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STATEMENT OF

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CHEMICAL AND BIOLOGICAL DEFENSE

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1. INTRODUCTION

Mr. Chairman and distinguished Members of the Committee, I am honored to testify on behalf of the Department of Defense (DoD) Chemical and Biological Defense Program (CBDP), the U.S. Army as the Program's Executive Agent, and as the Joint Program Executive Officer for Chemical and Biological Defense (JPEO CBD) regarding technologies to combat Weapons of Mass Destruction (WMD).

As stated in the 2008 Army Posture Statement, persistent conflict and change characterize our strategic environment. We will confront highly adaptive and intelligent adversaries who exploit technology, information and cultural differences to threaten the interests of the United States. While advances in technology are benefiting people all over the world, extremists are exploiting that same technology to manipulate perceptions, export terror and recruit the people who feel disenfranchised or threatened by its effects. The diffusion and increasing availability of technology increases the potential of catastrophic nuclear, biological and chemical attacks. Many terrorist groups and organizations are assessed to be actively seeking Weapons of Mass Destruction.

Today I will address how we in the CBDP do three things to minimize the impact of nuclear, biological and chemical attacks; we support the Force and ongoing operations, we field improved capabilities and we build for the future. My testimony today will touch on all three of these missions from the perspective of the challenges posed by the evolving WMD threat. Additionally, I will discuss how we are collaborating with others

to harness the technologies necessary to generate capabilities for mitigating that threat. First, however, I will briefly describe the CBDP.

Public Law 103-160 Establishes the CBDP

Enacted by Congress in 1994, Public Law 103-160 designated the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs as the focal point for oversight of the CBDP, and it designated the U.S. Army as the Department of Defense Executive Agent for certain key aspects of the CBDP. It also consolidated all chemical and biological warfare defense training activities of the DoD at the U.S. Army Chemical, Biological, Radiological and Nuclear School.

The Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs is responsible for overall coordination and integration of the CBDP and exercises oversight through a Defense Acquisition Board process.

The U.S. Army, as the CBDP Executive Agent for the Department of Defense coordinates and integrates research, development, test and evaluation, and acquisition requirements of the military departments for chemical and biological warfare defense programs.

The CBDP and the National Military Strategies

Today our Armed Forces execute a wide range of missions from traditional combat to homeland defense, civil support, installation protection and consequence management to special operations, counterterrorism, security and police actions. Our CBDP Strategic Context incorporates the guidance from multiple National and Military Strategies. Our CBDP Strategic Context reflects the potential for layered missions and tasks, operations in and from forward areas, and maintenance of capabilities and forces to wage multiple campaigns in a given time frame.

As you know, the National Strategy to Combat WMD established the three pillars of our National Strategy. The pillars; Nonproliferation, Counter-proliferation and Consequence Management, and their four cross-cutting enabling functions form the foundation of a seamless layered defense. The 2006 National Military Strategy to Combat WMD supports the National Strategy and provides to the Services, combatant commands, and military planners a strategic framework for combating WMD. In accordance with this strategy DoD seeks to "dissuade, deter and defeat those who seek to harm the United States, its allies, and partners through WMD use or threat of use and, if attacked to mitigate the effects and restore deterrence."

Based on this strategic framework, DoD developed a Force Planning Construct. The CBDP utilizes the DoD Force Planning Construct as the foundation for identification and analysis of required capabilities to ensure that operations are unconstrained by Chemical,

Biological, Radiological and Nuclear effects. This vision brings together doctrine, organization, training, materiel leadership and education, personnel, facilities and technology in a manner as to eliminate the burden currently imposed upon our Warfighters by Chemical, Biological, Radiological and Nuclear defense equipment.

The CBDP uses the "operational attributes" or capability areas of *Sense, Shield, Sustain, Shape* as core capabilities in which to categorize Chemical, Biological, Radiological and Nuclear technologies and capabilities. The CBDP provides technologies and capabilities to *Sense* Chemical, Biological, Radiological and Nuclear hazards, *Shield* (protect) the force from these hazards, *Sustain* the personnel and equipment while restoring combat power and recovering from the effects of the hazards, *Sense* the presence of hazards and *Shape* the Chemical, Biological, Radiological and Nuclear environment by enabling the joint force commander to understand the current and predicted Chemical, Biological, Radiological and Nuclear situation. These technologies can often be directly used or adapted to provide the commanders with the capabilities required to support various aspects of the five Counter-proliferation missions which include; Passive Defense, Offensive Operations, Elimination Operations, Interdiction Operations, and Active Defense. The use of these *Sense, Shape, Shield and Sustain* core capability areas support the active, layered, defense-in-depth that has been established to dissuade, deter, and defeat those who seek to harm the United States, its allies, and partners through WMD use or threat of use.

The CBDP is a critical component of the DoD efforts to support national and military strategies in combating WMD. During the rest of my statement, I will focus on how the CBDP is providing the best chemical and biological defense capabilities in support of these strategies.

2. THE NEW THEORY OF WAR

The rapid pace of chemical and biological technology development and proliferation through the information age, as well as globalization of technology and expertise has broadened the threat context

These facts make uncertainty the defining characteristic of the present and future environment. Where once the capabilities of our adversaries were generally well understood and their intentions unclear, we now face quite the reverse situation. The intentions of our adversaries are clear while their capabilities are more varied and expanding. Jihadist websites and public statements frequently refer to "decisive strategic operations with Weapons of Mass Destruction." The July 2007 National Intelligence Estimate on "The Terrorist Threat to the U.S. Homeland" concludes that "Al Qaeda will continue to try to acquire and employ Chemical, Biological, Radiological and Nuclear material in attacks" This view was again reinforced by the Director of National Intelligence as recently as February 5, 2008.

We must now prepare our armed forces for a much broader array of current threats, including toxic industrial chemicals and materials, while also preparing for future threats. For example terrorists may soon be able to cause mass casualties, or create significant socio-economic impacts, that in the past were only possible for state-run biological weapons programs. Scientists can already engineer biological agents to enhance their lethality either through genetic engineering or other types of manipulations. Given the exponential growth in the field of biotechnology and global access to scientific information on the Internet, our vulnerability to this threat may be closer than we suspect. Toxic Industrial Chemicals are present everywhere in the industrialized world and their availability and toxicity make a potent combination for use both in areas of conflict abroad and by terrorists at home. The ongoing efforts of nation-states, terrorists and even individuals to develop and/or acquire these dangerous agents, weapons and delivery systems constitute major threats to the safety of our nation, our deployed troops, and our allies around the world.

Nation-states pose an additional biological weapons threat, and the weapons they can produce are potentially more sophisticated, and therefore more lethal, than those made by terrorists. While fear of retribution may deter nations from using biological weapons against the U.S., their covert use may be a different matter. States could attack the United States or its military installations and avoid retaliation by posing as terrorists.

The threat from the potential use of biological agents is expected to increase over the next decade as those countries now believed to have biological warfare programs, as well as

additional states, terrorist groups and even individuals seek advanced capabilities. There is an increasing availability of biological warfare-related technology, materials, information and expertise, and publicity about potential vulnerabilities. Genetic engineering is just one of a growing number of biotechnologies that could allow countries to develop agents, such as modified viruses, that could make detection and diagnosis difficult and may defeat current protection and treatment protocols. Because of the dual-use nature of the materials needed to produce biological warfare agents, any country with the political will and a competent scientific base could probably produce agents.

The chemical threat is no less real, as demonstrated by the terrorists that used the traditional chemical warfare agent Sarin in the Tokyo subway system and in Matsumoto 13 years ago. This threat is likely to also grow in the coming years for several reasons. The increased availability of chemical technologies, coupled with the relative ease of producing some chemical agents, as well as the potential emergence of advanced/future agents has increased concern that production and use may become more attractive to states or terrorist groups in the future.

New adversaries drive new relationships between threats abroad and at home and a new concept of security for the American citizen

Terrorism threats to the Homeland, to our deployed troops, to our national security interests, and to our allies are the pre-eminent challenge we face today. While the use of conventional explosives is currently the most likely attack scenario, al-Qa'ida and other terrorist groups are attempting to acquire chemical, biological, radiological, and nuclear weapons and materials, and have already demonstrated a willingness to use them. Indeed, today we are more likely to see an attack from terrorists using chemical, biological, radiological materials than from nation-states, as the Intelligence Community indicates that nearly 40 terrorist organizations, insurgencies, or cults have used, possessed, or expressed an interest in WMD.

Of the potential terrorist WMD threats facing the United States, those related to biological substances have evolved the most rapidly during the past 20 years. Unlike nuclear or chemical weapons, a biological weapon has already been used to attack the United States, in the form of the anthrax letter attacks in 2001. This still unsolved criminal attack killed five people, crippled mail delivery in several cities, and required decontamination efforts costing more than $1 billion.

The deliberate use of Toxic Industrial Chemicals against people, territory, or property of the U.S. could produce severe consequences. Beginning in January 2007, insurgents in Iraq began the use of chlorine cylinders in improvised explosive devices. While to date

these types of attacks have killed fewer people than conventional suicide bombs, it marked a new phase in the insurgency and has increased concerns that non-state actors will use toxic industrial chemicals or conventional chemical weapons in other countries. The risks to the United States by terrorist use of Toxic Industrial Chemicals and/or chemical agents are very real with significant potential to affect public health, critical infrastructure, the environment, and the economy.

In conclusion, over the past two decades, the global WMD threat has grown significantly more complex and diverse. It has broadened from a focus on State threats to one that includes both State and non-State actors. Additionally, the WMD threat is not limited to a specific region or type of conflict. The threat, as well as our enemies, is evolving and therefore our strategy must be flexible and proactive.

3. DELIVERING CAPABILITIES NOW AND IN THE FUTURE

Supporting the Force: fielding and logistics support

We rapidly fielded many new capabilities and additional increments of existing capabilities in support of Operation Iraqi Freedom. These capabilities include Toxic Industrial Chemical detectors, protective equipment and decontamination capability; reconnaissance vehicles with enhanced Toxic Industrial Chemical detection capability, armor and weapons, and; mobile vehicle inspection systems. We continue to provide in

theater daily support for those systems both through resident Contractor Logistics Support contact teams and our JPEO CBD Chemical, Biological, Radiological and Nuclear Information Resource Center which operates on a 24/7 basis and serves as a single entry point for all requests for information related to the CBDP. This hot line can be accessed on line or via telephone by Service personnel throughout the world.

To counter the existing threat we field equipment and pharmaceuticals to support our Forces and current operation. In Fiscal Year 2007, we fielded equipment and pharmaceuticals in 48 States, 19 countries and 3 continents. This included nearly 7,000 chemical detectors, over 200 biological detectors, over 2,000 radiation detectors, over 8,000 specialized protective suits and over 50 Warning and Reporting software systems. In coordination with the Department of Health and Human Services, we have provided over 2 million doses of Anthrax vaccine and annually provide over 500,000 doses of Small Pox vaccine. With delivery of this equipment, previously fielded equipment, and the associated training and doctrine, the U.S. Military can better operate and succeed in the face of WMD on the battlefield. The CBDP invests approximately one billion dollars a year to field capability and to develop advanced technologies that will allow us to keep pace with the threat.

Improving Capabilities: our Research and Development

As we stated earlier, the functional construct the CBDP uses to combat chemical and biological agents is termed Sense, Shape, Shield and Sustain. Within those functions are

specific capabilities and technologies such as detection, protection, information systems, and medical systems. We also field integrated systems such as the installation protection program and the National Guard Civil Support teams. I will next discuss highlights of the various technologies being developed and an assessment of where technology development is proceeding in each.

Sense Capability

The primary roles of Sense Capabilities are to provide chemical and biological detection and facilitate warning of a chemical and biological event so forces can assume a protective posture and avoid exposure. This is accomplished by deploying multiple point sensors upwind of forces and several standoff sensors to scan wide areas not monitored by the point sensors. The early warning of potential hazards is critical to mission success. Without it, forces would be unlikely to react rapidly enough to avoid exposure. Chemical and biological detection is also used in restoring operations, consequence management and medical diagnostics.

Our current detector to address this threat is the Automated Chemical Agent Detector. Next year we will transition to the Joint Chemical Agent Detector which will provide improved detection capability at half the cost, a tenth of the weight and about one quarter the size of the Automated Chemical Agent Detector. This will allow chemical early warning detection capability to be fielded to more troops and integrated onto more platforms improving situational awareness throughout the DoD. Next year we will also

field the Joint Service Lightweight Standoff Chemical Agent Detector as a sensor on the Stryker Nuclear, Biological and Chemical reconnaissance vehicle. The Joint Service Lightweight Standoff Chemical Agent Detector is the first on-the-move, automated, passive infrared detector.

We have over 100 Joint Biological Point Detection Systems in our inventory. The Joint Biological Point Detection System is the first automated system to routinely monitor the air for biological agents and provide presumptive identification for up to 10 agents via immuno-assay tickets. Next year we will field the Joint Biological Standoff Detection Systems, the first biological standoff detector of its kind in the world. This detector uses a light detection and ranging system at two specific wavelengths to detect and classify airborne aerosols.

In response to the expanding number of biological threats, the push for detection technology to keep pace has led to the development of multiplex biological assays, the use of high-speed, high-throughput nucleic acid sequencing, linked with bio-informatics, and integration of multiple technologies in a Micro-Electro-Mechanical Systems platform. The multiplexed biological assays can provide presumptive identification for 10 plus agents per assay and is being considered for the next upgrade into the Joint Biological Point Detection Systems to expand the number of detectable biological agents. Nucleic acid sequencing linked with bio-informatics will have the capability to assess the potential of an unknown organism to be a threat. This capability will be the foundation for next generation of biological detection system with the capability to address emerging

and unknown biological threats. Micro-Electro-Mechanical systems technology has the potential to significantly reduce the size and cost of detection devices across the technological spectrum, and will provide us an enhanced capability to integrate different technologies into a single detector or platform.

As the CBDP develops new chemical and biological detectors, and as the nature of the threat and potential means of attack become harder to predict, it is necessary to integrate the most advanced capability into as many platforms and installations as possible. To that end, we have developed the Common Chemical, Biological, Radiological and Nuclear Sensor Interface Standards. These Standards define the architecture, common component interconnects, power, connector, and communications protocol standards and specifications that provide a plug-n-play capability for sensors and detectors through net-centric operations. The Standards facilitate interoperability with command and control networks by providing a standard set of extensible commands and reports for interaction with sensors. They provide timelier sensor and detector information, improved sensor platform independence, improved sensor portability, and simplified integration of new sensors. The Standards and specifications language will be used for all future sensor procurements. The Standards are modular to support tailoring by acquisition programs to incorporate the capabilities they need.

Additional Sense capabilities that are scheduled for delivery to the field are the Joint Biological Tactical Detection System (Fiscal Year 2011). This is a lightweight system that will enhance force protection and medical response decision. The system will detect

the presence, provide warning and a presumptive identification, and collect samples of a biological threat agent.

Detection technologies developed and fielded by the CBDP are primarily used in the passive defense and consequence management mission areas of the counter-proliferation pillar of the national strategy to combat WMD. However the core technologies can be adapted or re-engineered for other missions. For example, the immuno-assay tickets used in the Joint Biological Point Detection System are the same root technology that the National Guard Civil Support Teams use when presumptively identifying unknown substances such as anonymous "white powder" incidents for Homeland Defense. The Joint Chemical Agent Detector chemical detectors used by deployed troops for passive defense can be used by Sailors performing an interdiction operation at sea searching for chemical weapons, or ground forces securing suspect chemical facilities.

Shield Capabilities

Shield capabilities provide protection to the force from Chemical, Biological, Radiological and Nuclear hazards by preventing or reducing individual and collective (group) exposure. Shield capabilities are aligned within two areas, individual and collective protection. While Shield capabilities also include those chemical and biological medical systems technologies that provide approved pretreatments (prophylaxis) for the Warfighter we will speak to all medical systems within the "Sustain" capability area.

This year we will begin fielding to all of the Services the Joint Service General Purpose Mask. This mask provides enhanced protection capabilities and reduced breathing resistance. We have also begun fielding enhanced boots, gloves, and a mask leakage detector to our forces as part of our strategy to incrementally enhance individual protection capabilities. Additional Shield systems that are scheduled for future delivery to the field include both fixed wing and rotary wing variants of the Joint Service Aircrew Mask.

The unpredictable nature of the evolving threat drives our vision toward embedding a level of chemical, biological and radiological protection into our forces' standard combat uniform or tent materials without degrading their ability to operate. At the same time, we must provide protection against a wider range of threats tailored to specific user communities which optimize human performance and reduce logistical impacts. Technological advances provide an opportunity to revolutionize our future approach to individual and collective protective equipment by providing a modular family of systems. These technological advances are coming from both industry and government research and development efforts. Technological solutions, such as imbedded reactive materials and nanofibers, are ready now for further refinement and development into a joint combat ensemble (family of systems) that optimizes and enhances protection while meeting the diverse needs of the ground, mounted, air, and special operating forces.

A number of new technologies offer considerable opportunities for achieving integrated low-burden protection against a broadening threat spectrum without compromising needed performance. One of the most exciting areas is *reticular chemistry,* which is described as "the linking of molecular building blocks of synthetic and biological origin into a predetermined structure using strong bonds." The most well known class of these materials is Metal Organic Frameworks which have already exhibited absorbency potentials that far exceed activated carbon, and are currently being manufactured in commercial quantities. These compounds can be tailored to target specific classes of chemicals that include the high volatility Toxic Industrial Chemicals which limit the performance of current technologies. Such compounds can be used to design smaller and lower-profile filters for protective masks and collective protection systems that protect against the expanding spectrum of threats. Smaller and lower profile filters decrease weight and reduce interference of the respirator or protective shelter filter systems with other mission systems.

Another promising area has been the development of nanofibers. It may soon be possible to produce particulate filters for protective masks with order-of-magnitude lower pressure drop, and high efficiency particulate filtration capabilities that can be built into the clothing. Additional developing technologies will make it possible to assemble these fibers into nano-composites that will enable built-in adsorption, reactive, anti-microbial and sensing capabilities into a thin coating. This could revolutionize protective clothing and collective protection and produce unconventional and extremely low burden approaches to respiratory protection.

Shape Capabilities

Shape capabilities enhance the Commander's situational awareness on the battlefield. These capabilities are the heart of the layered, integrated, Chemical, Biological, Radiological and Nuclear defense model. There are three capabilities that are being developed and fielded; a Warning and Reporting capability, a hazard prediction model, and an operational effects model.

We have fielded approximately 50 Block 1 versions of the Joint Warning and Reporting Network software that enable Warfighters to seamlessly integrate Chemical, Biological, Radiological and Nuclear sensor data into a common command node. We are in the development phase of the next Joint Warning and Reporting Network increment that will integrate into more Service command and control systems, provide additional networking capability, and interface with additional Chemical, Biological, Radiological and Nuclear sensors.

Near the end of this fiscal year, we will field the Joint Effects Model. This model will provide Warfighters with the DoD accredited modeling capability to predict high-fidelity, downwind hazard areas and effects associated with the release of Chemical, Biological, Radiological, Nuclear, and Toxic Industrial Hazards into the environment. The model also incorporates the impacts of weather, terrain and material interactions into the downwind prediction and provides enhanced situational awareness of the battle space.

Also in development is the Joint Operational Effects Federation that will enable Warfighters and planners to estimate Chemical, Biological, Radiological, Nuclear, and Toxic Industrial Material effects on personnel, equipment and operations. The Joint Operational Effects Federation will enable the conduct of defensive planning to minimize or eliminate the threats and carry out effective consequence management in response to contamination when it occurs. The Joint Operational Effects Federation is expected to begin fielding in Fiscal Year 2009.

We are leveraging the advances that we have made in developing these capabilities to perform consequence management. These activities include developing modeling and simulation software to assist planners in estimating the potential human casualty that might result from a Chemical, Biological, Radiological and Nuclear attack. Our research has lead to the building of advanced software tools that allow the simulation of the hazard environments posed by WMD across a broad array of scenarios. These scenarios include both military operations and homeland defense scenarios that encompass high altitude missile intercepts, urban environments, building interiors, military installations, coastal and littoral, as well as a variety of military operational settings. We are also investing in the development of a sensor data fusion capability to allow the fusion of information and data from diverse detectors and sources to provide the Warfighter with a more refined common operating picture of the battlespace with respect to Chemical, Biological, Radiological and Nuclear weapons.

Sustain Capabilities

Sustain capabilities include decontamination capabilities and medical capabilities. Decontamination technologies remove and neutralize contamination and detoxify contaminated material without damaging combat equipment, personnel, or the environment. Chemical and biological medical capabilities include both prophylactics (pretreatments) and therapeutics (treatments).

We have many challenges in this area; to include an "all-hazards" decontaminant that places a minimum logistic burden on the operational forces. Technology advances in neutralization technologies such as those found in the Reactive Skin Decontamination Lotion, which we will field this year under the Joint Service Personnel/Skin Decontamination program, have resulted in a significant (up to 15,000 percent) improvement in our ability to provide a skin decontamination capability against future threat agents. We continue to look at technologies that provide coatings, catalysts, and other means to reduce the logistics burden, manpower requirements, and lost operational capability associated with decontamination operations. Our decontamination science and technology efforts are focused in five areas: 1) decontamination-enabling sciences: 2) traditional approaches to decontamination: 3) energetic and kinetic decontamination: 4) smart system decontamination: and 5) self-detoxification processes.

Developing and fielding new chemical and biological medical systems technologies provides Food and Drug Administration-approved prophylaxis, therapeutics, and diagnostics. Chemical, Biological, Radiological and Nuclear medical systems include all

pharmaceuticals, biologics, and devices that preserve combat effectiveness by timely identification, diagnosis, and providing medical countermeasures in response to Joint Service Chemical, Biological, Radiological and Nuclear defense requirements. The program is developing safe, effective, and affordable medical countermeasures to ensure the effectiveness and survival of U.S. Warfighters against validated military threats in a chemical and/or biological warfare environment by maintaining uncontested global supremacy in the development and delivery of Chemical, Biological, Radiological and Nuclear medical countermeasures. Developing and acquiring new medical chemical and biological technologies and products entails using government and commercial best practices to obtain Food and Drug Administration-approval of Chemical, Biological, Radiological and Nuclear medical countermeasures and diagnostics within benchmark timelines. These best practices have helped keep 80 percent of chemical and biological medical products (approved or in development) on track in terms of safety and effectiveness. This success rate is exemplary when compared to the 10-20% of products that achieve Food and Drug Administration approval within the industry benchmark.

Chemical, Biological, Radiological and Nuclear medical systems technology development is continuously advanced through focus on partnering with the science and technology base, international partners, and industry to reduce technical and cost risks, to ensure regulatory compliance, and to align transition opportunities with capability gaps. For example, the CBDP is working with the Defense Advanced Research Project Agency to shorten development time and decrease the costs of vaccine development. We are collaborating with the Department of Health and Human Services to form a Joint

National Stockpile for fielded products and continued cooperation on numerous developmental products. A joint stockpile currently exists for the smallpox vaccine and one is being developed for the anthrax vaccine.

One of our major initiatives in the area of chemical and biological medical therapeutics is the Transformation Medical Technology Initiative, which we will address in our ongoing CBDP initiatives to build for the future.

Improving Capabilities: Dual Use (Military and Civil) and Multi-Use (across the spectrum of WMD operations) capabilities can mitigate the new threat relationships and the new concept of security

Given a common threat to both the U.S. Military and the homeland, the same basic technologies provide useful increments of capability. The difference is a matter of engineering to ruggedize, ensure interoperability and other environmental and mission attributes.

However, this area poses significant challenges. Among them is the absence of many National Standards for detection and other capabilities. There are dual standards (one for civil and one for military) for items such as protective equipment. In addition to the need to create synchronized standards of performance, another area that poses a challenge are the differences in test capabilities and methodologies that frequently exist between a National Standard, such as those established by the National Institute for Occupational

Safety and Health for respiratory protection, or those established by the National Fire Protection Association for percutaneous protection, and the existing military standards and test methodologies.

Two of the ways DoD has worked to address this challenge is the Non Standard Equipment Review Panel, a process we have set up to apply in cases where National Standards do not exist, and our work with the Office of Federal Procurement Policy to establish a policy that facilitates DoD selling equipment and services developed for the DoD to state and local community first responders. In the case of National Standards, in the long term we are working through organizations such as the Interagency Board for Equipment Standardization and Interoperability to ensure standards are created where they do not exist and are synchronized where they conflict. This board is designed to establish and coordinate local, state, and federal standardization, interoperability, compatibility, and responder health and safety to prepare for and respond to any incident by identifying requirements for an all-hazards incident response capability.

In a similar effort we are also working directly with the Department of Homeland Security to develop integrated process and procedures for the Biowatch program, to include common reporting protocols and the integration of Biowatch collection and detection into our operational networks.

As previously described, we are making progress in the development of dual use technologies in areas such as detection with our Joint Biological Point Detection System and the Joint Chemical Agent Detector systems.

DoD has also procured and employed numerous commercial technologies to significantly augment operational military capabilities. These include chemical detection and identification, biological detection and identification, radiological and nuclear detection systems, individual protection, decontamination and information management and warning. We have ongoing efforts to address communications and interoperability. By leveraging open architecture design and web based communications systems we are improving the ability for military and civilian first responders to communicate and to interoperate.

Improving Capabilities: Military-Civil Integration can mitigate the new threat relationships and the new concept of security

A significant example of both the promise and challenges inherent in the integration of military and civil capabilities is the Installation Protection Program. A key component of our support to the National Security Strategy of the United States in defeating WMD is ensuring that we can both protect and project our military forces. Furthermore, our Homeland Defense Strategy calls for military support to civilian authorities. Both of these missions begin here at home. To accomplish this we must strengthen partnerships with Federal, State and local agencies to ensure that our military installations are equipped to both protect the Force and support surrounding civilian communities.

To protect our installations from WMD, we have applied a tiered concept to ensure appropriate and scalable level of response capability at each of our military installations.

All installations receive at least a baseline tier of protection, which consists of a set of training products, planning guidance, exercise scenarios, and templates for developing exercises and Mutual Aid Agreements. We facilitate the installation's coordination, and support to with their civilian counterparts by providing them with the guidance necessary to improve communication and information sharing through Memorandums of Agreement. Such Baseline resources are available to all military installations via the Installation Protection Program web-based portal.

The next level of protection, known as Tier 1, includes government and commercial off-the-shelf emergency response equipment such as protective suits, pharmaceuticals and breathing apparatus for first responders, as well as portable detection equipment, decision support tools, and mass notification and warning capabilities in addition to all Baseline Tier capabilities. The final level of protection, Tier 2, builds on the Baseline and Tier 1 capabilities, and includes an enhanced decision support system, fixed sensors for chemical, biological and radiological detection, and protection for mission critical facilities.

Our approach for ensuring interoperability and military support to civilian authorities was developed from the 2006 Chemical, Biological, Radiological, Nuclear and High-yield Explosives Installation Protection Study sponsored by the Assistant to the Secretary of Defense for Nuclear, Chemical and Biological Defense Programs and the Joint Requirements Office. This study highlighted the complexities of a Chemical, Biological, Radiological and Nuclear response, identified interoperability gaps, and reinforced the

inherent co-dependency of installations and the civilian community on the assets and capabilities of both.

To address the gaps identified within the study, we established the Installation Protection Steering Group. This group is charged with overseeing efforts to develop and/or clarify installation protection standards, transitioning DoD from a previously limited focus to an all-hazards approach. This holistic approach is consistent with civilian emergency preparedness and management efforts and will provide for a more unified response to a wide range of natural and man-made threats.

In addition, through our partnership with the Department of Homeland Security and the relationships we continue to foster with each of the Services, we have participated in efforts to leverage existing civilian capabilities such as those provided by the BioWatch Program and the Domestic Nuclear Detection Office.

In 2007, we collaborated with BioWatch to collocate DoD and Department of Homeland Security bio-detection technologies on Andrews Air Force Base. This partnership resulted in several significant accomplishments:

- Enhancing assay equivalency work currently underway between the Centers for Disease Control and Prevention and DoD laboratories;
- Developing multi-agency (national and local) concepts of operations for event notification – the genesis for developing an expanded concepts of operations for the National Capital Region; and

- Relocating collectors within the National Capitol Region that seeks to optimize DoD and Department of Homeland Security bio-monitoring capabilities – a strong first step in solidifying the National Bio-monitoring Architecture.
- Using up to 25 DoD installations that have bio-detection capability that provides BioWatch additional geographic coverage.

In addition, we have developed, procured and fielded critical incident protection and response capabilities in support of the National Guard Bureau and the U.S. Army Reserve. We have developed and fielded the Unified Command Suite to every National Guard Weapons of Mass Destruction Civil Support Team in the country.

The Analytical Laboratory System provides enhanced sensitivity and selectivity in the detection and identification of chemical, biological and radiological agents or substances. The Analytical Laboratory System provides a science-based analysis of potentially hazard samples to gain and maintain a complete understanding of the contaminated environment. This is done to support informed decisions by a myriad of possible agencies over and above the typical Incident Commander or other official.

The Unified Command Suite is a self-contained, stand-alone platform that provides voice and data communication capabilities to the Civil Support Team Commanders and other agencies. It is the primary means of reachback communications for the Analytical Laboratory System and the Civil Support Team's, and acts as a command and control hub to provide a common operational picture for planning and executing an incident response.

In August 2005, we deployed 13 sets of these systems throughout Louisiana and Mississippi in support of Hurricane Katrina recovery and relief efforts and they were critical in establishing secure, reliable communications links for the recovery and relief efforts.

Building for the future: Broad spectrum capabilities developed through Technology Mega Thrusts can mitigate the broadened threat context

As we look to the future, our goal is to ensure our forces are never technologically surprised. The rapid advances and convergence among the Technology Mega Thrust areas of Nano, Bio, Information and Cognitive technologies can assist us to develop the broad spectrum capabilities needed to counter the uncertain and advanced threat. Nano-technology is allowing us to manipulate the fundamental properties of materials that can be used in protective clothing and masks and develop sensing elements that distinguish hazards across a broad range of chemicals. By its very nature, nano-technology will enable the embedding of this protection and sensing capability into not only soldiers' uniforms, but also across the range of military platforms. This integration and proliferation of capability will provide better overall force protection regardless of where troops are stationed.

Advances in bio-technology are enabling the CBDP to do several things. First, rapid genetic sequencing is providing the information necessary to understand the means of pathogenicity. Combined with bio-informatics, this genomic information will allow for

the more rapid identification of unknown threats and development of therapeutics to counter these threats. Second, bio-technology combined with improved understanding of the human immune system enables the creation of broad spectrum therapeutic countermeasures. The Transformational Medical Technologies Initiative is our programmatic vehicle to harvest, develop and field these revolutionary capabilities.

Information and cognitive science developments are enabling the creation, dissemination, manipulation and effective use of chemical and biological information on the battlefield. With the rest of DoD, the CBDP is migrating to a net-centric operating environment. No longer will information remain isolated or stove-piped. Commanders at all echelons will have the information they need regarding the chemical and biological hazard and the necessary information systems tools to take the appropriate protective, evasive, and restorative actions necessary.

As the sciences behind these Technology Mega Thrusts converge, there will be technology developments that are broad-stroke in nature but more integrated into the capability needs of the operational forces. Genomic research will target convergence of biotechnologies for detection, diagnostics, and therapeutics. Likewise, developments in nanotechnology from various agencies will be leveraged for detection, protection, and hazard mitigation (decontamination) applications. As “intelligent” materials and technologies emerge from these efforts, the processing of information from nano-scale elements will require a convergence of research in information management, systems,

and cognition as they relate to human factors in the design of future countermeasures technologies and for training on the use of these technologies.

Information and cognitive science developments are enabling the creation, dissemination, manipulation and effective use of information on the battlefield. The Joint Warning and Reporting Network, Joint Effects Model and Joint Operational Effects Federation of Models provide our commanders both situational awareness and analysis. With this information our forces are prepared to take the appropriate protective, evasive and restorative actions necessary for mission success.

Building for the future: Setting the stage for rapid capability development across our capability spectrum can mitigate the rapid pace of threat development

Rapid advances in biotechnology present not only great opportunities, but also threats. The emerging sciences of genomics and proteomics and the tools of genetic engineering create the potential for our adversaries to develop and use previously unknown viruses, bacteria and toxins.

The Transformational Medical Technologies Initiative is a system approach to defending against the conventional, emerging or genetically engineered biological threats. The approach is to use platform technologies, such as genetic sequencing, to accelerate the identification of the specific biological threat agent, development of broad-spectrum medical countermeasures, and the production of an effective countermeasure. Each

countermeasure will act against the targeted agent by blocking critical molecular pathways essential to the success of the agent to affect the host.

While efforts like the Transformational Medical Technologies Initiative are vital to our effort to lay the ground work for effective and rapid medical treatment against biological threats, we are using experimentation to assist us in rapidly analyzing the promise of new technologies to provide us capability across the WMD spectrum.

We use experimentation to examine how emerging technologies can be employed by Soldiers, Sailors, Marines, and Airmen to enhance their future Chemical, Biological, Radiological and Nuclear defense capabilities. The Joint Combat Developer for Chemical, Biological, Radiological and Nuclear Defense conducts joint limited objective experiments in order to exploit the technological opportunities that are identified by the Joint Science and Technology Office, Joint Requirements Office and the JPEO CBD. Experimentation helps to focus the developmental efforts of the acquisition program managers through a better understanding of the Warfighter requirements which can ultimately translate into the acceleration of the acquisition process. A recent successful example of such an experiment was the Joint Chemical, Biological, Radiological and Nuclear Dismountable Reconnaissance System Limited Objective Experiment which has enabled the acceleration of the second increment of the Joint Service Nuclear, Biological and Chemical Reconnaissance System.

Experimentation helps us to better understand the Warfighters needs and to better define the capabilities that emerging technologies can provide. To map what capabilities are required against emerging threat agents the CBDP has formed a working group and a Toxic Industrial Chemical and Toxic Industrial Material Task Force. The Working Group is the focal point for the coordination, alignment, and synchronization of advanced/future chemical agent defense capability development for the CBDP. This group provides integration and management visibility of efforts and provides a framework and plan-of-action for the capability development of material solutions to mitigate the effects of advanced/future chemical agents. The Toxic Industrial Chemical and Toxic Industrial Material Task force pulls together Subject Matter Experts across the CBDP community to develop a standard and prioritized list of Toxic Industrial Chemical agents for equipment and requirement development across the WMD defense capability spectrum.

Our test and evaluation capability for future equipment must also evolve consistent with the evolving threat. We have established a Product Director for Test Equipment Strategy and Support that, working in concert with the CBDP Test and Evaluation Executive, is developing the capabilities we will require to ensure future equipment is safe, effective and suitable.

Building for the Future: A portfolio approach to the acquisition of capabilities accelerates the exploitation of technological opportunities and the generation of new capabilities

Under the direction of the Under Secretary for Defense, Acquisition, Technology and Logistics, the CBDP is working with Service and joint Major Defense Acquisition Programs (e.g. Joint strike Fighter) to provide a portfolio approach exploiting technologies that deliver required Chemical, Biological, Radiological and Nuclear capabilities. This will ensure the Major Defense Acquisition Programs can accomplish their primary missions unencumbered by chemical or biological contamination. The uncertain nature of the threat and potential asymmetric attacks in any area of operation requires that chemical and biological defense capability be integrated, modular, and tailorable throughout these programs. This portfolio approach integrates formally discreet areas of Chemical, Biological, Radiological and Nuclear defense capability namely detection, protection, and decontamination into a system-of-systems. Viewing Chemical, Biological, Radiological and Nuclear defense as a system-of-systems facilitates the insertion of new technologies and, through them, the development of new capabilities.

Exploiting Chemical, Biological, Radiological and Nuclear defense technology opportunities will also facilitate future joint operational concepts. The joint Chemical, Biological, Radiological and Nuclear defense concepts must be based on an integrated system-of-system view where Chemical, Biological, Radiological and Nuclear defense

packages can be modular, tailored to the mission, environment or situation. The objective is to provide commanders the flexibility to understand and act on the Common Operating Picture without degrading operating tempo or survivability.

The Common Operating Picture should include Chemical, Biological, Radiological and Nuclear considerations based on data fused from multiple Chemical, Biological, Radiological and Nuclear sensors and non- Chemical, Biological, Radiological and Nuclear sensor sources. These sensors should be modular, plug-and-play, and operate in a net-centric environment, meaning they should be transferable from one platform to another (e.g. Soldiers can move sensors from Stryker vehicles to Mine Resistant Ambush Protected vehicles to Blackhawk helicopters as required.) Analysis and decision tools which integrate Chemical, Biological, Radiological and Nuclear and non- Chemical, Biological, Radiological and Nuclear information should enable rapid decision making at the strategic, tactical, and unit level to protect the force. The goal is for all of our forces to fight and win in a CBRN environment.

4. GLOBALIZING OUR TECHNOLOGY AND EXPERTISE

International, Inter-agency and Industry collaboration can mitigate the broadened threat context

The CBDP is actively involved in numerous cooperative efforts in chemical and biological defense material developments through bilateral, multilateral, and allied agreements and structures. These include the Australian, Canadian, United Kingdom,

United States Chemical, Biological and Radiological Memorandum of Understanding activities, North Atlantic Treaty Organization Joint Consultative Group Chemical, Biological, Radiological and Nuclear activities, and bilateral forums with the United Kingdom, Japan, Republic of Korea and other countries with advanced development efforts in chemical and biological defense. These venues link the CBDP to government military and non-military Research, Development, and Test and Evaluation organizations involved in chemical and biological defense materiel development efforts. The JPEO CBD participates in the Foreign Military Sales process to enhance interoperability with our allies, and Cooperative Development activities under these programs reduce our development costs through burden sharing and leveraging of others' significant investments in chemical and biological defense and increase our access to the broadest possible spectrum of available chemical and biological defense technologies.

The CBDP is also beginning to increase its leveraging of existing DoD and broader United States Government presence throughout the world as it searches for the best and most advanced technologies to meet its program requirements. Through more than 34 offices in 21 countries on six continents, we maintain awareness of all potentially beneficial foreign technologies that are available to meet our requirements. Together these efforts will ensure an ability to identify, assess, develop, and exploit military and civilian technology and materiel developments in chemical and biological defense on a global basis.

We have multiple inter-agency partners. For chemical and biological programs in the physical sciences, we have nine projects being worked for the CBDP by the Defense Advanced Research Projects Agency; the performance standardization projects for biological sampling methods and Polymerase Chain Reaction assay equivalency with the Center for Disease Control and the Department of Homeland Security; and the Biomonitoring Memorandum of Understanding governing development of a coordinated environmental biological weapon surveillance architecture with the Department of Homeland Security, United States Postal Service, the Department of Health and Human Services and the Environmental Protection Agency.

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For chemical, biological, radiological and nuclear medical systems we are working with the Defense Advanced Research Project Agency to shorten development time and decrease the costs of vaccine development, and with the Department of Health and Human Services to form a Joint National Stockpile for fielded products and continued collaboration on numerous developmental products. As previously noted, a joint stockpile currently exists for the smallpox vaccine and one is being developed for the anthrax vaccine.

We have contracts with over 100 large and small companies located across the United States. Industry is a key partner in our efforts both to exploit technological opportunities and to rapidly field Commercial Off-The Shelf capabilities. We work with the Joint Science and Technology office to regularly incorporate opportunities for industry to

demonstrate their most advanced products within the construct of Technology Demonstration Assessments and Technology Demonstration Evaluations.

Federal, State and Local collaboration (Military-Civil Integration) can mitigate the new threat relationships and the new concept of security

In additional to our national partnerships with the Department of Homeland Defense and other Federal Agencies, we have strengthened our partnerships with other federal, state and local agencies ensuring our military installations are prepared to mutually support and interoperate with the civilian communities in which they reside. We have already mentioned our partnership with the BioWatch Program and how that has fostered strong relationships between local BioWatch decision-makers and their neighboring military installations. The Common Alerting Protocol allows a warning message to be consistently disseminated simultaneously over many warning systems to many applications. Improving information sharing and management is a critical component our efforts to better integrate with the local community to ensure a coordinated and effective response.

We have made steady and significant progress in military-civilian coordination efforts. Interoperability between DoD and civilian capabilities are paramount to national security. Our strategy is to enable and facilitate coordinated preparedness planning activities, working collaboratively with our civilian counterparts to maximize the efficiency and effectiveness of both our military and civilian assets. We must collectively ensure that

the capabilities we deploy are not only adequate, comprehensive and scalable but also complementary and coordinated, to ensure the protection of our most precious assets, our military and civilian citizens.

5. CHALLENGES

We are facing a long-term threat that poses significant challenges to our success. I would like to provide details on several key points.

Stand-Off Detection

Standoff identification of chemical and biological agents remains a fundamentally difficult problem. We are pursuing several advanced technologies to improve performance, but standoff technologies are unlikely to provide the same fidelity of information that the technology used in point sensors can. To mitigate this inherent shortcoming, we are using point and standoff sensors together, combining the early warning strength of standoff detection with the fidelity of point sensing.

Technology Development for Decontamination

There are a range of technical challenges associated with Chemical, Biological, Radiological and Nuclear decontamination. Our Warfighters need decontaminants that are safe for sensitive equipment, do not require an extensive logistic footprint, able to

decontaminate a broad spectrum of agents, are environmentally safe, and pose no unacceptable health hazards. New technology developments are required to provide decontamination systems that effectively clean all surfaces and materials while simultaneously reducing the manpower and logistics burden. Especially challenging is a single all-hazard decontamination solution that eliminates all threats while not damaging materials such as plastics, fabrics, and composites.

"All-Hazards" Capabilities

Many factors drive us toward providing our Warfighters the full range of protection, detection and decontamination capabilities against "All-Hazards". By "All-Hazards" I mean that the threat can come from an adversary's use of traditional chemical warfare agents, advanced/future chemical agents and biological warfare agents, or even Toxic Industrial Chemicals. These threats can come from state actors, terrorists or the individual. "All-hazards" can include the effects of intentional and unintentional releases of hazardous materials to include natural disasters. These types of threats can be encountered at home or abroad and in a hostile or benign environment. All of these variables significantly challenge our technology requirements.

Synchronization of Information Systems with Service Oriented Architecture

Chemical, Biological, Radiological and Nuclear information systems are evolving to enable automatic collection and fusion of information from all Chemical, Biological,

Radiological and Nuclear defense assets throughout the battle space, and integrate that data. A significant challenge is to integrate relevant information into the Services Information Systems and architectures.

Maintaining the Industrial Base Capabilities

The Chemical and Biological Defense industrial base is characterized as small niche defense-centric sectors embedded in larger commercially dominant industries such as materials, textiles, pharmaceuticals and electronic equipment. The ability to maintain a healthy industrial base – commercial and organic – capable of responding to wartime surge requirements is a challenge and we work closely with our Service partners, the Defense Logistics Agency, the Defense Management Contract Agency and others to proactively identify, plan for and execute strategies that ensure we maintain vital industrial base capabilities.

Food and Drug Administration and Bio-surety Regulations

All CBDP medical products, by law, must be Food and Drug Administration approved. The Food and Drug Administration regulatory process is complex, with increasing development costs and schedules due to many factors, including: additional studies required to maintain compliance with Food and Drug Administration regulations, increasing cost of research tools and increasing clinical trial size and complexity. In spite of these industry-wide challenges, CBDP medical programs remain competitive

with industry benchmarks in obtaining Food and Drug Administration approval for medical countermeasures.

Policy for the Selling of DoD Equipment to Civil Authorities

We are working with the Office of Federal Procurement Policy to facilitate the sales of equipment developed for DoD to civil authorities in accordance with the Fiscal Year 2004 Defense Authorization Act.

Common Test and Performance Standards

Common test and performance standards across agencies and operational areas continue to challenge the efficient use of technology and impede interoperability. We are working with federal, state and local agencies through the Inter-Agency Board to develop these common standards.

Urban Environment

The urban environment contains many unique challenges to providing WMD protection or consequence management capability. The raw materials present in any urban environment include a broad array of chemicals, to include Toxic Industrial Chemicals. The urban environment also has very localized atmospheric conditions with a great degree of variance across the urban landscape due to differences in infrastructure height,

density and throughways. We are working to overcome these challenges with detectors, protective equipment and decontamination equipment that possess both a conventional warfare agent and a Toxic Industrial Chemical capability. We are also working to upgrade our decision support tools to account for the unique atmospheric conditions present in an urban environment and how those conditions influence the spread of hazards within that environment.

Funding

Our capability development must keep pace with the rapid advances in science, which directly influence the scope and structure of threat agents. To do this we must put adequate funding in place to ensure our capability matches this fast changing and uncertain environment.

6. SUMMARY

Mr. Chairman and distinguished committee members, I would like to thank you for allowing me to provide this written testimony. Your continued support of the Chemical Biological Defense Program is crucial for our military and nation to succeed in the face of a chemical or biological attack. We have been successful in fielding equipment and pharmaceuticals over the last several years to counter the current chemical and biological threat. We fully recognize that even the smallest use of a chemical, biological,

radiological or nuclear weapon can create an environment of instability, doubt and fear among our allies and citizens at home and we are deploying interoperable systems at our installations world-wide to address this threat. We are in the process of developing broad-spectrum technologies that we will integrate into a system of systems to counter the evolving threat. We are working closely with our inter-agency partners to defend the homeland. With your guidance and assistance, together, we are bringing future technologies forward to protect our military and the nation against the Chemical, Biological, Radiological and Nuclear threat.