDA licensures

Significantly expanded domestic vaccine production capacity: 60 M doses to 600 M antigen doses for influenza

Accelerated antibacterial product development to address critical vulnerabilities

How to Contact BARDA

medicalcountermeasures.gov

Portal to BARDA: ***Register to request a TechWatch meeting!***

www.fbo.gov/

("FedBizOpps")

Official announcements and info for all government contract solicitations

www.phe.gov/BARDA

Program description, information, news, announcements

www.drive.hhs.gov

DRIVe questions

www.usajobs.gov

Join the team!

Our People Are Our Success

BIOMEDICAL ADVANCED RESEARCH AND DEVELOPMENT AUTHORITY

BARDA

UNCLASSIFIED

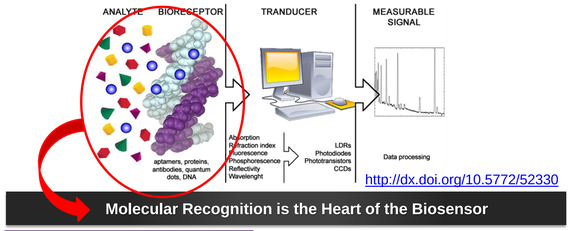
Peptide-based Receptor Development for Potential Integration into Wearable Bio-sensors

Sanchao Liu, Justin Bickford and Matthew Coppock

Sensors and Electron Devices Directorate, CCDC Army Research Lab, Adelphi, MD 20783

Objectives

Developing Biosensors for the Future Warfighter



Meeting requirements for:
- Robust functionality under environmental extremes
- Suitability for new and emerging threats
- Capability for rapid development and production

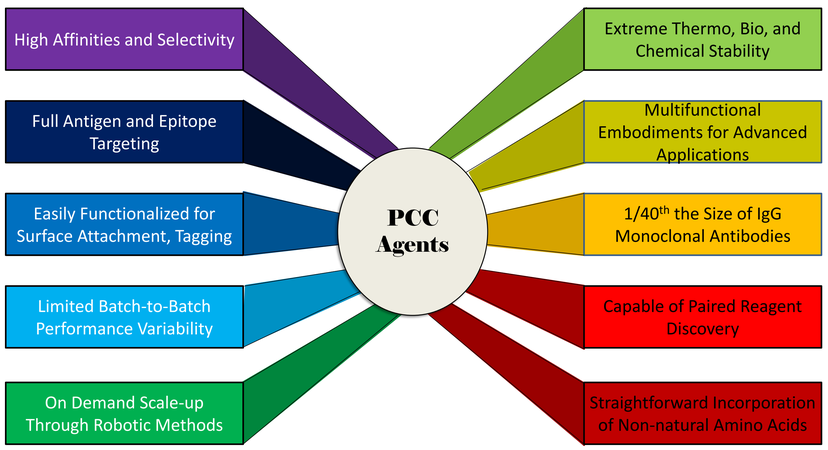
WILL PROVIDE

Technology to support:
- Water and food defense
- Individual soldier protection
- Collective protection
- Soldier health monitoring

Soldier wearables

In the multifaceted operational environments of future wars, Army forces will need to be more adaptive and optimized for execution. The development and production of ruggedized biosensors can provide real-time feedback for soldier health, performance, and biothreats.

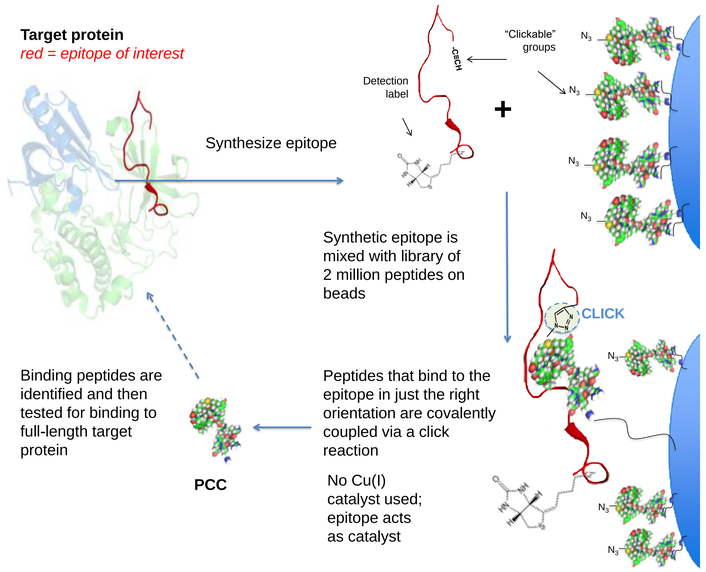
Advantages of Protein Catalyzed Capture Agents (PCCs) based Receptors



Targets: Toxins, biothreats, performance and health biomarkers

IL-17: an inflammation-associated interleukin
IL-6: inflammation and infection responses
IL-10: an immunosuppressive cytokine
IL-11: a signaling molecule improving platelet recovery after chemotherapy
UCHL-1: a human biomarker signaling traumatic brain injury (TBI)
CHIKV E2: virus for high fever
TNFα: Tumour Necrosis Factor alpha
IFNγ: Interferon gamma, inhibit viral replication

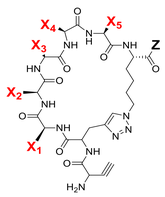
Epitope-targeted PCCs Development Procedures



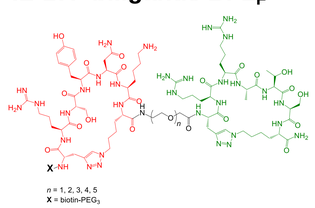
Multiple epitopes can be targeted and the resulting PCCs can be tethered to exploit cooperativity. The bi/tri-ligands show strong affinity (pM) and high selectivity for the target.

Cyclic PCC Stability

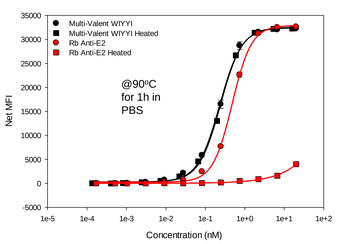
CHIKV E2 ligand: WIYYI



IL-17F biligands Bi-L_F

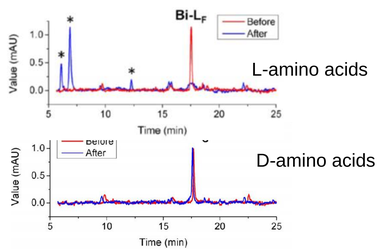


Thermal Stability



Luminex assay of the binding affinity of PCCs before and after heating at 90 °C for 1 h.
Rb Anti-E2: antibody

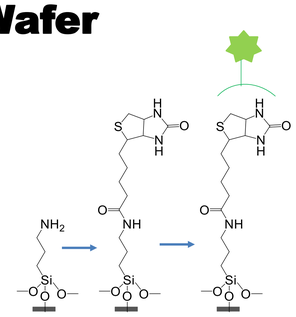
Biological Stability



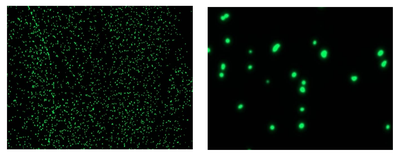
HPLC data for Bi-L_F before and after treatment with trypsin for 1h at 37 °C
* - Degradation products

Cyclic PCCs showed much higher thermal and biological stability compared to antibodies

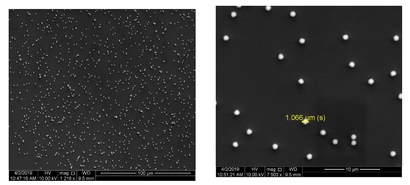
Surface Modification on Silicon Wafer



Streptavidin coated fluorescent beads

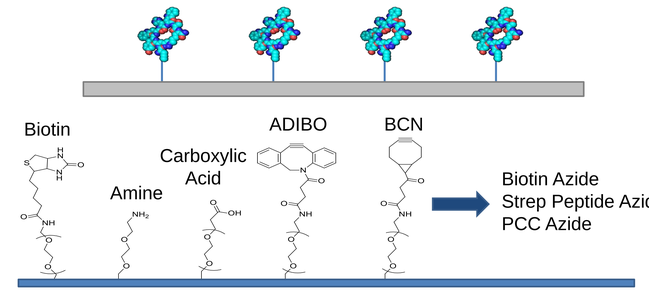


Streptavidin coated magnet beads



What's next: silicon surface will be modified with different silanes together with photolithography procedures to form different patterns. PCC-based receptors will then be attached on the Si-wafer surface.

Applications: PCCs will be integrated into silicon-based PIC (photonic integrated circuits) sensors to provide multiplex detection with true portability and high accuracy for DoD relevant applications.



Conclusions

- Peptide-based receptors fulfill the need for alternative antibodies by addressing critical gaps in adaptability, manufacturability, and stability.
- PCCs can be integrated into multiple platforms for real-time monitoring of biothreats and soldier health/performance
- Universal, wearable, disposable, and low cost

References

Coppock *et al. Sens. Biosensing Res.*, **2019**, *22*, 100248.
Coppock *et al*. *Methods*, **2019**, *158*, 12-16.
Coppock *et al*. *Peptide Science,* **2017**, 108: e22934.
Lai *et al., Chem. Eur. J*. **2018**, 24, 3760.
Agnew *et al. Chem. Rev.*, **2019**,
https://doi.org/10.1021/acs.chemrev.8b00660

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UNCLASSIFIED

Contamination Mapping the Agentase Disclosure Spray Using Simultaneous Localization and Mapping and Augmented Reality

Scott Donahue, Deanne Applegate, Jessica Milke, and Jeremy Walker, PhD

Agentase Disclosure Spray (ADS)

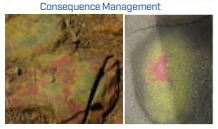
- Sprayable enzyme-based indicator that can be used for detection and mapping CWA contamination over large surfaces
- Available at handheld and wide area scales for different missions / applications

Decontamination

SSA/SSE Missions

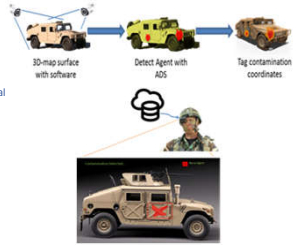
Protective Equipment Doffing

Consequence Management

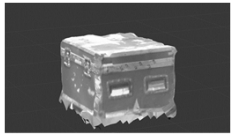


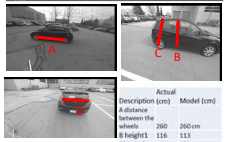
Vehicle Contamination Mapping

- Develop a system for high-resolution 3D digital contamination mapping in order to locate, tag, store, and recall ADS contamination information
- Enable real-time detection signal augmentation
- Facilitate focused decon and decon assurance operations
- Interface with future autonomous/robotic decontamination capabilities



Using Stereo Cameras to generate 3D Models

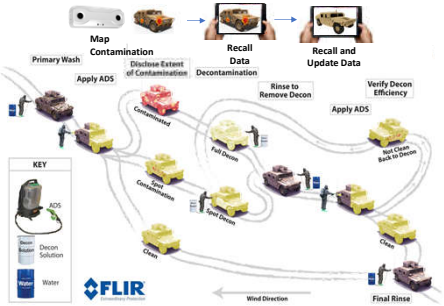




Description	Actual (cm)	Model measurement (cm)
A depth (inner margins)	44	44, 42, 45
B height	33	33, 31, 34
C width	51	51, 52, 50

Description	Actual (cm)	Model (cm)
A distance between the wheels	260	260 cm
B height1	116	113
C height2	141	139
D width	119	105

Decon Triage with ADS



Wide-Area Chemical Release Mapping

Russian spy and his daughter were poisoned by nerve agent

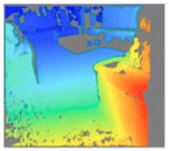
Tokyo subway sarin attack
地下鉄サリン事件

- ADS can be used to map contamination on terrain to minimize the spread of contamination and assist with remediation.

SLAM using Stereo Cameras

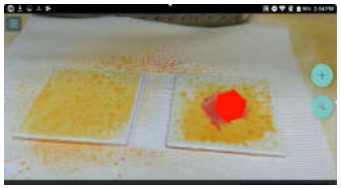
- SLAM: Simultaneous Localization and Mapping
  - Construction of a map of an unknown environment while keeping track of the camera location within it
- Stereo cameras use triangulation for 3D sensing
  - Similar to human vision
  - Correspondence attempted between cameras for every stereo image pixel results in tens of thousands of 3D values
  - Visual odometry for positional tracking

FLIR BPC 2500 camera



Area Mapping and Signal Detection

- Demo app on Google Tango area learning platform
- Red color detected and augmented on live video
- Location of threat is tagged
- Augmentation stays in place after signal is gone
- Ideal for Mapping and Tagging Chemical Threats over large areas



Sensitive Site Assessment & Exploitation

1. Sample the ADS positive test result
2. Extract the sampler
3. Inject it on the Griffin 510 GCMS to identify the chemical species

- Tagged ADS location can be sampled for downrange confirmatory GC/MS analysis in the hot-zone to identify the chemical threat.

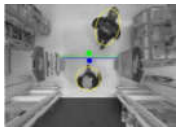
Contamination Indicator / Decon Assurance System (CIDAS)

- Mission: Field Agent Disclosure Spray (Nerve & Training) to Joint Services for Contamination Disclosure and Decon Assurance / Validation
- Customer: JPEO CBRND – JPM Protection
- Users: Army, Air Force, Marines, USSOCOM
- FLIR is the sole prime contractor
  - EMD 2015 – 2017
  - LRIP 2017 – 2019
  - FRP 2019 – 2025
- Blister Agent formulation to transition in 2019

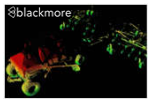
FLIR IIS Stereo Camera

Current use of the FLIR IIS stereo camera (BPC 2500)
- Mostly used as a closed product for people tracking in retail stores
- Also used for assisted boat docking by Raymarine

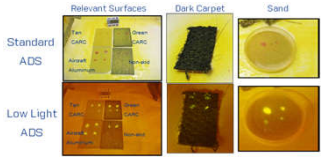
Merits of the BPC camera over other stereo cameras
- Ethernet interface, on-board stereo processing, high calibration accuracy
- Onboard System on a Chip (SoC) makes the product flexible to adjust for particular application



ADS Signal Detection



- Red detection challenges
  - Dark surfaces
  - Porous surfaces
  - Shaded areas
  - Low light conditions
- Risk management
  - ADS fluorescent additive
    - Excited with blue light, observed with orange filter
  - LIDAR-higher resolution 3D modeling
  - Machine learning – train camera and algorithm to identify threats



Acknowledgments

- FLIR
  - Integrated Imaging Solutions
  - Intelligent Transportation Solutions
  - Raymarine
- Novacoast, Inc.
- Blackmore Sensors and Analytics, Inc.
- ADS development funding
  - Defense Threat Reduction Agency
  - Joint Program Executive Office CBRND
  - Army Research Office

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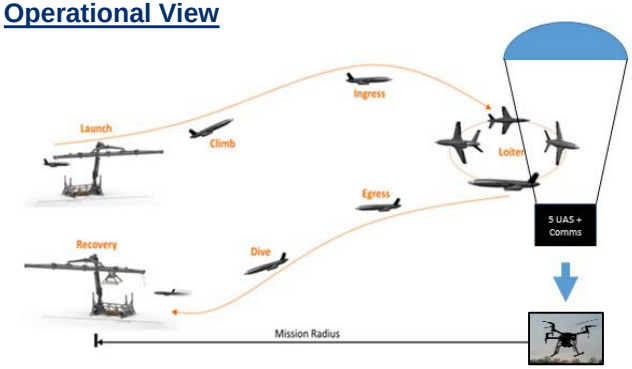
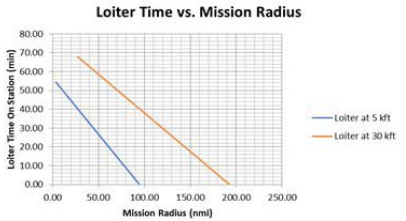
Low-Cost COTS-Based VTOL-UAS for Deep CBRN Sensing Missions

Distribution Statement: A

Operational View





Projected Operational and Performance Capabilities

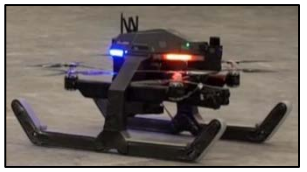
- Low-cost COTS-based VTOL-UAS militarized by adapting and optimizing for ISR and sensing capabilities, and then employed within an autonomous, stealthy swarm construct could be comparable to nature by the effects of one bee versus a bee swarm. Two examples:
- Drones flying nap-of-the earth and each carrying a suite of ISR and CBRN sensors arrive upon a sensitive site undetected, conduct ISR and on order, enter and conduct close-in CBRN sensing and detailed imaging of the site.
- Drones released from a Jet-powered UAS or submersible, and flying just over wave-tops, arrive and conduct low-altitude/low-speed ISR of a beachhead and on order, conduct CBRN sensing and detailed imaging of a sensitive site in support of a forcible entry or humanitarian operation.

There is potential for an effective Sensing Circular Error Probable (S-CEP) of perhaps 1 foot at 100+ miles range.

Operational and Technical Approach

- Under A2/AD conditions, a group of VTOL-UAS drones are delivered OTH and fly nap-of-the earth carrying ISR and CBRN sensors.
- They conduct ISR and on order, conduct entry into a sensitive site for CBRN sensing in support of a forcible entry or humanitarian operation.
- These are relatively low-cost, adapted COTS-based VTOL-UAS that can image an operating area and then precisely inject CBRN sensors into the space.
- This approach leverages and builds using adapted commercial parts to keep pricing within an “expendable” range.
- Target sub-$20K price point per (naked) aircraft at the prototype stage.
- The UAS carries selectable CBRN sensors as part of removable landing legs.
- The approach uses GFE sensors with Dedicated Radios and SATCOM.
- Leverage AFRL/DTRA/SOCOM “Lethal Doormat” Lessons Learned.

Key Elements



Small GFE CBRN Sensors

Our Team

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FIREFLY: Dynamically Deployable Situational Awareness Platform for Emergency Events

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Challenge

Offensive fire response operations within large buildings require first responder teams to navigate complex, unfamiliar floor plans in hazardous conditions with limited visibility. Determining the location of responders that become lost or disoriented in these buildings constitutes a significant challenge for Incident Commanders, as they are responsible for coordinating rescue efforts with limited information.

FIREFLY Platform

FIREFLY is a dynamically deployable, situational awareness platform that gives Incident Commanders real-time visibility into the locations of on-scene personnel as well as environmental conditions during emergency response operations. FIREFLY is composed of inexpensive ***wearable devices***, a real-time, ***AI & analytics engine*** for receiving, storing and applying machine learning techniques to augment on-scene decision making, and a game-engine based ***command and control dashboard*** to render on-scene personnel locations and evolving environmental conditions. We have also integrated the use of our environmental monitoring devices into drone swarms that can be dispatched quickly at a scene to identify airborne contaminants in an area.

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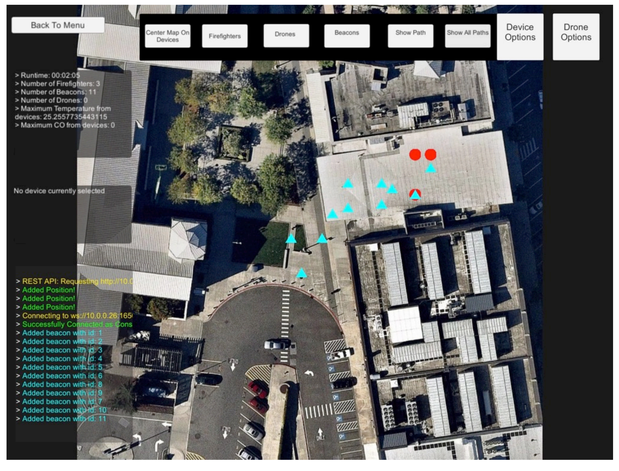
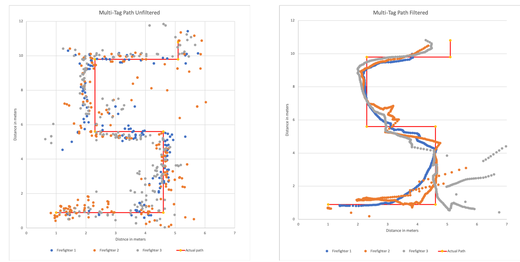
Enhanced Operational Visibility For Incident Command

FIREFLY Command Tablet enables real-time visibility of environmental conditions during emergency response events. AI-based analytics are available to augment IC decision making, accelerate response operations, and adapt to real time threats. Below, responders (red dots) are tracked during a search operation in an urban building.



Field testing wearable location tracking badges and autonomous drone environmental monitoring during live house fire. Right: FIREFLY Command Tablet view of airborne contaminants measured in real-time during house fire event. Deploying drones and rendering environmental conditions uses the same Command interface for personnel tracking and analytics.

Accurate Indoor Tracking



Left: Raw indoor location tracking relative to ground truth (red line) using dynamically deployed anchors. Right: Indoor location tracking using patent-pending location tracking pipeline and dynamic anchors. Accuracy within 1m.

HazMat Visibility

Acknowledgements

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