Bio-Defense Now:
56 Suggestions for Immediate Improvements

Final Report
85% Biological Defense Project

Major Tasha L. Pravecek, USAF,
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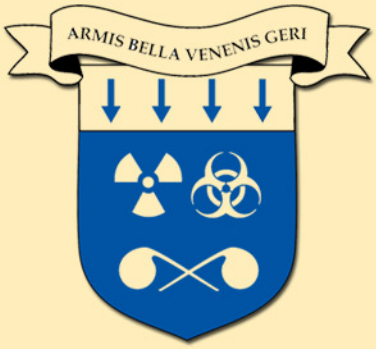

US Air Force
Counterproliferation Center
Maxwell Air Force Base, Alabama

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56 SUGGESTIONS FOR IMMEDIATE IMPROVEMENTS

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by

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The USAF Counterproliferation Center was established to provide education, information, and analysis to assist the understanding of the U.S. national security policymakers and USAF officers to help them better prepare to counter the threat from weapons of mass destruction. This research was funded jointly by the Defense Threat Reduction Agency Chemical and Biological Directorate and the USAF Counterproliferation Center. Copies of this report and other publications are available from the USAF Counterproliferation Center, 325 Chennault Circle, Maxwell AFB AL 36112-6427. The fax number is (334) 953-7530; phone (334) 953-7538.

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The views expressed in this report are those of the authors and do not necessarily reflect the official policy or position of the U.S. Government, Department of Defense, U.S. Air Force, or the U.S. Air Force Counterproliferation Center.

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Workshop attendees included: Facilitators—Dr. Bruce Bennett, Mr. Leo Cropper, Mr. Jim Miller, Mr. Roy Williams; Recorders—Col Michael Ainscough, Mr. Dick Estes, MSgt Henry Mayfield, Mr. Walt Studdard; and Participants—Dr. Salvatore Bosco, Col John Bowley, Gen (ret) Walt Busbee, Dr. Steve Channel, Mr. Paul Clark, Ms. Renae Ditmer, Ms. Anne Dixon, Mr. Phil Gardner, Col Glenn Goddard, Dr. Richard Gullickson, LtCol Donna Hudson, Mr. Jerry Jensen, CDR Daizo Kobayashi, Mr. Randall Larsen, Dr. Peter Lavoy, Dr. Ross LeClaire, Mr. Russ Lewey, Dr. Kent Lohman, Mr. Al Mauroni, Mr. Dutch Miller, Col Donald Minner, Mr. Paul Mundt, Maj Jim Poel, Ms. Katheryn Szeliga, Dr. Robert Sherwood, Mr. Eric Stephens, Dr. David Stockwell, CAPT Steven Temerlin, Col Donald Thompson, Mr. Andrew Wilson, and Mr. Curt Wilhide.

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Colonel (ret) Jim A. Davis was the Deputy Director of the USAF Counterproliferation Center. He retired March 1, 2005, and is currently employed by Battelle where he continues to work issues of combating weapons of mass destruction. Previously, Colonel Davis was the AF Surgeon General's Chair to Air University. Before coming to Air University, he was the Commander, 48th Aerospace Medicine Squadron at RAF Lakenheath, UK. He also served as UK Medical Intelligence Officer and USAFE Consultant for Public Health. Colonel Davis served 4 years in the U.S. Army Veterinary Corps, 6 years in private veterinary medicine, and then joined the Air Force in 1987. His areas of special interest include Chemical and Biological Warfare, bioterrorism, homeland security, and occupational epidemiology. Colonel Davis has several academic degrees including a Doctorate of Veterinary Medicine from Texas A&M, a Doctorate of Public Health from the University of Texas, and is a graduate of Air War College. He is board certified with the American College of Veterinary Medicine.

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ACRONYMS

ACADA	Automatic Chemical Agent Detector/Alarm
ACTD	Advanced Concept Technology Demonstration
AFCESA	Air Force Civil Engineering Support Agency
AFDD	Air Force Doctrine Document
AFI	Air Force Instruction
AFIOH	Air Force Institute for Operational Health
AFMIC	Armed Forces Medical Intelligence Center
AFMS	Air Force Medical Service
APOD	Aerial Port of Debarkation
AVIP	Anthrax Vaccination Immunization Program
AVRP	Anthrax Vaccine Research Program
BACE	Bio-Attack Climatology Effectiveness
BDTF	Biological Defense Task Force
BIDS	Biological Integrated Detection System
BIT	BW/BT Intel Threat
BW	Biological Warfare
BW/BT	Biological Warfare/Biological Terrorism
BWCI	Biological Warfare Countermeasures Initiative
BX	Base Exchange
CAM	Chemical Agent Monitor
CASPODS	Contamination Avoidance at Seaports of Debarkation
CBER	Center for Biologics Evaluation and Research
CBIRF	Marine Chemical-Biological Incident Response Force
CBRN	Chemical, Biological, Radiological, and Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear, and High Yield Explosives
CBW	Chemical and Biological Warfare
C-BW CONOPS	Counter-Biological Warfare Concept of Operations
C-CBRNE	Counter-Chemical, Biological, Radiological, Nuclear, and High Yield Explosives
C-CW CONOPS	Counter-Chemical Warfare Concept of Operations
CDC	Centers for Disease Control
CDC/ATSDR	Centers for Disease Control/Agency for Toxic Substances and Disease Registry
CENTCOM	Central Command

CIA	Central Intelligence Agency
COCOMs	Combatant Commanders
CONUS	Continental United States
COTS	Commercial-off-the-Shelf
CPC	Counterproliferation Center
CPS	Collective Protection System
CRAF	Civil Reserve Air Fleet
CSAF	Chief of Staff of the Air Force
DARPA	Defense Advanced Research Projects Agency
DCP	Disease Containment Plan
DHHS	Department of Health and Human Services
DHS	Department of Homeland Security
DIA	Defense Intelligence Agency
DNA	Deoxyribonucleic Acid
DoD	Department of Defense
DOE	Department of Energy
DOTMLPF	Doctrine, Organization, Training, Material, Leadership, Personnel, and Facilities
DTRA	Defense Threat Reduction Agency
DTRA/CB	Defense Threat Reduction Agency/Chemical and Biological Division
EEE	Eastern Equine Encephalitis
EET	Exercise and Evaluation Team
EIS	Epidemic Intelligence Service
EPA	Environmental Protection Agency
Epi-X	Epidemic Information Exchange
ESSENCE	Electronic Surveillance System for the Early Notification of Community-based Epidemics
ETE	Education, Training, and Exercise
FDA	Food and Drug Administration
FHPC	Force Health Protection Committee
FOS	Family of Systems
FPBL	Force Protection Battle Lab
FPCON	Force Protection Condition
FSTR	Full Spectrum Threat Reduction
HAZMAT ID	Hazardous Material Identification
HEPA	High Efficiency Particulate Air (filter)

HHA	Hand Held Assay
HHS	Health and Human Services
HMMWV	Heavy High Mobility Multipurpose Wheeled Vehicle
HPAC	Hazard Prediction and Assessment Capability
HQ AETC	Headquarters Air Education and Training Command
HVAC	Heating, Ventilation and Air Conditioning
ICAM	Improved Chemical Agent Monitor
ICD-9-CM	Internal Classification of Diseases, 9th Revision, Clinical Modification
IND	Investigational New Drug
INFOCON	Information Threat Condition
IPE	Individual Protective Equipment
JBAIDS	Joint Biological Agent Identification and Diagnostic System
JBPDS	Joint Biological Point Detection System
JBSDS	Joint Biological Standoff Detector System
JCIDS	Joint Capabilities Integration and Development System
JP	Joint Publication
JPME	Joint Professional Military Education
JPMG	Joint Program Manager Guardian
JPEO-CBD	Joint Program Executive Office for Chemical and Biological Defense
JROC	Joint Requirements Oversight Council
JSIPP	Joint Service Installation Pilot Project
JSLIST	Joint Service Lightweight Integrated Suit Technology
JSLNBCRS	Joint Service Lightweight NBC Reconnaissance System
JSTO	Joint Science and Technology Office
KFE	Kunsan Focused Effort
LIDAR	Light Detection and Ranging
MAJCOM	Major Command
MARE	Major Accident Response Exercise
MB	Methyl Bromide
MCRP	Medical Contingency Response Plan
MDG	Medical Group
MERV	Minimum Efficiency Reporting Value
METL	Mission Essential Task List
MOOTW	Military Operations Other Than War
MOPP	Mission Oriented Protective Posture
MREF	Medical Research and Evaluation Facility

MTF	Medical Treatment Facility
NBC	Nuclear, Biological and Chemical
NBCC	Nuclear, Biological, Chemical and Conventional
NCEH	National Center for Environmental Health
NCID	National Center for Infectious Diseases
NEDSS	National Electronic Disease Surveillance System
NEHC	Navy Environmental Health Center
NEO	Non-combatant Evacuation Operation
NIMS	National Incident Management System
NIOSH	National Institute for Occupational Safety and Health
NLT	No Later Than
NRP	National Response Plan
NSC	National Security Council
NWCA	Nuclear Weapons and Counterproliferation Agency
OPR	Office of Primary Responsibility
OSD	Office of the Secretary of Defense
OSI	U.S. Air Force Office of Special Investigation
OTUSF	Other Than U.S. Forces
PA	Public Affairs
PACOM	Pacific Command
PCR	Polymerase Chain Reaction
PF	Protection Factor
PME	Professional Military Education
PX	Post Exchange
RAM	Random Antiterrorism Measures
RAND	Research and Development
RAPID	Ruggedized Advanced Pathogen Identification System
R&D	Research and Development
RESTOPS	Restoration of Operations
RSCAAL	Remote Sensing Chemical Agent Alarm
RSVP	Rapid Syndrome Validation Project
SAF/PA	Secretary of the Air Force/Public Affairs
SAIC	Science Applications International Corporation
S&T	Science and Technology
SARS	Severe Acute Respiratory Syndrome
SBCCOM	Soldier and Biological Chemical Command

SEB	Staphlyoccocal Enterotoxin B
SOFA	Status of Forces Agreement
SPOD	Seaport of Debarkation
SVP	Small pox Vaccination Program
TB	Tuberculosis
TNT	Tri-nitro Toluene
TRANSCOM	Transportation Command
UJTL	Universal Joint Task List
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAF	U.S. Air Force
USAMRIID	U.S. Army Medical Research Institute of Infectious Diseases
USPACOM	U.S. Pacific Command
USSR	Union of Soviet Socialist Republics
UV	Ultraviolet
VEE	Equine Encephalitis
VISA	Voluntary Intermodal Sealift Agreement
WEE	Western Equine Encephalitis
WHO	World Health Organization
WMD	Weapons of Mass Destruction
XO	U.S. Air Force, Air and Space Operations
XOS	U.S. Air Force, Air and Space Operations, Strategic Security

Bio-Defense Now:
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EXECUTIVE SUMMARY

The search for the "best solution" for bio-defense is proving to be an obstacle to finding the more immediate "good solution"…. it is important we get to the immediate business of what might be termed the "85% Quick Fix"—some simple, effective, and immediate counters to today's biological weapons threat.

—Jim A. Davis and Bruce W. Bennett[1]

Purpose

The 85% Biological Defense Project identifies those ideas that can significantly improve the defensive capabilities and facilitate military forces survival, operation, and sustainment in a biologically contaminated environment. The 100% biological warfare (BW) defense solution is difficult, if not impossible, to obtain. The purpose of the "85% Biological Defense Project," hereafter referred to as the "85% Project," is to determine if there are quick-to-implement ideas using available technologies or capabilities that have not yet been adequately addressed to enhance our military forces' protection against biological weapons. While this project was focused on the military services as a whole (Army, Navy, Marines, and Air Force), several ongoing initiatives within the United States Air Force (USAF) are used as examples of the different service's initiatives to counter the biological warfare threat. Likewise, the "85% Project" identifies areas being worked by other USAF programs under the USAF Counter-Chemical, Biological, Radiological, Nuclear, and high yield Explosives (C-CBRNE) Council that require further attention and refinement. The ultimate goal is to reduce the biological weapons threat to U.S. and allied forces at fixed bases. This publication is the product of the authors' research, the "*Needed Now: The '85% Quick Fix' in Bio-Defense*" publication (Appendix A), and a workshop held to address shortfalls in biological weapons defense.

This report has been prepared by U.S. Air Force Counterproliferation Center (USAF CPC) senior researchers for the

[1] Jim A. Davis and Bruce W. Bennett, 2004, "*Needed Now: The '85% Quick Fix' in Bio-Defense*," The Counterproliferation Papers, Future Warfare Series No. 23, USAF Counterproliferation Center, Maxwell AFB, AL.

Defense Threat Reduction Agency/ Chemical and Biological Division (DTRA/CB). The report is targeted to be read by decision-makers, commanders, staff officers, and planners in all functional areas at the DoD, major command, and installation levels.

Scope

Biological weapons defense is a distinct element of the C-CBRNE continuum. Many of the counter-BW tactics, techniques, and procedures are clearly distinguishable from counter-chemical warfare and other elements of the CBRNE gamut. The ideas generated in this report consider solutions that could be easily implemented in the short-term and focus on protecting U.S. and Coalition military forces and their ability to survive, operate, and sustain themselves in a biologically contaminated operational environment. For the purposes of this study, researchers and workshop participants focused on ways to improve protection against a BW threat in the short-term timeframe of 2006 (two years from the research/workshop), but the value of their findings should help direct DoD activities for an even longer period.

Why We Need and 85% Solution

The search for the "best solution" for bio-defense is proving to be an obstacle to finding the more immediate "good solution." In the day when Americans have grown used to fast food, instant access to the Internet, and minimal United States' casualties during war, many have come to expect a "silver bullet solution" for almost any problem. The military, like the rest of America, is often in a quest for the 100% solution to its challenges. For example, the military, now awakened to the biological warfare/biological terrorism (BW/BT) threat, is in search of the perfect solution to the problem posed by biological weapons. The pursuit of the 100% solution often diverts efforts from potential quick (though incomplete) fixes for such tough problems that could provide valuable protection. Some new proposals are presented in this report to provide an "85% Solution."

Unless we adopt a group of partial fixes now, our military forces will be left grossly vulnerable to the BW/BT threat while we search for a more comprehensive breakthrough in vaccines, sensors, and other counters. In April 1990, two U.S. naval bases, Yokosuka and Yokohama, were attacked by botulinum toxin, and although the attacks failed, the scenario could have turned out much different. Likewise, consider the Gulf War in 1991 when the U.S. had 320,000 military personnel massed in a 50 by 150 mile rectangular area southeast of Iraq. The Office of the Secretary of Defense estimated if an anthrax attack had occurred on our troops, 76,300 individuals would have died if they were not vaccinated. On the other hand, if all were vaccinated, it was estimated that only 122 would have died. Conversely, what if the attack had been tularemia, Q-fever, or a host of other bio-

logical agents for which we do not have a vaccine?

Since there is no mechanism in place today to provide even partial protection from a biological warfare attack at most military installations, both the Aum Shinrikyo and the Gulf War scenarios have grave implications. U.S. military forces could suffer death tolls higher than the tragic events of September 11, 2001. Death tolls could be more similar to those experienced in the December 24, 2004, Indian Ocean tsunami, unless some interim efforts for the partial protection occur prior to finding the 100% solution. With the so-called "85% Solution," the goal is to provide substantial immediate protection against a near-term biological weapons attack on military personnel in the targeted area by adopting a combination of quick fix measures. For the purpose of this study, participants were asked to suggest immediate measures that might be taken with the goal of providing protection to at least 85% of the soldiers, sailors, marines, and airmen present. While no single measure might provide such levels of safety, a combination of defensive steps might achieve the protection sought.

The U.S. military forces must have the freedom to operate effectively in any CBRNE environment. However, today's military forces have not been tested in a chemically or biologically contaminated environment. Although the military services, most notably the U.S. Air Force, have developed, educated, and trained a counter-chemical warfare concept of operations (C-CW CONOPS) and should be adequately prepared to withstand and operate in a chemically contaminated environment, the C-CW CONOPS cannot be used in defense of a biological weapons attack due to the significant differences in the characteristics of a chemical versus a biological attack. The armed services have an extreme lack of defensive BW warfighting planning capability and resilience.

Currently, the DoD has not developed the 100% solution to these BW defense shortfalls. A biological attack may dramatically slow operations tempo to unacceptable levels. The inability of the U.S. military to sustain the fight in forward locations will limit the amount of power brought to the battlefield if a counter-attack is desired. Hence, some solution, even if it is not the complete long-term answer to the problem, is warranted.

Structure of the Report

The report is organized similar to a standard research report with an executive summary, introduction, materials and methods, results, discussion and recommendations, and conclusion sections. The discussion and recommendations section primarily focus on the results of the 56 ideas generated from the "85% Biological Weapons Solution" workshop. These 56 ideas have been divided into five tiers based on their relative importance as determined by the workshop participants. When addressing each workshop-generated idea that fits into one of the top three tiers, detailed background information is provided to indicate a current state of preparedness. Recommendations are

presented where additional emphasis or suggestions for improvement or refinement seem warranted. Ultimately, the U.S. military forces must be able to sustain and operate even if the enemy uses biological weapons. This report provides additional information and guidance toward reaching that goal.

Workshop Process and Analysis

On October 20, 2004, the "85% Biological Weapons Solution" workshop was held in Washington, D.C. Forty-one workshop attendees (divided into four working groups) generated 56 ideas aimed at providing a substantial amount of additional protection against a BW attack ("the 85% Solution") in the next two years. In order to cull these numerous ideas into a more manageable list for the DoD to address, the workshop attendees later reviewed the 56 ideas and ranked their top 15 choices in three categories. The three categories were *Implemented Quickest*, *Greatest Benefit*, and *Implemented Quickest and Greatest Benefit*. *Implemented Quickest* was described as "the solution that can be the most quickly implemented regardless of the amount of benefit to the war fighter." *Greatest Benefit* was described as "the solution that offers the greatest benefit to our biological weapons defense without regard to cost, time, or other considerations which may inhibit implementation." Finally, *Implemented Quickest and Greatest Benefit* was described as "the solution that offers the 'most bang for the buck,' or the 'best solution' when you consider the cost, speed of implementation, and value to the warfighter."

The workshop attendee's ranking of the 56 ideas showed that developing a counter-BW concept of operations (C-BW CONOPS) was selected the most times as the #1 choice in the *Greatest Benefit*, and *Implemented Quickest and Greatest Benefit* categories. The attendees placed the most #1 votes in the *Implemented Quickest* category to the suggestion of holding Weekly Commander's Stand-Up Briefings to provide uniform, frequent briefings to installation commanders regarding illness trends.

The rankings of the 56 ideas were also analyzed to yield a "top ten" in each of the three aforementioned categories. Since some of these top ten items reoccurred in more than one of the three categories, there were only 24 ideas that emerged in the "top ten" for the three categories. Of these 24 ideas, 19 appeared in more than one category of importance and are defined here in one of three tiers indicating relative importance given by the workshop attendees.

Results

Rankings regarding the importance of each of the 56 ideas generated at the "85% Biological Weapons Solution" workshop fell into five easily discernable categories (Tiers 1 through 5). Tier 1 ideas were those that were determined to be the most important for an 85% solution. The top ten ideas are in Tier 1 and Tier 2. The next nine ideas in importance for this project are in Tier 3.

Tier 1 Bio-Defense Recommendations

- Educate Senior-Level DoD Personnel
- Develop Decision Tools for Commanders
- Develop C-BW CONOPS

Tier 2 Bio-Defense Recommendations

- Educate Combatant Commanders (COCOMs)
- Train and Exercise DoD Personnel
- Educate All Other DoD Personnel
- Develop Installation Medical Surveillance Information
- Prepare Public Information Packages and Media Relations
- Develop BW Force Protection Condition and Random Anti-Terrorism Measures (FPCON/RAM)
- Vaccinate All Military

Tier 3 Bio-Defense Recommendations

- Provide Weekly Commander's Stand-Up Briefings
- Develop Quick-Reference Education Handouts
- Research New Prophylaxis and Vaccines
- Institute the 922 Concept
- Investigate New Detection Methods
- Modify Ventilation Systems
- Develop DoD Integrated Information Collection
- Re-Prioritize BW Threat Agents
- Expand Joint BW Advanced Concept Technology Development (ACTD) Funding

Recommendations

The data reflect that the workshop attendees consider education and training as a top priority toward an 85% BW defense solution: five of the top ten ideas (Tiers 1 and 2) related to education and training. The following section provides detailed information and discussion for each of the ideas.

Recommendations related to the ideas generated at the "85% Project" workshop are provided where additional emphasis or suggestions for improvement or refinement are warranted. These recommendations are also summarized here.

Tier 1 Bio-Defense Recommendations

Educate Senior-Level DoD Personnel: Educate senior level military and civilian personnel in the DoD on the basics of BW agent effects, characteristics, treatment, the BW threat, passive defense measures, and operational considerations.

Education of senior-level DoD personnel appears in every list analyzed and should be considered a top priority in our BW defense development. Educational requirements should be mandated to all services to be included in all senior service schools, general officer schools, base/ post/ wing commander's courses and joint

courses for Colonels and higher ranks. Another suggestion is to ensure focus is given to educating senior level personnel through efforts like the Kunsan Focused Effort (KFE)[2] and CODE SILVER.[3] A subset of the CODE SILVER exercises could be modified to focus solely on the senior-level personnel at MAJCOMs or Air Staff.

Senior staff must be educated on the hazards of a biological weapons attack to ensure preparedness of U.S. and Coalition military forces. Senior military leaders are responsible for adequately determining the effects to operations, instilling BW-specific education and training, generating appropriate plans, developing effective information gathering techniques and capabilities, providing the physical protection of our forces, and research and development for future BW defenses.

Develop Decision Tools for Commanders: Develop biological weapons attack Decision Tools for Commanders which include recommendations for baseline posture, indicators of biological attack, questions that need to be asked about the extent and implications of an attack, and appropriate actions.

The purpose of Decision Tools is to ensure the information presented to the commander is defined and organized in a concise and logical manner to facilitate the decision-making process.[4] These tools must define the most critical decisions as they relate to preventing further injury and maintaining operational capability. The relevant installation functionals or personnel must also provide the commander with underlying information to make informed decisions. This information should fit into a Decision Tools matrix in a clear, well-organized and predictable manner. In addition, Offices of Primary Responsibility (OPRs) for each decision should be clearly identified. Decision tools should also include pre- and post-attack or exposure prophylaxis and treatment plans.[5]

The DoD should direct a Joint working group to bring together the lessons of the KFE and the USPACOM bio-defense initiatives with subject matter experts to define the best Decision Tools for Commanders.

Develop C-BW CONOPS: Doctrine for BW should be de-linked from other CBRNE doctrine since it is significantly different.

The COCOMs and services should develop C-BW CONOPS for all military operations in BW contaminated environment including individual, Joint and Coalition operations. Further, a comprehensive

[2] The USAF KFE Program is an initiative designed to determine educational shortfalls and developing tools to ensure the education and understanding of the BW hazard. The study location is Kunsan Air Base, Korea.

[3] CODE SILVER is a program that offers tabletop exercises emphasizing biological and chemical warfare responses by Air Force medical facilities. The exercise focuses on how the medical facilities interact with the rest of the base and the local civilian community.

[4] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-2, Appendix E-2.

[5] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-4, Appendix E-1.

C-BW CONOPS should address issues such as airfield operations, deployment and redeployment of forces, use of Civil Reserve Air Fleet (CRAF) and Voluntary Intermodal Sealift Agreement (VISA), trans-loading cargo and trans-loading airfield operations, operating contaminated Aerial Port of Debarkation (APODs) and Seaports of Debarkation (SPODs), re-supply, and disposition of BW-contaminated remains and mass casualties.[6] Biological defense is not a separate entity to be addressed in isolation by medical or disaster preparedness staff; it must be an integral part of war plans, operations, and training.[7]

Tier 2 Bio-Defense Recommendations

Educate Combatant Commanders (COCOMs): Educate, train, exercise COCOMs regarding impacts of biological weapons attacks on combat operations.

COCOMs (Major through Flag Officer ranks and their civilian equivalents) should receive pertinent BW education, training, and practice through active education programs and exercises in order to understand and effectively react to BW attacks that impact combat operations. The BW threat is often overlooked in war plans and operations due to frequent rotation of personnel without sufficient BW training. There should be recurring education at theaters of operation so as personnel rotate in they can receive the initial education within the first three months.

Train and Exercise DoD Personnel: Train and Exercise all DoD personnel more specifically and thoroughly on BW agents.

All services should implement and integrate a comprehensive training and exercise program by the direction of the Joint Staff. The U.S. Air Force's Education, Training, and Exercise (ETE)[8] model can be used by the joint community as a starting point for this effort. Training of basic BW-defenses and responses to biological weapons attacks should occur at all levels of enlisted and officer ranks. Training expectations should be of a specific detail and level of knowledge appropriate for the rank. In order to ensure an effective training scenario, more definitive goals, objectives and requirements should be established; and resources and training aids should be made available. Likewise, exercises across services should be mandated to exercise BW-specific scenarios at least once annually.

Educate All Other DoD Personnel: Educate all personnel in the DoD on the basics of BW agent effects, characteristics, treatment, the BW threat, passive

[6] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-8, Appendix E-1.

[7] Ibid.

[8] The ETE is a Chief of Staff of the Air Force directed collaborative effort between AF/XOS-FC and HQ AETC. The goal of the ETE initiative is to develop C-CBRNE learning objectives (education), skill sets (training), and operational capabilities (exercise requirements) that every airman must have to be competent against a CBRNE-armed adversary.

defense measures, and operational considerations.

All DoD personnel should receive BW education in all levels of Professional Military Education (PME), through briefings, and in routine education and exercises.[9] The education provided during PME should be tailored to each rank and included at all levels of enlisted and officer PME. Exercises such as CODE SILVER help promote education and training of personnel associated with Air Force medical facilities. This type of activity should be encouraged at all military installations, and the involvement of the entire base should be required in order to educate all personnel.

Develop Installation Medical Surveillance Information: Develop and implement an installation system of near real-time, high-fidelity medical surveillance information for both military and local civilian populations.

This integrated medical surveillance program will collect data from multiple sources, for example medical surveillance of clinic appointments, illness observed by co-workers, school absenteeism, veterinary reports, and over-the-counter drug sales.

DoD should make a review of DoD Directive 6490.2 a priority to ensure it provides for comprehensive medical surveillance. Priority should be given to its implementation and metrics for its compliance should be monitored by MAJCOMs.

Public Information Packages and Media Relations: Prepare standardized public information packages, policies and procedures for public release concerning BW agents.

Public Affairs, in coordination with medical, pubic health, bioenvironmental engineers, civil engineers, and others determined by the installation commander should prepare public information packages regarding how to respond to various forms of BW threats or attacks in advance.[10] These public information packages can have a significant positive psychological impact on the local community. A properly worded and detailed message delivered by the right means with definitive and clear actions for each individual will reduce panic and the number of behavioral casualties. A poor message in content, timing, or delivery may promote panic, even if a BW has not been used.

A critical step in the development of these messages is educating the messenger. Media relations, specifically Public Affairs, should receive BW-specific education and participate in training and exercises concerning procedures and capabilities for pre- and post-BW events. A template of announcements should be generated at a MAJCOM or DoD level for installation use.

[9] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-2, Appendix E-1.

[10] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-2, Appendix E-1.

Develop BW FPCON/RAM Measures: Develop BW-specific counter-measures in Force Protection Conditions (FPCONs) and Random Antiterrorism Measures (RAMs) for commands with elevated threats.

The Joint Staff should host an interservice working group with COCOM representatives to develop a specific set of C-BW measures to be taken at different RAM or FPCON levels. Participants of the workshop must have a broad range of expertise such as intelligence, medicine, climatology, engineering, operations, etc.

Vaccinate All Military: Vaccinate all military populations against most likely lethal BW diseases (e.g., smallpox and anthrax) to lessen likelihood of infection.

The Joint Staff should develop a team of multi-disciplinary subject matter experts as well as non-medical personnel to address challenges related to a universal vaccination program with the ultimate goal of vaccinating all military against smallpox and anthrax.

Tier 3 Bio-Defense Recommendations

Provide Weekly Commander's Stand-Up Briefings: Provide uniform, frequent briefings to installation commanders regarding illness trends.

At weekly commander's stand-up briefings, overall disease trends should be reported, including occurrences of infectious diseases such as flu. Depending on the threat level, this information may need to be reported to the commander more frequently.

Develop Quick-Reference Education Handouts: Develop a brief, simplified document (2-3 pages) with detail and level of knowledge specific for each rank.

Potential application of this idea may be instilled in the KFE Program or the ETE Initiative. During the development of the education, training and exercise materials of the ETE Initiative, quick-reference handouts could also be developed. These handouts may be incorporated as tabs in future editions of the Airman's Manual for quick and easy reference.

Research New Prophylaxis and Vaccines: Investigate alternate and improved prophylaxis and vaccines.

The DoD should explore challenges related to new prophylaxis and vaccines. DoD should direct increased funding to support more aggressive vaccine production as well as alternatives to vaccines.

Institute the 922 Concept: Evaluate 922 Concept for military application.

The National 922 Concept, if implemented, will be a telephone triage system that collects real-time, self-reported symptoms of a population and provide meaningful information that could prevent panic and enhance sustainment. Develop and institute a military 922 system.

Investigate New Detection Methods: Identify and deploy current cutting-edge technologies to enhance identification of BW agents.

DoD should aggressively explore commercial and government off-the-shelf technology, such as the 454 technology,[11] to reduce the time and enhance the accuracy of biological agent detectors.

On a more strategic level, area monitoring on an installation could be conducted using a system similar to that used in the BioWatch program. BioWatch is the Department of Homeland Security (DHS) program, assisted by the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (CDC/ATSDR) and Environmental Protection Agency (EPA), which performs 24/7 environmental surveillance using the existing EPA and Department of Energy (DOE) air quality monitoring systems. Collected air samples are tested as an early warning indicator of biological attacks.[12] The BioWatch system has been successfully operating in more than 30 urban centers since early 2003. The system has performed over a million tests with no false positive, and one true positive (an environmental source).[13]

Modify Ventilation Systems: Install protective ventilation system, filters, room air purifiers, or ultraviolet lights, as economically feasible.

In normal buildings, some level of protection against BW can be achieved simply by using improved filters. Normal buildings use filters with a Minimum Efficiency Reporting Value (MERV) of 6 to 8, but filters with a MERV of 11 can usually be substituted without changing the heating, ventilation and air conditioning (HVAC) system capabilities, making a big difference in removal of many BW agents. High Efficiency Particulate Air (HEPA) filters are also readily available, and can remove particulates to 0.3 microns. DoD should acquire a supply of improved filters for its buildings in threat areas, and have rules for when to switch to their use.[14]

In addition to ventilation system filters, other options exist to provide limited protection to individual rooms. For instance, room air purifiers will filter out some biological particulates in the air. If a BW agent concentration can be reduced below its infectious level, then the inhabitants of the room will be protected for a short period of time. Ultraviolet (UV) lights may also kill some microorganisms. If UV lights are installed at building or room entrances and in ventilation ducts, this too may offer some additional protection.

[11] The 454 Life Sciences Company offers a DNA sequencing system to sequence an entire genome. Through advanced technology, several million base pairs of genetic sequence data per hour can be generated on a single instrument. So, the complete identity of an organism, or BW agent, can be determined in hours instead of days.

[12] CDC, ATSDR, and DHHS, 2004, "A National Public Health Strategy for Terrorism Preparedness and Response 2003-2008," March 2004, 9.

[13] U.S. Department of Homeland Security, 2004, "Fact Sheet: A Better Prepared America: A Year in Review," 25 May 2004. On-line, Internet, 9 June 2004, available from www.whitehouse.gov/news/releases/2004/05/print/20040525-4.html.

[14] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-6, Appendix E-1.

Develop DoD Integrated Information Collection: Adopt a DoD systems approach to combine information from all sources. Intelligence collection should focus on the strategic, operational, and tactical levels of war.

The DoD should develop a team with similar expertise to the Epidemic Intelligence Service (EIS)-trained officers (or send them to this training) to enable a specialized team of trained epidemiologists to assist in the collection of data indicative of a BW attack. These individuals should be integrally linked to Armed Forces Medical Intelligence Center (AFMIC), other Defense Intelligence Agency (DIA) resources, the Central Intelligence Agency (CIA), and other disease surveillance systems.

Additionally, a DoD Integrated Information Collection System should be developed combining data from all sources. The suggested DoD Integrated Information Collection involves a systems approach for data acquisition. For example, the data may include adversary capabilities and intent, friendly vulnerability, measurements from detectors, environmental surveillance, information from local nationals, installation medical surveillance information, and regional (civilian) medical surveillance.[15] This integrated collection system must include development of effective interaction with the intelligence community to define and refine the threat.

Re-Prioritize BW Threat Agents: Set priorities on most likely BW or disease threats to guide research and development (R&D) concerning detection, treatment, and defense (i.e., are anthrax, smallpox, and plague the top three?).

The DoD BW-defense experts should conduct a technical assessment to determine the priority of BW agents. The DoD should partner with the Department of Homeland Security in conducting this national risk assessment to determine our probable BW threats. This assessment should include the following characteristics of an effective biological weapon:[16, 17, 18]

- Inexpensive,
- Easily acquired and readily available,
- Easy to produce (enemy has technical capability),
- Easy to hide and transport,
- Easily weaponized (enemy has technical capability),
- Stability in storage and after disseminated,
- Effectively dispersed,

[15] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-3, Appendix E-1.

[16] Judith Miller, 2004, "Bush Issues Directive to Bolster Defense against Bioterrorism," *New York Times*, 28 April 2004.

[17] Graham S. Pearson, 2000, "The Essentials of Biological Threat Assessment," in *Biological Warfare: Modern Offense and Defense*, Raymond A. Zilinskas, Ed., Boulder, CO: Lynne Rienner Publishers, 61-67.

[18] Raymond S. Weinstein and Kenneth Alibek, 2003, *Biological and Chemical Terrorism: A Guide for Healthcare Providers and First Responders*, New York, NY: Thieme, 4-9.

- Stability as an aerosol (potentially the best dispersal method),
- Short and predictable incubation period,
- Initial recognition of disease likely to be delayed,
- Communicable and highly contagious,
- Highly lethal and/or incapacitating,
- Maintains potency and persists in the environment,
- Limited detectability (instruments do not readily detect),
- No treatment or vaccine, and
- Name of the disease induces fear, devastating psychological effect.

Funding priorities and C-BW CONOPS could then focus on the re-prioritized list of BW Threat Agents.

Expand Joint BW Advanced Concept Technology Development (ACTD) Funding: Expand funding for joint experimentation ACTD for BW defense; more Limited User Tests to bring new technologies to field.

Ensure funding for BW ACTDs is provided. Senior leaders should recognize the importance of ACTDs for BW defense issues and support Joint BW ACTDs. Proposed ACTDs dealing with bio-defense should be given top priority consideration.

Conclusion

The military services, PACOM, DTRA, OSD, Joint Staff, and many others are addressing solutions to BW defense. The Joint Program Executive Office for Chemical and Biological Defense should be effectively utilized as a focal-point to ensure communication between all groups working programs related to BW defense. This office should ensure all lessons learned are shared to develop an effective BW program more efficiently.

The DoD, services, and MAJCOMs are encouraged to aggressively support and implement the ten recommendations in Tier 1 and Tier 2. Most of these recommendations have been initiated in various services or MAJCOMs. By capitalizing on the work already done, DoD can rapidly improve its BW defense posture and at least be “85%” ready.

Addressing quick-fix solutions to our BW defense insufficiency is critical *today*. We cannot afford to be the unready confronting the unthinkable!

Bio-Defense Now:
56 Suggestions for Immediate Improvements
Final Report

The search for the "best solution" for bio-defense is proving to be an obstacle to finding the more immediate "good solution"…. it is important we get to the immediate business of what might be termed the "85% Quick Fix"—some simple, effective, and immediate counters to today's biological weapons threat.

—Jim A. Davis and Bruce W. Bennett
"Needed Now: The '85% Quick Fix' in Bio-Defense"

INTRODUCTION

The U.S. military forces must have the freedom to operate effectively in any Chemical, Biological, Radiological, Nuclear, or high yield Explosive (CBRNE) environment. The potential biological warfare (BW) threat has been described in Joint Doctrine[19] and open-source literature.[20] However, today's military forces have not been tested in a chemically or biologically contaminated environment.

Although the military services, most notably the U.S. Air Force, have a developed, educated, and trained a counter-chemical warfare concept of operations (C-CW CONOPS) that should allow the U.S. to operate from airbases in a chemically contaminated environment, the military services have a shortfall in the education, training, equipping, and preparedness for a BW attack.

A biological attack may dramatically slow operations tempo to unacceptable levels. The inability of the U.S. military to sustain the fight during biological weapons attacks in forward locations will limit the amount of power brought to the battlefield during a counter-attack.

In general, Joint and Service doctrine address CBRNE defense. These doctrine documents include Joint Publication (JP) 3-11 "Joint Doctrine for Operations in

[19] JP 3-11, 11 July 2000, "Joint Doctrine for Operations in Nuclear, Biological, and Chemical (NBC) Environments," I-4 through I-7. Document currently under revision.

[20] Many sources reference state and non-state actors that possess or desire to possess biological weapon development capability. For example, documents and equipment recovered from al-Qa'ida facilities in Afghanistan show that al-Qa'ida had conducted research on biological agents. Al-Qa'ida's BW program may primarily be "focused on anthrax for mass casualty attacks, although the group most likely will pursue opportunities to produce and use other biological agents in smaller-scale attacks." CIA, 2003, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 2003." On-line, Internet, 14 December 2004, available from http://www.odci.gov/cia/reports/721_reports/july_dec2003.htm. Many other references address BW and are too numerous to detail here, but are available upon request.

Nuclear, Biological, and Chemical (NBC) Environments" and JP 3-40 "Joint Doctrine for Combating Weapons of Mass Destruction." These doctrine documents address Weapons of Mass Destruction (WMD) or Nuclear, Biological, and Chemical (NBC) or CBRNE in general terms. JP 3-11 contains an Appendix C, "Biological Hazard Considerations," which details some specific characteristics and types of biological agents and operational considerations.

As an example of service doctrine, the USAF has the AF Doctrine Document (AFDD) 2-1.8 "Counter Nuclear, Biological, and Chemical Operations." AFDD 2-1.8 allocates a cursory paragraph to BW in Chapter One. Yet little doctrinal guidance exists to specifically address BW defense. As a result of lax BW defensive guidance, the U.S. Air Force and U.S. Pacific Command (USPACOM) independently have started initiatives to fill this gap.

The U.S. Air Force recognized the need to develop biological defense capabilities. In April 2002, the Air Force released the "Commander's Guidelines: Force Protection and Operations in a Biological Warfare Environment" demonstrating the first step toward generating a cohesive biological defense strategy.[21] Next, in July 2002 the Chief of Staff of the Air Force chartered the Biological Defense Task Force (BDTF), an Air and Space Operations (XO) led group.[22] The BDTF developed the "Interim Bio-Defense Plan" to identify capability gaps, assess risks, and develop doctrine, training, exercises, and tactics, techniques, and procedures. In the "Status Report to the Chief of Staff of the Air Force," the recommendations and directions aimed to refine and improve Air Force biological defense capabilities.

In March 2004, the USAF C-CBRNE Council assumed the roles and responsibilities of the BDTF. Through the BDTF and C-CBRNE Council, programs such as the Kunsan Focused Effort (KFE) and development of a C-BW CONOPS have been initiated. The BDTF 2003 Action Plan[23] identified 59 action items that have many similarities to the ideas generated in the October 20, 2004, "85% Biological Weapons Solution" workshop (annotated at Appendix F).

As a separate effort, in 2003, USPACOM established the Biological Warfare Countermeasures Initiative (BWCI) to incorporate BW mitigating measures into deliberate plans, coalition needs, and domestic interagency efforts. USPACOM partnered with the Defense Threat Reduction Agency (DTRA) and Department of Homeland Security (DHS)

[21] HQ USAF, 12 April 2002, "Commander's Guidelines: Force Protection and Operations in a Biological Warfare Environment." On-line, Internet, 14 December 2004, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/data/bdguidelines.doc.

[22] Charter on-line, Internet, 14 December 2004 available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/bdtf/bdtf.shtml.

[23] "Biological Defense Task Force Action Plan," 28 May 2003. On-line, Internet, 14 December 2004, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/bdtf/bdtf.shtml.

in this initiative.[24] Some of the BWCI initiatives that have similarity to the ideas generated by the October 2004 "85% Biological Weapons Solution" workshop are annotated in Appendix F.

The purpose of the "85% Biological Defense Project," hereafter referred to as the "85% Project," is to identify those ideas that can significantly improve the military services' defensive capabilities and ability to survive, operate, and sustain in biologically contaminated environment.

Instead of focusing on the "silver bullet" to obtain a 100% solution which may take many years, the "85% Project" aims to determine if there are additional quick-to-implement ideas using available technologies or capabilities that are not being fully employed. The report uses several programs of the U.S. Air Force under the USAF Counter-CBRNE (C-CBRNE) Council[25] as examples of a some Department of Defense (DoD) efforts currently in progress and as a way to elucidate programs that still need further attention and refinement. The ultimate goal is to reduce the BW threat to U.S. and allied forces at fixed bases.

During 2002, Col Jim Davis and Dr. Bruce Bennett were working on a draft of "*Needed Now: The '85% Quick Fix' in Bio-Defense*." The paper sought to spur the DoD toward a more immediate pragmatic approach to protecting today's military forces from the BW threat. This think-piece was presented to both the U.S. Air Force BDTF and the USPACOM BWCI and helped stimulate discussion and new ideas in both forums. The paper was a springboard for further study of BW-defense ideas.

The "*85% Biological Defense Project*" is a compilation of ideas and recommendations that should lead to enhanced defensive capabilities, survival, and operations in a BW situation. While this project was focused on the military services as a whole (Army, Navy, Marines, and Air Force), several ongoing initiatives within the USAF are used as examples of the service's initiatives to counter the biological warfare threat. The ultimate goal is to reduce the biological weapons threat to U.S. and allied forces at fixed bases.

This publication is the product of the authors' research, the "*Needed Now: The*

[24] Thomas B. Fargo, 31 March 2004, *Testimony before the House Armed Services Committee, U.S. House of Representatives.* On-line, Internet, 14 December 2004, available from http://armedservices.house.gov/openingstatementsandpressreleases/108th congress/04-03-31 fargo.html.

[25] Excerpt from the C-CBRNE Charter, "At the direction of the Assistant Vice Chief of Staff of the Air Force (AF/CVA), the HQ USAF Counterproliferation Integrated Process Team (CP IPT) is renamed the C-CBRNE Council and is chartered to address USAF-wide issues related to countering the chemical, biological, radiological, nuclear, and high-yield explosive threat on an ongoing basis… The C-CBRNE Council will address USAF actions to counter CBRNE through proliferation prevention, counterforce, active defense, passive defense, and crisis/consequence management. The Council will oversee USAF C-CBRNE issues to maximize warfighting capabilities and support lead Federal agencies if tasked and available. The Council will address C-CBRNE issues brought before it by its members or submitted through the Council's Policy Working Group (PWG)." On-line, Internet, 14 January 2005, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_council/040114/HQUSAF_CCBRNE_CouncilCharter.doc.

'85% Quick Fix' in Bio-Defense" publication (Appendix A), and a workshop held to address shortfalls in biological weapons defense.

This report has been prepared by U.S. Air Force Counterproliferation Center (USAF CPC) senior researchers for the Defense Threat Reduction Agency/Chemical and Biological Division (DTRA/CB). The report is targeted to be read by decision-makers, commanders, staff officers, and planners in all functional areas at the DoD, major command, and installation levels.

MATERIALS AND METHODS

Approximately one hundred of the top biological weapons subject matter experts in the U.S. from various civilian and DoD organizations were identified, contacted, and invited to attend a workshop on October 20, 2004. The initial information and invitation letter (reference Appendix C-1) was sent via e-mail in late September and early October. After the selected subject matter experts responded, they received a second e-mail in October with further details regarding the purpose of the workshop and administrative information (reference Appendix C-2). During all of the e-mail contact, the potential attendees were provided no pre-conceived notions or biased opinions on potential biological weapons defense solutions. In total, 50 people confirmed their attendance to the workshop.

The workshop was held on October 20, 2004, in a group of meeting rooms operated by Science Applications International Corporation (SAIC) in the Crystal Gateway I building, Crystal City, Virginia. Forty-one of the 50 confirmed subject matter experts attended the workshop (Appendix B).

The workshop began with an overview of "The 85% Biological Defense Project" by Col Jim Davis, Deputy Director, USAF Counterproliferation Center. The presentation slides are located at Appendix D-1. Col Davis' presentation provided background of historical biological weapons use, why an 85% solution was needed, some ideas to create an 85% solution, and rules of engagement for the workshop. Col Davis instructed the attendees to focus on the threat in the 2006 time frame (the next two years) and consider solutions that could be easily implemented through that period of time. He also advised the attendees to concentrate their efforts to generate ideas on protecting U.S. and Coalition military forces and their ability to survive, operate, and sustain themselves in a biologically contaminated operational environment.

The 41 workshop attendees were divided into four groups of 9 or 10 people, including a facilitator and recorder. Every effort was made to separate attendees into different groups so that each group would have a broad range of backgrounds. The four groups broke to meet in separate meeting rooms for approximately three hours to individually brainstorm ideas or solutions to biological weapons defense shortcomings. In the afternoon, all four groups returned to the main conference room; facilitators (Jim

Miller, Bruce Bennett, Leo Cropper, and Roy Williams) for the different groups presented their group's findings. This was an open forum discussion so the findings from each group were criticized and improved by peers in open discussion. Reference Appendix E-1 through E-4 for the individual group proceedings and the group slide presentations provided to all of the attendees. After each group completed their presentation, Col Davis provided a brief summary and closing remarks (reference slides at Appendix D-2).

The week following the workshop, the recorders and facilitators edited the workshop notes to ensure all ideas were captured clearly and completely. The group notes were thoroughly reviewed to generate a comprehensive list of 56 ideas from the workshop. The 41 workshop attendees were contacted by e-mail with an attached Excel worksheet listing the 56 ideas generated at the workshop (reference Appendix F). Respondents rank ordered the ideas listed in Appendix F with "1" denoting highest priority through "15" denoting the lowest priority in each of three categories: *Implemented Quickest*, *Greatest Benefit*, and *Implemented Quickest and Greatest Benefit*.

The spreadsheet listing the ideas contained a comment block to describe each of the categories. *Implemented Quickest* was described as "the solution that can be the most quickly implemented regardless of the amount of benefit to the war fighter."

Greatest Benefit was described as "the solution that offers the greatest benefit to our biological weapons defense without regard to cost, time, or other considerations which may inhibit implementation."

Finally, *Implemented Quickest and Greatest Benefit* was described as "the solution that offers the 'most bang for the buck,' or the 'best solution' when you consider the cost, speed of implementation, and value to the war fighter." For brevity, the last category, *Implemented Quickest and Greatest Benefit*, will be referred to as *Best Overall* hereafter. The respondents were given no other instructions as to how to conduct their rating and analysis.

Three methods of analysis were used to analyze the data. First, the idea that generated the most number one votes in each of the three categories was identified. Second, a top ten for each of the three categories was determined by using a frequency distribution of total votes (regardless of the value of the vote). This provided a set of data titled "**Priority Ranking by Number of Total Votes**." Third, a top ten for each of the three categories was determined by adding all the votes of one through five (each vote of one through five given equal value). This provided a set of data titled "**Priority Ranking by Number of Votes 1-5**."

After reviewing the results of these three methods of analysis, the ideas were prioritized as to their perceived precedence for implementation. Based on the total number occurrences of each idea in the "**Priority Ranking by Number of**

Total Votes" and "**Priority Ranking by Number of Votes 1-5**" data sets, three different levels (tiers) of priorities were easily discernable. See Appendix G for details.

RESULTS

Each workshop idea was rank ordered by *Best Overall*, *Implemented Quickest*, and *Greatest Benefit*. Of the 41 workshop attendees contacted by e-mail to provide a rank order of the ideas, 36 responded with a *Best Overall* rank order. Only 34 respondents ranked the ideas using the *Implemented Quickest* category; and 35 ranked the ideas using the *Greatest Benefit* category. The data were combined and analyzed to determine the most number one votes, the "**Priority Ranking by Number of Total Votes**," and the "**Priority Ranking by Number of Votes 1-5.**"

The table at Appendix G-1 provides the idea which received the most number "1" votes for each category. The C-BW CONOPS idea was ranked first in the *Greatest Benefit*, and *Best Overall* categories. The Weekly Commander's Stand-Up Briefing idea was first in the *Implemented Quickest* category.

The data from each of the three categories was combined and analyzed by looking at them in two different ways. First by using a "**Priority Ranking by Number of Total Votes,**" hereafter referred to as "Total Votes" category (regardless of the value of the vote). Secondly, by using a "**Priority Ranking by Number of Votes 1-5,**" hereafter referred to as "Votes 1-5" category.

The "Total Votes" category is detailed in Tables G-2.1 to G-2.3 of Appendix G-2 which display the top 10 ideas for each category that garnered the most number of total votes regardless of rank order. To clarify, any vote (1 to 15) was given a value of "1" and the total number of votes summed.

In order to further elucidate the priority that should be given to the 56 ideas generated at the workshop, a second frequency analysis was used and named "Votes 1-5." Tables G-3.1 to G-3.3 of Appendix G-3 detail the top 10 ideas for each category that garnered the most number of votes 1 to 5. To clarify, any vote of 1 to 5 was given a value of "1" and the total number of those votes summed.

After reviewing the "Total Votes" and "Votes 1-5" of all 56 ideas for each of the three categories (*Best Overall*, *Implemented Quickest*, and *Greatest Benefit*), the ideas were organized by priority into five "tiers." Tier 1 ideas were those that received the highest priority emphasis by workshop attendees. Likewise, Tier 2 ideas were next in order of priority, and so on for Tiers 3 through 5.

Table 1. Tier 1 BW Defense Ideas

	Total Votes Results			Votes 1-5 Results			
Idea from 85% Solution Workshop	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	***Total Occurrence in Categories***
Educate Senior-Level DoD Personnel	1	1	3	1	1	4	6
Decision Tools for Commanders	2	1	4	2	5	2	6
C-BW CONOPS	2	4	1	3	5	1	6

Tier 1 BW defense ideas were those that workshop attendees considered were the most important toward improving quick defensive capabilities against BW. Tier 1 ideas were solutions that occurred in all six of the "Total Votes" and "Votes 1-5" data-sets. Numbers in "Total Votes" and "Votes 1-5" columns represent the ranking this idea received upon data analysis. "1" is the highest rank possible. Where there was a tie for an idea, the ideas received the same score.

Table 2. Tier 2 BW Defense Ideas

	Total Votes Results			Votes 1-5 Results			
Idea from 85% Solution Workshop	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	***Total Occurrence in Categories***
Educate COCOMs	8	-	8	6	5	6	5
Train and Exercise DoD Personnel	3	5	7	8	-	-	4
Educate All Other DoD Personnel	8	5	-	7	6	-	4
Develop Installation Medical Surveillance Info	4	-	2	7	-	7	4
Public Information Packages and Media Relations	6	2	-	-	3	7	4
BW FPCON/RAM Measures	5	-	-	4	-	6	3
Vaccinate All Military	7	-	-	5	-	6	3

Tier 2 BW defense ideas were those that workshop attendees considered to be very important toward improving quick defense capabilities against biological weapons. Tier 2 ideas were solutions that occurred in three or more datasets. Numbers in "Total Votes" and "Votes 1-5" columns represent the ranking this idea received upon data analysis. "1" is the highest rank possible. Where there was a tie for an idea, the ideas received the same score.

Table 3. Tier 3 BW Defense Ideas

	Total Votes Results			**Votes 1-5 Results**			
Idea from 85% Solution Workshop	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	***Total Occurrence in Categories***
Quick-Reference Education Handouts	-	3	-	-	4	-	2
Weekly Commander's Stand-Up Briefings	-	5	-	-	2	-	2
Re-Prioritize BW Threat Agents	-	-	-	8	6	-	2
Develop DoD Integrated Information Collection	-	-	6	-	-	7	2
922 Concept	-	5	-	-	6	-	2
New Prophylaxis and Vaccines	-	-	5	-	-	3	2
New Detection Methods	-	-	6	-	-	5	2
Ventilation Systems	-	-	-	7	-	6	2
Expand Joint BW ACTD Funding	-	-	-	8	-	7	2

Tier 3 ideas occurred in two datasets. Numbers in "Total Votes" and "Votes 1-5" columns represent the ranking this idea received upon data analysis. "1" is the highest rank possible. Where there was a tie for an idea, the ideas received the same score.

Table 4. Tier 4 BW Defense Ideas

	Total Votes Results			**Votes 1-5 Results**			
Idea from 85% Solution Workshop	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	**Best Overall**	**Implemented Quickest**	**Greatest Benefit**	***Total Occurrence in Categories***
Train Health Care Workers and First Responders	-	5	-	-	-	-	1
Daily Health Screening	-	-	-	-	6	-	1
Rapid Vaccine Approval	-	-	-	-	-	7	1
Fast In-Theater Confirmatory Analysis	-	-	7	-	-	-	1
Disease Containment Plan	-	-	-	8	-	-	1

Tier 4 ideas were those ranked in the top ten of only one dataset. These Tier 4 ideas received votes, which can be reviewed in the raw data at Appendix G-4. Numbers in "Total Votes" and "Votes 1-5" columns represent the ranking this idea received upon data analysis.

Table 5. Tier 5 BW Defense Ideas

Idea from 85% Solution Workshop	
Determine BW Agents Possible	*These ideas may have received some votes by the workshop participants, however were not in the top ten rankings for any category upon analysis of the data.*
Enhance Research Community and Operator Interaction	
Badge-Based Biometrics	
Thermal Sensors	
R&D of Novel Agents	
R&D Versus Acquisition of Current Bio-detectors	
Improve Solutions/Technology Implementation Process	
New Decontamination Methods	
New Individual Protective Equipment (IPE)	
Develop Individual Protection Guidance	
New Treatments	
Increase DoD Vaccine Funding	
External Inputs for Prophylaxis and Vaccination Policies	
Disposition of BW contaminated personnel, remains, equipment	
"How Clean is Clean" Policy	
Pre-positioned Material and Supplies	
Initial Deployment Packages	
Develop Specialized BW Teams	
Hire BW-educated Health Care Workers and First Responders	
Educate Non-DoD Personnel	
Train Non-DoD Personnel	
Mission Essential Task Lists	
Subject Matter Experts in Exercise Planning and Execution	
Publicize BW Preparedness	
Establish Collective Protection Standards	
Vulnerability Assessments	
Installation Quarantine (ETE)	
International Quarantine (ETE)	
Information Management/Risk Communication for Installations (ETE)	
Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	
Information Management/Risk Communication for Public Release (ETE)	
Joint and Coalition Decision Tools	

Tier 5 ideas were those not ranked in the top ten of any dataset. Nevertheless, some of these Tier 4 ideas received votes, which can be reviewed in the raw data at Appendix G-4.

DISCUSSION AND RECOMMENDATIONS

The data reflect that the workshop attendees consider education and training as a top priority toward an 85% BW defense solution: five of the top ten ideas (Tiers 1 and 2) related to education and training. The following section will provide detailed information and discussion for each of the ideas identified in Tables 1-3 of the Results section.[26]

Tier 1 Bio-Defense Recommendations

Educate Senior-Level DoD Personnel

The workshop attendees determined that educating senior-level DoD personnel, including the rank of Colonel, Flag Officers, and civilian equivalents, is a top priority in all three categories (*Implemented Quickest, Greatest Benefit, Best Overall*). Senior-level personnel determine funding and planning priorities for the DoD. If they do not understand the BW threat and defenses, they may not assess the need for further attention in the BW arena. In addition, senior leaders developing doctrine, tactics, techniques, and procedures must be fully informed and knowledgeable in order to effectively prepare for and counter a biological attack.[27] Therefore, it is critical that senior leaders receive the appropriate education to accurately understand the BW threat and the U.S. defensive shortfalls.

The U.S. Air Force's "Commander's Guidelines: Force Protection and Operations in a Biological Warfare Environment" was released on April 12, 2002.[28] This document was designed to help Commanders make risk-based decisions. This document represents an initial step toward educating U.S. Air Force senior leaders. Additionally, several initiatives have focused on the education of all Air Force personnel, including Air Force senior leaders. These initiatives include the CODE SILVER program, the KFE Program, and the BDTF's Education, Training and Exercise (ETE) Initiative.

The BW education for all senior-level DoD personnel should focus on the basics of the current BW threat and BW agent effects, characteristics, treatment, active and passive defense measures, and operational considerations. One of the groups suggested CODE SILVER Command and Control type exercises at the MAJCOM or Air Staff level.[29]

[26] Some ideas were ranked higher in more than one category, while others ranked in only one category. For those ranked high in only one category, there may be an inference that idea only meets the criteria of that category. For instance, if an idea appears highly ranked in only the *Implemented Quickest* category, this may indicate a selection based speed of employment only.

[27] The 85% Biological Weapons Solution Workshop, Group 3, p. E3-2, Appendix E-3.

[28] HQ USAF, 12 April 2002, "Commander's Guidelines: Force Protection and Operations in a Biological Warfare Environment." On-line, Internet, 14 December 2004, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/data/bdguidelines.doc.

[29] The 85% Biological Weapons Solution Workshop, Group 4, p. E4-4, Appendix E-4.

CODE SILVER is a program that offers tabletop exercises emphasizing biological and chemical warfare responses by Air Force medical facilities. The exercise focuses on how the medical facilities interact with the rest of the base and the local civilian community. Forty Air Force medical facilities and the communities surrounding them planned to participate in CODE SILVER exercises in 2004.[30]

Currently, the KFE Program is another initiative designed to determine educational shortfalls and develop tools to ensure the education and understanding of the BW hazard. The KFE program objectives include: examining the impact of BW on mission recovery and sustainment of operations; examining current capabilities to recognize and respond to BW attacks; assessing current integrated base defense capabilities in a BW environment; and examining the ability to conduct air operations in a BW environment.[31]

The KFE Program is a cross-functional effort which should develop procedures, education, and risk management tools in the short-term.[32] And, the KFE should result in supporting doctrine, policy, and guidance in the long-term. In addition, the KFE Program also offers an opportunity to ensure thorough BW education of senior leaders. A further discussion of the KFE Program as it relates to educating the junior DoD personnel is addressed later in the "Educate All Other DoD Personnel" section of this report.

The BDTF recognized the need for more robust education, training, and exercises in their February 6, 2004, status report.[33] The BDTF was chartered by the Chief of Staff of the Air Force (CSAF) on July 13, 2002, to identify actions to improve Air Force bio-defense capabilities and develop a C-BW CONOPS. The Task Force recommended a life-cycle approach to biological defense education and training.

This recommendation resulted in the establishment of the ETE initiative on September 17, 2003, which involves a collaborative effort between AF/XOS-FC and Headquarters Air Education and Training Command (HQ AETC).[34] The goal of the

[30] George Peach Taylor, Jr, (LtGen), USAF, Surgeon General, "Defense Health Programs," before the Subcommittee on total force, House Armed Services Committee, United States House of Representatives, March 18, 2004. Online, Internet, 29 November 2004, available from http://www.house.gov/hasc/openingstatementsandpressreleases/108thcongress/04-03-18taylor.html.

[31] Donna Hudson, (LtCol), XOS-FC, "Counter-Biological Warfare (C-BW) Program," slide presentation, 22 September 2004.

[32] Organizations participating in the KFE effort include XOS-FC, XOS-FP, SGOP, ILEX, AFCESA, Nuclear Weapons and Counterproliferation Agency (NWCA), Force Protection Battle Lab (FPBL), and PACAF.

[33] "Biological Defense Task Force, Status Report to the Chief of Staff of the Air Force," 6 February 2004, p. 29. On-line, Internet, 29 November 2004, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/bdtf/CSAF_Report-CSAFVersion20_15_Mar_04-2.doc.

[34] The USAF Counterproliferation Center (CPC) is a member of the ETE Initiative Working Group and can be contacted for further information.

ETE initiative is to develop C-CBRNE learning objectives (education), skill sets (training), and operational capabilities (exercise requirements) that every airman must have to be competent against a CBRNE-armed adversary.[35]

The ETE working group has divided the levels of training for Colonels and higher into eight groupings.[36] Through the development of the ETE initiative, especially concerning the education of Colonel and higher ranks, appropriate education may be developed.

Recommendations: Education of senior-level DoD personnel appears in every list analyzed and should be considered a top priority in our BW defense development. Educational requirements should be mandated to all services to be included in all senior service schools, general officer schools, base/post/wing commander's courses, and joint courses for Colonels and higher ranks.

Another suggestion is to ensure focus is given to educating senior level personnel through efforts like the KFE and CODE SILVER. A subset of the CODE SILVER exercises could be modified to focus solely on the senior-level personnel at Major Commands (MAJCOMs) or Air Staff.

Senior staff must be educated on the hazards of a biological weapons attack to ensure preparedness of U.S. and Coalition military forces. Senior military leaders are responsible for adequately determining the effects to operations, instilling BW-specific education and training, generating appropriate plans, developing effective information gathering techniques and capabilities, providing the physical protection of our forces, and research and development (R&D) for future BW defenses.

Develop Decision Tools for Commanders

To assist commanders in their response to BW threats, attacks, or recovery, "Decision Tools" should be developed. The participants considered this idea to be an important priority in all three categories. Much of this information would probably also help commanders determine C-BW measures to take at different Force Protection Condition (FPCON) and Random Antiterrorism Measures (RAM).

Decision tools should include recommendations for baseline posture, indicators of biological attack, information to collect concerning the extent and operational challenges of an attack, and appropriate actions.[37] The KFE Program identified this need, and defined four trigger events to assist the commander: intelligence, weapons, detectors, and sentinel casualties.[38] One workshop group also identified key components that should be

[35] Op. Cit., "Biological Defense Task Force," 29-30.

[36] The eight categories for levels of education, training and exercise include E-1 through E-3, E-4 through E-5, E-6 through E-7, E-8 through E-9, precommissioning, O-1 through O-3, O-4 through O-5, and O-6 and higher.

[37] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-2, Appendix E-2.

[38] The 85% Biological Weapons Solution Workshop, Group 4, p. E4-1, Appendix E-4.

included in the further development of the Decision Tools for Commanders, these are included in the Group 2 slides at Appendix E-2.

Recommendations: The purpose of Decision Tools is to ensure the information presented to the commander is defined and organized in a concise and logical manner to facilitate the decision-making process.[39] These tools must define the most critical decisions as they relate to preventing further injury and maintaining operational capability. The relevant installation functionals or personnel must also provide the commander with underlying information to make informed decisions. This information should fit into a Decision Tools matrix in a clear, well-organized, and predictable manner.

In addition, Offices of Primary Responsibility (OPRs) for each decision should be clearly identified. Decision tools should also include pre- and post-attack or exposure prophylaxis and treatment plans.[40]

The DoD could direct a Joint working group to bring together the lessons of the KFE and the USPACOM initiatives with yet untapped subject matter experts to define the best Decision Tools for Commanders.

Develop C-BW CONOPS

A Concept of Operations (CONOPS) describes the approach to the deployment, employment, and operation of capabilities used to meet identified tasks or missions. The workshop participants ranked the development of a separate C-BW CONOPS in the top ten of all three categories. In addition, the idea was also ranked as a #1 selection in the *Greatest Benefit* categories (reference Table 1, Results section). These results indicate the importance with which the workshop attendees viewed the development of a C-BW CONOPS.

The Air Force instituted the Counter-Chemical Weapons (C-CW) CONOPS Air Force-wide, in 2002. Through rapid spiral development, the Air Force planned to develop the C-BW CONOPS mirroring the C-CW CONOPS wherever possible.

Some of the attendees stressed the need for the C-BW CONOPS to be de-linked from other CBRNE doctrine since it is significantly different. For instance, the methods of countering and the effects of BW differ significantly from chemical, radiological or nuclear.[41] In addition, chemical weapon exposure symptoms are generally seen quickly, versus biological weapon exposure which may take days or weeks to surface.

Finally, when a biological attack is discovered, the contamination may be spread throughout the base making it difficult to cordon off an area and sector the

[39] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-2, Appendix E-2.

[40] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-4, Appendix E-1.

[41] The 85% Biological Weapons Solution Workshop, Group 3, p. E3-3. Appendix E-3.

base, as in a chemical weapon attack scenario.

The C-BW CONOPS could incorporate lessons learned from the KFE Program and other related efforts such as Contamination Avoidance at Seaports of Debarkation (CASPOD), Restoration of Operations (RESTOPS), and Joint Service Installation Pilot Project (JSIPP). More specifically, AF/XOS-FC is leading the development of the C-BW CONOPS through the CBRNE Policy Working Group (including ILEXR and AFMSA/SGPF), with a first draft due no later than October 2006.[42, 43]

The goal of the CASPOD demonstration was to generate operational concepts and tactics, techniques and procedures to initiate and sustain chemical and biological defense operations at seaports of debarkation (SPODs). The CASPOD program also developed and demonstrated resident, pre-positioned, or rapidly transportable chemical and biological defense equipment and material packages needed for employment at SPODs.[44]

The RESTOPS final demonstration was at Osan AB in February 2003. The RESTOPS demonstration developed tools and technologies, and tactics, techniques, and procedures to mitigate effects of a chemical or biological attack on a fixed site.[45]

The JSIPP demonstrations occurred at nine diverse CONUS installations during the summer of 2003. The goal of the JSIPP program was to increase chemical and biological defense capabilities at DoD installations through contamination avoidance and protection and decontamination equipment.[46]

Recommendations: The COCOMs and services should develop C-BW CONOPS for all military operations in BW contaminated environment including individual, Joint, and Coalition operations. Further, a comprehensive C-BW CONOPS should address issues such as airfield operations, deployment, and redeployment of forces, use of Civil Reserve Air Fleet (CRAF) and Voluntary Intermodal Sealift Agreement (VISA), trans-loading cargo and trans-loading airfield operations, operating contaminated Aerial Ports of Debarkation (APODs) and Seaports of Debarkation (SPODs), re-supply, and disposition of BW-contaminated remains and mass casualties.[47] Biological defense is not a separate entity to be addressed in isolation by medical or disaster preparedness staff; it must be an integral part of war plans, operations, and training.[48]

[42] The 85% Biological Weapons Solution Workshop, Group 4, p. E4-6, Appendix E-4.

[43] Russell V. Lewey, SAIC, correspondence on 8 November 2004.

[44] Salvatore Bosco, September 2004, "Chemical and Biological Defense Program, DTRA/CB," presentation to AWC elective.

[45] Ibid.

[46] Ibid.

[47] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-8, Appendix E-1.

[48] Ibid.

Tier 2 Bio-Defense Recommendations

Educate COCOMs

Combatant Commanders (COCOMs) are key decision-makers in a theater. The workshop participants recognized the critical importance of COCOMs by ranking this idea 83% (5 of 6) possible times in all three categories (reference Table 2, Results section). The leaders at combatant commands must thoroughly understand how to operate in the presence of a BW attack and recovery.

Recommendations: COCOMs (Major through Flag Officer ranks and their civilian equivalents) should receive pertinent BW education, training, and practice through active education programs and exercises in order to understand and effectively react to BW attacks that impact combat operations. The BW threat is often overlooked in war plans and operations due to frequent rotation of personnel without sufficient BW training. There should be recurring education at theaters of operation so as personnel rotate in they can receive the initial education within the first three months.

Train and Exercise DoD Personnel

The workshop attendees determined that all DoD personnel should also train and exercise with a more specific and thorough focus on BW agents. "Continuation or recurring training maintains and refines skills necessary for a unit to conduct their mission in a NBC-threatened/contaminated environment. Since continuation or recurring training sharpens knowledge of counter NBC functions and operations, this training should meet the highest standards."[49]

This topic ranked 66% (4 of 6) of the time in all three categories (reference Table 2, Results section). When developing training, the expectations should be of a specific detail and level of knowledge appropriate for the rank. Again, the KFE and CODE SILVER Programs are guides that could be used to accomplish this task. In addition, the Guardian and Integrated Training and Education Program are also tools that are making strides toward training and educating DoD personnel.

The Bio-Defense State of Knowledge Mission Sustainment and Recovery document produced by AF/XOS-FC provides more detailed information on military and civilian training and exercise programs. The document details military exercises such as CODE SILVER and Joint Service Installation Pilot Project, and civilian exercises such as Sooner Spring 2002 and TOPOFF 2.[50]

Air Force Instruction (AFI) 10-2501, Full Spectrum Threat Response (FSTR) Planning and Operations, defines exercise requirements in its Table 10.1.[51] Biologi-

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[49] AFDD 2-1.8, Counter Nuclear, Biological, and Chemical Operations, 16 August 2000, Chapter 5, 26.

[50] "Bio-Defense State of Knowledge Mission Sustainment and Recovery," August, 2004. On-line, Internet, 28 January 2005, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/bio-state-of-knowledge/index.shtml.

[51] AFI 10-2501, Full Spectrum Threat Response (FSTR) Planning and Operations, 24 December 2002, 9.7.4, 64.

cal attack incident training biannual requirements are detailed under "Terrorist Use of WMD." These exercises must be executed cross-functionally according to the local threat, incorporating all local response elements. In reality, these biological agent exercises are often conducted as a tabletop exercise in a cursory manner. In addition, the Exercise and Evaluation Team (EET) members who develop the exercise scenarios are often not experts in biological weapons or attack scenarios.

Therefore, the quality of the exercise and its execution are defined by the limited knowledge of the EET team. Further, neither AFI 10-2501 nor any other source clearly defines a requirement to conduct both covert and overt biological attacks or a BW mass casualty scenario that affects the base and local community.

Recommendations: All services should implement and integrate a comprehensive training and exercise program by the direction of the Joint Staff. The U.S. Air Force's ETE model can be used by the joint community as a starting point for this effort. Training of basic BW-defenses and responses to biological weapons attacks should occur at all levels of enlisted and officer ranks. In order to ensure an effective training scenario, more definitive goals, objectives, and requirements should be established; and resources and training aids be made available. Likewise, exercises across services should be mandated to exercise BW-specific scenarios at least once annually.

Educate All Other DoD Personnel

Education is different from training and exercises in that it involves the intellectual understanding of the "why" and "how." For DoD personnel at any level to be able to respond to a changing battlefield environment, they must have an understanding of the threat and how to mitigate its effects. Workshop attendees selected the idea to educate all other DoD personnel as a high priority 66% (4 of 6) of the time in all three categories (reference Table 2, Results section). Again, the KFE and CODE SILVER programs are attempting to establish BW training for all DoD personnel.

The CSAF has stated "all airmen are sensors"[52] and therefore should be well versed on BW agent effects, hazards, characteristics, treatment, passive defense measures, and effects to operations. The KFE Program included a BW-101 Briefing, used during KFE II in August 2004, which provided basic education on BW to promote understanding of the hazard. However, the results of the first KFE exercise demonstrated the need to better educate airmen on the hazards associated with potentially contaminated equipment and environments.[53]

In reaction to the KFE findings to date, Air Force Civil Engineering Support Agency (AFCESA) is developing a new

[52] James G. Roche, 1 March 2004, "SecAF 2004 Focus Areas," in *The Secretary's Vector*. On-line, Internet, 1 December 2004, available from http://www.af.mil/media/viewpoints/focus_2004.html.

[53] Donna Hudson, 22 September 2004.

C-CBRNE course to replace the Nuclear, Biological, Chemical and Conventional (NBCC) Course with increased information on the BW threat. The new course will be completed by summer 2005.[54]

Recommendations: All DoD personnel should receive BW education in all levels of Professional Military Education (PME), through briefings, and in routine training and exercises.[55] The education provided during PME should be tailored to each rank and included at all levels of enlisted and officer PME. In addition, as discussed in the previous section, CODE SILVER exercises promotes education and training of personnel associated with Air Force medical facilities. This type of activity should be encouraged at all military installations and the involvement of the entire base should be required in order to educate all personnel.

Develop Installation Medical Surveillance Information

Workshop attendees selected this idea as a high priority 66% (4 of 6) of the time in all three categories because early indication of a BW attack is critical to prompt response (reference Table 2, Results section). People showing up with unexplained sicknesses at hospitals or clinics may be the first warning of attack, even at facilities with BW detectors. Recognition that an attack occurred may not happen until symptoms develop, which may be days or weeks after the event. Therefore, proactive disease surveillance at hospitals and other medical facilities is paramount to successful defense against a BW attack.

In environments with elevated BW threats, the rules for military personnel reporting illnesses need to be adjusted to require such reports more frequently, allowing medical professionals to rapidly determine that a BW attack has occurred. Making warning more rapid will speed medical responses at the site attacked, and allow protective actions to be taken at other sites.[56]

The installation medical surveillance information should include collection of data from multiple military and local civilian population sources.[57] These sources may include, but are not limited to, medical (Public Health) surveillance of clinic appointments, illness observed by co-workers, school absenteeism, veterinarian reports, over-the-counter drug sale, and reports of un-explained pet and wildlife deaths. Public Health and medical personnel should emphasize epidemiologic principles and techniques to enable continuous population-based disease monitoring.[58]

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[54] AFCESA representative and Russell V. Lewey, SAIC, correspondence on 8 November 2004.

[55] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-2, Appendix E-1.

[56] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-3, Appendix E-1.

[57] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-5, Appendix E-2.

[58] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-2, Appendix E-2.

The installation Public Health currently uses Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) to monitor illness trends to provide early warning of abnormal health conditions in a population. ESSENCE is a computer-based biosurveillance system that has been in use since 1999, with widespread use in the DoD after the September 11th attacks.[59]

ESSENCE is a DoD-Global Emerging Infections System sponsored system which looks at seven syndrome groups that best represent the symptoms and signs of infectious disease, such as dermal and fever cases. The system gathers information from the Internal Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes input by the doctors after seeing a patient.

The quality of the medical surveillance is therefore dependent on the doctors and medical technicians accurately reporting and inputting ICD-9-CM codes in a timely fashion. Although the Public Health officer may review the data once a day, there is a centralized organization conducting real-time monitoring of the information at all DoD installations. If the centralized organization detects a trend, they notify the installation personnel of a potential adverse health trend.

The shortcomings of the ESSENCE system as an early indicator of a BW attack center on the delay in entering ICD-9-CM codes. If a doctor or technician waits until the end of the duty day or following day to enter codes, the ESSENCE data is also delayed. Currently, medical personnel attempt to enter the codes by the end of the day. However, emergencies and increased patient workloads at times make this an impossible task. Nevertheless, the ESSENCE biosurveillance system has the capability to provide early warning of infectious diseases and incidents of bioterrorism.

The Bio-Defense State of Knowledge Medical Surveillance document produced by AF/XOS-FC provides more detailed information on DoD medical surveillance activities. Information in this document includes a detailed description of the Defense Medical Surveillance System, the Armed Forces Medical Intelligence Center (AFMIC) and the Global Emerging Infections System.[60]

Another source of information that has not yet been implemented may be analysis of the installation population during elevated threat conditions through random sampling, such as throat culture swabs or temperature monitoring. A rapid assay technology [(e.g., polymerase chain reaction (PCR)] can determine exposure of personnel and contamination of environmental samples and inanimate objects. The technology currently exists to rapidly

[59] Gretel Johnston, 2002, "System Adds to Biodefense Readiness," *Bio-IT Bulletin*. On-line, Internet, 21 January 2005, available from www.bio-itworld.com/news/110102_ report1436.html?action=print.

[60] "Bio-Defense State of Knowledge Medical Surveillance," August, 2004. Online, Internet, 28 January 2005, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/bio-state-of-knowledge/index.shtml.

sequence bacteria and viruses from throat swabs.[61] The earlier medical personnel can discover a population with elevated temperatures or other indications of widespread illness, the better the chance of isolating those affected, containing the attack, and continuing to operate.[62]

The DoD Directive 6490.2, Joint Medical Surveillance and DoD Instruction 6490.3, Implementation and Application of Joint Medical Surveillance for Deployments, provides further guidance regarding medical surveillance. The DoD instruction is currently under revision. One group highly recommended that the newly published DoD Instruction on medical surveillance should be universally implemented as soon as possible.[63] Incorporating the DoD guidance into the Installation Medical Surveillance program should provide a more effective capability. This installation surveillance program may provide first indication of covert biological warfare attack.

The U.S. Air Force has the Full Spectrum Threat Response (FSTR) Planning and Operations, AFI 10-2501, which requires the medical treatment facility (MTF) commander to "assure the medical facility has an ongoing and threat-based locally appropriate disease surveillance and disease and non-battle injury report program (see AFI 48-109)."[64] The fact that the attendees recommended implementation of a program that, by Air Force Instruction, should already exist at Air Force installations may reflect that the existing program has not been implemented in such a manner as to be an indicator of covert BW attacks. The workshop attendees suggested development of a more comprehensive medical surveillance program.

Recommendations: DoD should make a review of DoD Directive 6490.2 a priority to ensure it provides for comprehensive medical surveillance. Priority should be given to its implementation and metrics for its compliance should be monitored by MAJCOMs.

Prepare Public Information Packages and Media Relations

Public Affairs (PA) is critical in preparing a coherent, well-informed message to promote effective risk communication to the military installation, dependants, and local community. The workshop attendees determined that not only was this a quick solution, but also highly beneficial by selecting it 66% (4 of 6) of the time in the three categories.

While it is unclear what all the services have done in this area, the Air Force C-CBRNE Council is currently addressing this idea in the form of a "BW Toolbox" for Public Affairs and also a BW Risk

[61] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-2, Appendix E-2.

[62] The 85% Biological Weapons Solution Workshop, Group 3, p. E3-4, Appendix E-3.

[63] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-1, Appendix E-2.

[64] AFI 10-2501, Full Spectrum Threat Response (FSTR) Planning and Operations, 24 December 2004, A2.6.12, 112.

Communication program for the base populace.[65] They have established a working group of public health and life skills professionals to advise on BW-related public awareness.

Next, the working group is also interfacing with Secretary of the Air Force Public Affairs (SAF/PA) to determine the impact of the new National Incident Management System (NIMS) on PA activities. The group is also working with SAF/PA to develop BW-specific PA information templates to assist base-level PA offices. Finally, the working group has drafted a BW defense public awareness product aimed at the base population at large.[66]

Recommendations: Public Affairs, in coordination with medical, public health, bioenvironmental engineers, civil engineers, and others determined by the installation commander should prepare public information packages regarding how to respond to various forms of BW threats or attacks in advance.[67] These public information packages can have a significant positive psychological impact on the local community. A properly worded and detailed message delivered by the right means with definitive and clear actions for each individual will reduce panic and the number of behavioral casualties. A poor message in content, timing, or delivery may promote panic, even if biological weapons have not been used.

A critical step in the development of these messages is educating the messenger. Media relations, specifically Public Affairs, should receive BW-specific education and participate in training and exercises concerning procedures and capabilities for pre- and post-BW events. A template of announcements should be generated at a MAJCOM or DoD level for installation use.

Develop BW Force Protection Condition and Random Anti-Terrorism Measures (FPCON/RAM)

C-BW specific Force Protection Condition measures should be considered when the threat level has been partially or wholly based upon a potential BW threat.[68] Random Anti-Terrorism Measures are extra security measures or defensive measures taken to reduce the vulnerability of individuals and property when there is an increased suspicion or threat of terrorist acts. The workshop attendees viewed this idea as holding high significance in 50% (3 of 6) of the three categories (reference Table 2, Results section). One example of the development of BW specific Force Protection Condition measures is provided at Appendix A, pages A-14 to A-20, "Bio-Threatcon Levels." In summer 2004, AF

[65] Russell V. Lewey, SAIC, correspondence on 8 November 2004.

[66] Donna Hudson, 22 September 2004.

[67] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-2, Appendix E-1.

[68] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-2, Appendix E-2; and from the Draft C-BW Force Protection Methods under development, provided by Russell V. Lewey, SAIC, 3 November 2004.

XOS-FC hosted a BW FPCON workshop to specifically address this issue. [69] In addition, the KFE Program is currently addressing this idea with draft C-BW specific FPCON measures.[70]

Recommendations: The Joint Staff should host an inter-service working group with COCOM representatives to develop a specific set of C-BW measures to be taken at different RAM or FPCON levels. Participants of the workshop must have a broad range of expertise such as intelligence, medical, climatology, engineering, and operations.

Vaccinate All Military

If the DoD vaccinated all military populations against the highest threat BW diseases; for example, smallpox and anthrax, our defensive stance against these agents would be greatly enhanced. The workshop attendees agreed that this vaccination policy would offer a great benefit by ranking it high in 50% (3 of 6) of the three categories (reference Table 2, Results section). On June 28, 2004, the Anthrax Vaccination Immunization Program (AVIP) and the Smallpox Vaccination Program (SVP) required vaccination of personnel assigned or deployed to the Korean peninsula, CENTCOM, or other "higher threat areas" for 15 or more consecutive days.[71]

There are many challenges regarding a universal vaccination policy, the primary ones being funding and personnel wariness of side effects. DoD should increase funding for vaccination programs so all personnel can be vaccinated.[72] Additionally, they should educate the force regarding medical side effects data. According to one workshop group, if the DoD discontinues sustainment of present BW detectors such as Portal Shield, which are less than optimally effective, this would free up monetary resources to vaccinate the force.[73] Many senior level people in the DoD agree that funding reflects the priority and importance of an issue.[74] If vaccination programs receive little funding, this indicates that it is not a priority issue.

The second challenge relates to medical-legal challenges. The on-again, off-again legal battle regarding anthrax vaccinations clearly demonstrates the legal aspects of a universal vaccination policy. As late as October 2004, a legal action again stopped the mandatory anthrax vaccination

[69] The 85% Biological Weapons Solution Workshop, Group 4, p. E4-3, Appendix E-4; and Russell V. Lewey, SAIC, correspondence on 8 November 2004.

[70] Ibid.

[71] Donna Hudson, 22 September 2004.

[72] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-4, Appendix E-1.

[73] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-4, Appendix E-1, and Group 3, p. E3-2, Appendix E-3.

[74] Lisa Bronson, 2004, Keynote speaker at "Non-Traditional Chemical Agents: Assessing the Threat and Our Response," 29 September 2004. Ms. Bronson is the Deputy Under Secretary of Defense for Technology Security Policy and Counterproliferation and Director, Defense Technology Security Administration.

of soldiers deployed to high threat areas.[75] Legal challenges may be minimized by a continued wide-spread information campaign to broadcast the safety, minor health hazards, and risks of both the anthrax and smallpox vaccinations.

In addition, the smallpox vaccine cannot be given to all personnel. For example, DoD policy today is that a person with dermatitis or other skin conditions will not be given the smallpox vaccine unless smallpox is used in a deployed location. Many military personnel fear the smallpox vaccination due to the reported potential to infect family members. Thus, many personnel preparing for deployment asked to be provided alternate government quarters during the healing time for their inoculation site in order to keep their family "safe."

Recommendations: The Joint Staff should develop a team of multi-disciplinary subject matter experts as well as non-medical personnel to address challenges related to a universal vaccination program with the ultimate goal of vaccinating all military against smallpox and anthrax.

Tier 3 Bio-Defense Recommendations

Provide Weekly Commander's Stand-Up Briefings

In order for commanders to make an operationally effective decision, they must be provided with complete information. The workshop attendees recognized the importance of frequent information presented to the commander, and also determined that this idea could be implemented very quickly. This idea received the most number one votes in the *Implemented Quickest* category. The BW threat and responses should be discussed during Command information sessions, or Commander's Stand-Up Briefings, to increase Command BW focus at all levels. This action would increase individual and Command awareness and prepare all to respond to BW use.[76] The briefings should be provided by the MTF Commander or appropriate representative.

Recommendations: At weekly commander's stand-up briefings, overall disease trends should be reported. Depending on the threat level, this information may need to be reported to the commander more frequently.[77]

[75] United Press International, 28 October 2004, "Anthrax Vaccinations Halted Again." On-line, Internet, 14 December 2004, available from http://www.military.com/NewsContent/0,13319,FL_anthrax_102804,00.html.

[76] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-2, Appendix E-1.

[77] AFI 10-2501, Full Spectrum Threat Response (FSTR) Planning and Operations, 24 December 2004, states that the MTF commander: "establishes, operates and reports threat/vulnerability-based disease early warning and surveillance to Installation Commander and higher headquarters. This program may provide first indication of covert biological warfare attack." A2.6.12, 112.

Develop Quick-Reference Education Handouts

The attendees determined that the development of quick-reference education handouts is one of the solutions to be *implemented quickest*. This brief, simplified non-technical handout would be specific for each rank in the form of a two to three page document.[78] The format of the document should be concise, informational, and to the point. A document that is 100 pages may contain a significant amount of information, but is not what a senior leader through junior enlisted person is likely to read or reference at some later time.

Recommendations: Each service should develop a brief, non-technical handout that would be specific for each rank in the form of a two to three page document. For the Air Force, potential application of this idea may be instilled in the KFE Program or the ETE Initiative. During the development of the education, training, and exercise materials of the ETE Initiative, quick-reference handouts could also be developed. These handouts may be incorporated as tabs in future editions of the Airman's Manual for quick and easy reference.

Research New Prophylaxis and Vaccines

The ultimate BW defense would be a comprehensive vaccine or pill that would defend against all BW agents. This vaccine or pill obviously does not exist. However, the workshop attendees recognized that investigation of new prophylaxis and vaccines would provide a great benefit to U.S. forces.

At the national level, President Bush has taken great strides to increase the focus on prophylaxis and vaccines for the nation. In addition, researchers continue to investigate alternatives to vaccines to assist in BW defense. Despite these advances, focusing attention on the known, high-threat agents like smallpox and anthrax may prove risky when considering genetically altered biological agents that current vaccines may not defend against.

In President Bush's 2004 State of the Union address, he proposed Project BioShield as a new bioterrorism countermeasure. The President signed the legislation on July 21, 2004, which committed $5.6 billion over 10 years.[79] BioShield is a comprehensive effort to develop, stockpile, and make available drugs and vaccines to protect against biological and chemical weapons attacks.

The main provisions include: "(1) relaxing procedures for bioterrorism-related procurement and peer review; (2) guaranteeing a market through contract authority granted to the Secretary of Health and Human Services (HHS) to buy countermeasures following Presidential approval, funded by a permanent, indefinite appropriation; and (3) allowing the Secretary of

[78] The 85% Biological Weapons Solution Workshop, Group 4, p. E4-4, Appendix E-4.

[79] Jim Garamone, 2004, "Bush Signs $5.6 Billion BioShield Legislation," American Forces Information Service, 23 July 2004. On-line, Internet, 23 July 2004, available from www.defenselink.mil/news/Jul2004/n07212004_2004072103.html.

HHS to permit the emergency use of unapproved countermeasures."[80]

In short, BioShield provides incentives to pharmaceutical makers and biotechnology companies for development of medicines and vaccines to treat people exposed to biological agents. BioShield should strengthen research and development and enhance our ability to counter BW attacks.

In addition to the R&D efforts under project BioShield, the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (CDC/ATSDR) is progressing on the defense of a number of other BW agents. The CDC/ATSDR is undertaking a 5-year project, under the National Center for Infectious Diseases (NCID), to acquire, maintain, and immunize 200 horses to develop a botulinum equine heptavalent antitoxin as a treatment for clinical botulism.

In addition, the CDC/ATSDR is attempting to manufacture anthrax immune globulin to provide treatments for anthrax illness, and is also involved in the Anthrax Vaccine Research Program (AVRP) to conduct studies to determine the factors associated with side-effects of the vaccine and the length of time the vaccine protects.

Finally, the CDC/ATSDR will continue to administer the Smallpox Vaccination Program by providing expertise and guidance for the delivery of the vaccine.[81]

Meanwhile, private researchers continue to investigate alternatives to vaccines to assist in BW defense. One area of study is in non-specific immune modulation. Non-specific immunity is a body's innate ability to defend against attacks by foreign bodies, such as viruses and bacteria.[82] When exposed to a BW agent, elements of innate immunity are marshaled quickly to respond. In contrast, adaptive or specific immunity is more focused and takes several days or weeks to develop (ex., anthrax and smallpox).

Alternatively, the immune system can be enhanced in a number of ways. One example is non-specific immune enhancement through paraspecific vaccines. Paraspecific vaccines are not an immunization, but produce a non-antigen specific mechanism to combat viral infections. Paraspecific vaccines have been used to combat herpes and hepatitis B and C infections, chronic inflammatory diseases, and stress-related dysfunctions of the immune system.[83]

[80] Gottron, Frank, 2003, "Project BioShield," Congressional Research Service Report for Congress, 23 July 2003.

[81] Op. Cit., CDC, 11, 26.

[82] Non-specific immunity is based on phagocytic leukocytes (polymorphonuclear (PMN) phagocyte or granulocyte and the mononuclear phagocyte or macrophage). PMNs and macrophages phagocytise or engulf foreign material and destroy them. From: *Casarett and Doull's Toxicology: The Basic Science of Poisons*, Eds. Mary O. Amdur, John Doull, Curtis D. Klaassen. New York, NY: Permagon Press, 2004, 283.

[83] A. Mayr, 2003, "Development of a Non-Immunising, Paraspecific Vaccine from Attenuated Pox Viruses: a New Type of Vaccine," *New Microbiology*, Volume 26, Issue 1, 7-12.

Another example is use of peptides, or parts of proteins, to augment innate immunity. Inimex Pharmaceuticals of Vancouver Canada has conducted extensive research on enhancing innate immunity to counter infectious agents. Specifically, Inimex has used their novel peptides in animal experiments investigating *Salmonella Typhmurium, Escherichia coli,* and *Staphylococcus aureus*.[84]

An alternative to vaccines and peptides is use of dietary supplements. Researchers have been investigating possible ways to broadly boost the human immune system. There is some preliminary evidence that a variety of vitamins and dietary supplements may mildly increase immunity.[85] More research must be completed before dietary supplements can be considered a viable alternative.

When considering manufacture and distribution of vaccines, one must remember that the former USSR genetically engineered biological agents to be used as weapons. Novel agents from molecular engineering of microbes may pose a future threat, and other agents that are not now on the classic BW charts could emerge. If the U.S. focuses on anthrax, smallpox, and plague, the agents at the top of the list, we could be missing the next big threat.[86] However, the alternatives such as new prophylaxis and vaccines discussed here may offer widespread protection to even these genetically engineered biological weapons.

Recommendations: The DoD should explore challenges related to new prophylaxis and vaccines. DoD should direct increased funding to support more aggressive vaccine research and production as well as alternatives to vaccines.

Institute the 922 Concept

The National 922 Concept is a telephone triage system that collects real-time, self-reported symptoms of a population. The workshop attendees determined that since this is a civilian effort currently pending U.S. Government funding that the idea could be implemented very quickly.

The National 922 Concept would establish a national computer center and telephone triage system that could collect real-time self-reported symptoms from civilians in a biological exposure area. Information about the disease and required actions could be requested and distributed on television stations.

National 922 is designed for both response to man-made or naturally occurring epidemics. It also would be useful in chemical and other crisis scenarios. This epidemiologic data could be used to make

[84] E.M. Dullaghan, et al., 2003, "Enhancement of Innate Immune as A Strategy to Counter Infectious Agents," American Society of Microbiology Biodefense Research annual meeting, 7-10 March 2004. Further information available at the Inimex Pharmaceuticals' website. On-line, Internet, 6 December 2004, available from www.inimexpharma.com/st_a.htm.

[85] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-4, Appendix E-2.

[86] The 85% Biological Weapons Solution Workshop, Group 3, p. E3-3, Appendix E-3.

decisions about treatment and quarantine.[87]

The National 922 Concept could be modified to be used by the military to help detect symptoms related to BW exposures. Some workshop attendees offered an alternative suggestion of a web-based version versus the telephone communications version detailed for the civilian community. A web-based version could enhance Air Force Commanders' insight and management of a bio-outbreak.[88] Either a telephone-based or a web-based 922 Concept would provide a relatively prompt assessment of a potential BW attack.[89]

Recommendations: Develop and institute a military 922 system.

Investigate New Detection Methods

The Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) through the Joint Project Manager Guardian (JPMG) provides DoD installations with biological protection and response capabilities to reduce casualties, maintain critical operations, contain contamination, and restore operations.[90]

The JPMG published a draft initial Family of Systems Component List which includes government and commercial products that are acceptable for Installation Protection Program use. The extensive list contains only two biological sampling kits and no biological detectors. This finding reflects the "85% Project" workgroup's discussion that today there is no sensor that can give troops a real-time warning of BW attack.[91] Thus, the attendees determined that developing new detection methods would offer great benefit. However, investigating new detection methods is not a solution that can be implemented very quickly.

Most of the BW detection capabilities today provide "detect to treat" instead of "detect to warn" capability. In other words, today's detection capabilities provide confirmation that a disease is present, but cannot provide advanced warning of an approaching cloud of biological agent. The military and civilian first responders are the primary users of detection equipment. The following provides a brief list of *some* of the equipment available to detect biological agents:

- Hand Held Assays (HHA): a simple, inexpensive, easy to use, antibody-based assay to presumptively identify biological warfare agents. Identifies 10 different biological agents and 4 simulant agents. Designed to be used on only non-porous surfaces. Not de-

[87] The 85% Biological Weapons Solution Workshop, Group 2, p. E2-2, Appendix E-2.

[88] The 85% Biological Weapons Solution Workshop, Group 3, p. E3-2, Appendix E-3.

[89] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-3, Appendix E-1.

[90] Joint Project Manager Guardian (JPMG), Program Management Technical Directive #001, "Initial Family of Systems (FoS) Component List," Draft, August 2004.

[91] The 85% Biological Weapons Solution Workshop, Group 3, p. E3-3, Appendix E-3.

signed to be the sole method of identification.[92]

- HAZMAT ID: a rugged, compact, self-contained Fourier Transform Infrared spectrometer with an integrated computer weighing 22 lbs. Only a single drop of liquid or a few grains of powder are required to run a complete analysis. The instrument uses Bio-CheckIR software to analyze the spectrum of the unknown and alerts when a protein is detected indicating the presence of a possible biological material.[93]
- Ruggedized Advanced Pathogen Identification System (RAPID): detects and identifies various microbes associated with infectious disease and bio-warfare agents. Idaho Technology produces specific test reagents for detection of organisms including anthrax, botulinum, *Brucella*, plague, tularemia, *Salmonella*, *E. coli O157*, *Listeria*, and *Campylobacter*. The RAPID is a field-hardened air thermocycler capable of automatically analyzing samples for the presence of targeted DNA sequence. Easy-to-use software allows the RAPID to automatically collect and interpret data, and report results. RAPID is capable of analyzing 32 samples in less than 25 minutes.[94]
- Joint Biological Agent Identification and Diagnostic System (JBAIDS): detects and diagnoses biological agent exposure or infection. JBAIDS will be capable of simultaneous identification of multiple biological agents and other pathogens.[95]
- Portal Shield: Consists of a variable number of biological sensors forming a network under the command and control of a centralized command post computer. Portal Shield uses the HHA as a primary identification component. Portal Shield will enhance a fixed-site's NBC defensive posture.
- Joint Biological Point Detection System (JBPDS): consists of a common biosuite that can be installed on vehicles, ships, and at fixed sites. The first version will identify 10 biological warfare agents in less than 20 minutes. Uses the HHA as a primary identification component. The JBPDS can operate remotely up to 5 kilometers away from fixed sites.
- Biological Integrated Detection System (BIDS): consists of a shelter (S-

[92] Department of the Army, 2002, "Information Paper, Hand Held Assay (HHA)," White Paper from Program Executive Office for Chemical and Biological Defense, Falls Church, VA, 23 July 2002.

[93] SensIR, 2004. On-line, Internet, 6 December 2004, available from http://www.sensir.com/newsensir/On_scene/HazmatID.html.

[94] Idaho Technology, 2003, "Detection and Identification of Bio-Warfare Agents." On-line, Internet, 21 September 2004, available from http://www.army-technology.com/contractors/nbc/idaho/index.html#idaho1.

[95] Office of the Deputy Assistant to the Secretary of Defense, Chemical Biological Defense, 2004, "Joint Service Chemical and Biological Defense Program FY04-05 Overview."

788 Lightweight Multipurpose Shelter) mounted on a dedicated vehicle [M1097 (Heavy High Mobility Multipurpose Wheeled Vehicle) HMMWV] and equipped with a biological detection suite employing complementary technologies to detect large area biological attacks. The BIDS Biological Detection Suite links aerodynamic particle sizing, bioluminescence and fluorescence, flow cytometry, mass spectrometry, and immunoassay technologies in a complementary, layered manner to increase detection confidence.[96] BIDS also uses the HHA as a primary identification component. BIDS will be replaced by the JPBDS.[97]

- Joint Service Lightweight NBC Reconnaissance System (JSLNBCRS): The JSLNBCRS is comprised of the base vehicle, command and control, and NBC equipment suite. The NBC equipment suite allows for detection, identification, collection, and marking of NBC hazards.

  The NBC sensor suite has been digitally linked with the communications and navigation subsystems by a dual-purpose central processor system. The processor fully automates NBC warning and reporting functions and provides the crew commander with full situational awareness of the NBC sensors, navigation, and communications systems.

  The JSLNBCRS is also equipped with a global positioning system and other navigation capabilities to enable the system to accurately locate and report agent contamination. It has an over-pressure filtration system that permits the crew to operate in a shirt-sleeve environment that is fully protected from the effects of NBC agents and contamination outside the vehicle.[98, 99]

- Joint Biological Standoff Detector System (JBSDS): uses LIDAR-based technology to detect aerosol clouds from long distances. "Light Detection And Ranging," LIDAR, is based on the same physical principles as radar, except instead of bouncing longer wavelength radio waves off a target, higher energy light waves are used. Using lasers that generate light waves in the infrared, the ultraviolet, and the visible portion of the electromagnetic spectrum, the multiple energy wavelengths of LIDAR furnish more de-

[96] SBCCOM, 2004, "Biological Integrated Detection System (BIDS)." On-line, Internet, 21 September 2004, available from http://cjnewsline.com/Homeland%20Defense/NucBioChemical%20Detection/ECBC%20Biological%20Integrated%20Detection%20Systems%20%28BIDS%29.htm.

[97] Office of the Deputy Assistant to the Secretary of Defense, Chemical Biological Defense, 2004, "Joint Service Chemical and Biological Defense Program FY04-05 Overview."

[98] U.S. Army, 2004, "Army Fact File: Nuclear, Biological, Chemical Reconnaissance System." On-line, Internet, 21 September 2004, available from http://www.army.mil/fact_files_site/nbcrs/.

[99] Office of the Deputy Assistant to the Secretary of Defense, Chemical Biological Defense, 2004, "Joint Service Chemical and Biological Defense Program FY04-05 Overview."

tailed information, including three-dimensional imaging.[100]

New detection methods are being developed. In the 1990s, the U.S. saw a dramatic improvement in biological detection capabilities. After September 11, 2001, the number of companies and research in this area notably increased.

For instance, the 454 Life Sciences company offers a DNA sequencing system which uses "a revolutionary way to sequence an entire genome. Through miniaturization, advanced image processing and unique data analysis, several million base pairs of sequence data, per hour, are now generated on a single instrument."[101]

So, the complete identity of an organism, or BW agent, can be determined in hours instead of days. Theoretically, if only a portion of the DNA library of an BW agent is needed to be identified to confirm the BW agent presence, the 454 technology could speed detection of an agent to seconds.

Recommendations: DoD should aggressively fund bio-detector research and development and explore commercial and government off-the-shelf technology, such as the 454 technology, to reduce the time and enhance the accuracy of biological agent detectors.

On a more strategic level, area monitoring on an installation could be conducted using a system similar to that used in the BioWatch program. BioWatch is the DHS program, assisted by the CDC/ATSDR and EPA, which performs 24/7 environmental surveillance using the existing EPA and DOE air quality monitoring systems. Although it is a "detect to treat" system, collected air samples are tested as an early warning indicator of biological attacks.[102]

The BioWatch system has been successfully operating in more than 30 urban centers since early 2003. The system has performed over a million tests with no false positive, and one true positive (an environmental source).[103]

Modify Ventilation Systems

Appropriately equipped buildings can provide a significant component of force protection for the war fighter. Simple alterations to the ventilation systems of buildings can make them a less attractive target, protect human occupants, and quickly restore the building to full function.

The workshop attendees determined that this idea is a high priority in both the

[100] Margaret E. Kosal, 2003, "The Basics of Chemical and Biological Weapons Detectors," *Center for Nonproliferation Studies, Monterey Institute of International Studies*. On-line, Internet, 21 September 2004, available from http://cns.miis.edu/pubs/week/031124.htm.

[101] 454 Life Sciences, 2004. On-line, Internet, 6 December 2004, available from http://www.454.com.

[102] CDC, ATSDR, and DHHS, 2004, "A National Public Health Strategy for Terrorism Preparedness and Response 2003-2008," March 2004, 9.

[103] U.S. Department of Homeland Security, 2004, "Fact Sheet: A Better Prepared America: A Year in Review," 25 May 2004. On-line, Internet, 9 June 2004, available from www.whitehouse.gov/news/releases/2004/05/print/20040525-4.html.

Greatest Benefit and *Best Overall* categories. There are simple solutions that can be implemented now to provide some protection against BW agents. In addition, there is an on-going demonstration of Defense Advanced Research Projects Agency's (DARPA) Immune Building Program which should offer significant advances in building protection.

On a larger scale, in 2001 the Special Projects Office of DARPA began work on the Immune Building Program. The program focuses on protecting the occupants of a building from the release of airborne chemical or biological agents. This program has developed biological sensor-activated heating, ventilation, and air conditioning (HVAC) control systems, high efficiency agent filtration and neutralization technologies. In 2006, the first functional "Immune Building" will be demonstrated at Ft. Leonard Wood, MO.[104]

Recommendations: In normal buildings, some level of protection against BW can be achieved simply by using improved filters. Normal buildings use filters with a Minimum Efficiency Reporting Value (MERV) of 6 to 8, but filters with a MERV of 11 can usually be substituted without changing the HVAC system capabilities, making a big difference in removal of many BW agents. High Efficiency Particulate Air (HEPA) filters are also readily available, and can remove particulates to 0.3 microns. DoD should acquire a supply of improved filters for its buildings in threat areas, and have rules for when to switch to their use.[105]

In addition to ventilation system filters, other options exist to provide limited protection to individual rooms. For instance, room air purifiers will filter out some biological particulates in the air. If a BW agent concentration can be reduced below its infectious level, then the inhabitants of the room will be protected for a short period of time. Ultraviolet (UV) lights may also kill some microorganisms. If UV lights are installed at building or room entrances and in ventilation ducts, this too may offer some additional protection.

Develop DoD Integrated Information Collection

Strategic warning of potential biological weapons use is critical in the early warning, defense, and survivability of our deployed troops. Although this 85% solution idea may take time to implement, the workshop attendees indicated by votes that this idea offers a great benefit in our BW defense. The suggested DoD Integrated Information Collection involves a systems approach to combine data from all information sources.

For example, the data may include adversary capabilities and intent, friendly vulnerability, measurements from detectors, environmental surveillance, informa-

[104] More information can be found on-line, Internet, available from www.darpa.mil/spo/programs/ib.htm.

[105] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-6, Appendix E-1.

tion from local nationals, installation medical surveillance information, and regional (civilian) medical surveillance.[106] This integrated collection system must include development of effective interaction with the intelligence and civilian community to define and refine the threat.

The Armed Forces Medical Intelligence Center (AFMIC) is a Defense Intelligence Agency (DIA) organization that could be used to coordinate some of this information collection. The AFMIC advises the theater surgeon of important medical aspects of the theater. For instance, AFMIC prepares assessments of foreign military and civilian medical systems, infectious disease risks, environmental health risks, and life sciences and biotechnology.[107]

The theater surgeon advises the commander of the appropriate actions required to permit personnel to function effectively and safely in the theater of operations. Medical Intelligence should encompass, at a minimum, indigenous and enemy threats, and a description of all national medical resources in the deployment area, to include availability and capabilities of host nation, joint, or coalition-held medical assets. Constant medical surveillance of local disease incidence may also assist in identifying sources of large-scale chemical and biological production facilities.[108]

The Central Intelligence Agency (CIA) has components that monitor disease outbreaks and are actively monitoring potential CBRN attacks. DoD should establish liaison officers in these departments to facilitate information flow back to AFMIC.

The Centers for Disease Control and Prevention and Agency for Toxic Substance Disease Registry (CDC/ATSDR) is a proven agency in the world of epidemiology since the inception of the Epidemic Intelligence Service (EIS) in 1951. The CDC has capabilities to detect, investigate, and communicate a variety of public health concerns, especially those from a terrorist act. The following bullets detail some CDC/ATSDR activities discussed in their strategy:[109]

- Epidemic Information Exchange (Epi-X): a secure web-based communications network for public health officials. Provides 24/7 emergency alerts and forum to share disease information nationwide. Epi-X enables public health officials to detect and respond accordingly to suspected terrorism emergencies. Used by the CDC/ATSDR Emergency Operations Center and state terrorism coordinators to share information with state and CDC/ATSDR public health experts.

[106] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-3, Appendix E-1.

[107] "Bio-Defense State of Knowledge Medical Surveillance," August, 2004. Online, Internet, 28 January 2005, available from https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/bio-state-of-knowledge/index.shtml.

[108] JP 3-11, 2000 "Joint Doctrine for Operations in a Nuclear, Biological, and Chemical Environment," 11 July 2000.

[109] Ibid., 8-9, 11-12, 17.

- National Electronic Disease Surveillance System (NEDSS): performs automatic capture and analysis of data already available electronically. Monitors public health conditions. The NEDSS system will promote the use of data and information system standards to advance the development of efficient, integrated, and interoperable surveillance systems at federal, state, and local levels.
- PulseNet: an early warning system for outbreaks of food borne disease run by the NCID. PulseNet is a national network of laboratories that perform DNA fingerprinting on bacteria that may be food borne. The NCID uses PulseNet to identify and label each fingerprint pattern and compare these patterns through an electronic database at CDC/ATSDR to identify related strains. The PulseNet system functions like an Interpol system for microbes, identifying outbreaks and their sources.
- Syndromic Surveillance Evaluation: An initiative to evaluate the efficacy of collecting data that precedes diagnosis, such as laboratory test requests, emergency department chief complaints, ambulance run sheets, prescription and over-the-counter drug use, and school or work absenteeism. This data may provide early indication of an outbreak of disease.
- Rapid Toxic Screen: Developed by the National Center for Environmental Health (NCEH), capable of performing tests to identify 150 chemical agents in human blood or urine. In a terrorism event, Rapid Toxic Screen will help determine what chemical agents were used, who has been exposed, and to what extent in order to guide treatment of affected persons.
- Epidemic Intelligence Service (EIS): A 2-year, post-graduate program consisting of service and on-the-job training for epidemiologists. The EIS generates highly trained CDC "Disease Detectives." The CDC is attempting to place an EIS Officer or EIS-trained epidemiologist in every state. Training includes terrorism preparedness and emergency response. One example of the EIS in action occurred in summer 2002 with the increase in West Nile Virus infections. Thirty-nine EIS officers were deployed on 45 occasions to assist teams sent to southern and mid-western states affected by the West Nile Virus infections.[110]

As our information technology capabilities advance, so too do the tools available to health care providers. The Rapid Syndrome Validation Project (RSVP) is a web-based tool that maps symptoms, showing when, where, and how people fall sick. Another tool is the ProMed-mail, an internet mailing list that sends information regarding disease surveil-

[110] CDC, 2003, "Epidemic Intelligence Service (EIS): CDC's 'Disease Detectives.'" On-line, Internet, 20 June 2004, available from www.cdc.gov/programs/bio.htm.

lance. Many other information technology advances are being investigated.[111]

Recommendations: The DoD should develop a team with similar expertise to the EIS-trained officers (perhaps by sending them to this training) to enable a specialized team of trained epidemiologists to assist in the collection of data indicative of a BW attack. These individuals should be integrally linked to AFMIC, other DIA resources, the CIA, and other disease surveillance systems.

Additionally, a DoD Integrated Information Collection System should be developed combining data from all sources. The suggested DoD Integrated Information Collection involves a systems approach for data acquisition.

For example, the data may include adversary capabilities and intent, friendly vulnerability, measurements from detectors, environmental surveillance, information from local nationals, installation medical surveillance information, and regional (civilian) medical surveillance.[112] This integrated collection system must include development of effective interaction with the intelligence and civilian community to define and refine the threat.

Re-Prioritize BW Threat Agents

In order to more efficiently guide the use of scarce R&D resources for detection, treatment, and defense, the potential BW agents the U.S. troops may be threatened with should be reassessed. The workshop attendees viewed this as a quick solution as well as an overall best solution to our BW defense shortfalls. Many experts agree the "top three" BW agents presenting the most serious threat are anthrax, smallpox, and plague.[113]

However, different BW agents may be considered the highest threat when an assessment of their properties as weapons is assessed. For instance, there may be a biological agent more easily dispersed with greater deleterious effects on combat forces than anthrax or smallpox. Recently, Milton Leitenberg, a prolific writer in the field of biological weapons, argued that the U.S. has completed no real threat assessment and our current definition of enemy capabilities in the field of BW is vague.[114]

On April 27, 2004, President Bush approved the creation of a common surveillance system to collect and analyze information about bioterrorist threats. The plan calls for the Department of Homeland Security to conduct a national risk assess-

[111] Laxminarayan, Swamy and Beth Hudnall Stamm, 2004, "Technological Challenges in Counter Bioterrorism: Science and Technology Needs for Responding to Attacks by CBRNE Weapons of Mass Destruction," *IEEE Engineering in Medicine and Biology Magazine*, Jan/Feb 2004, 119-121.

[112] The 85% Biological Weapons Solution Workshop, Group 1, p. E1-3, Appendix E-1.

[113] Mark G. Kortepeter and Gerald W. Parker, 1999, "Potential Biological Weapons Threats," *Emerging Infectious Diseases*, Vol. 5, No. 4, 523-527.

[114] Milton Leitenberg, 2 December 2004, "Experts Question Levels of Bio-Defense Spending," in an interview by David Kestenbaum, National Public Radio. On-line, Internet, 2 December 2004, available from www.npr.org.

ment every two years on new biological threats. The plan does not include funding, but depends on part of the $6 billion allocated annually for bio-defense.[115]

Recommendations: The DoD BW-defense experts should conduct a technical assessment to determine the priority of different BW agents. The DoD should partner with the Department of Homeland Security in conducting this national risk assessment to determine our probable BW threats. This assessment should include, as a minimum, the following characteristics of an effective biological weapon:[116, 117, 118]

- Inexpensive,
- Easily acquired and readily available,
- Easy to produce (enemy has technical capability),
- Easy to hide and transport,
- Easily weaponized (enemy has technical capability),
- Stability in storage and after disseminated,
- Effectively dispersed,
- Stability as an aerosol (potentially the best dispersal method),
- Short and predictable incubation period,
- Initial recognition of disease likely to be delayed,
- Communicable and highly contagious,
- Highly lethal and/or incapacitating,
- Maintains potency and persists in the environment,
- Limited detect-ability (instruments do not readily detect),
- No treatment or vaccine, and
- Name of the disease induces fear, devastating psychological effect.

Funding priorities and C-BW CONOPS could then focus on the re-prioritized list of BW Threat Agents.

Expand Joint BW ACTD Funding

The Advanced Concept Technology Development (ACTD) Program, which began in 1995, is designed to introduce mature technologies and related concepts of operations into war fighting use as rapidly as possible. Technologies or systems that prove successful can be left behind and fielded with warfighters upon completion of the program.

ACTDs are demonstrations, not an acquisition program. Recently, ACTDs involving BW defense have not been funded, with preference given to other programs deemed to be more important.

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[115] Judith Miller, 2004, "Bush Issues Directive to Bolster Defense against Bioterrorism," *New York Times*, 28 April 2004.

[116] Ibid.

[117] Graham S. Pearson, 2000, "The Essentials of Biological Threat Assessment," in *Biological Warfare: Modern Offense and Defense*, Raymond A. Zilinskas, Ed., Boulder, CO: Lynne Rienner Publishers, 61-67.

[118] Raymond S. Weinstein, and Kenneth Alibek, 2003, *Biological and Chemical Terrorism: A Guide for Healthcare Providers and First Responders*, New York, NY: Thieme, 4-9.

The workshop attendees agreed that expanding ACTD efforts, to include demonstrations for BW defense, is of great benefit to the warfighter. This idea was also ranked highly in the *Best Overall* category.

The ACTD efforts help field new technologies more rapidly, educate military personnel on the nature of the threats they face, develop response capabilities, assist in the development of non-material solutions, and help the military understand how to better use the technologies it already has available.[119] CASPODS and RESTOPS are two ACTDs that have demonstrated some BW defense application. CASPODS purpose was to provide a fly-away capability that fills the gap in Chemical and Biological Defense at seaports of debarkation. RESTOPS included realistic attack scenarios to challenge personnel operating in a chemically and biologically contaminated environment. From these ACTD efforts, participants identified critical shortfalls in capability, policy, non-material solutions and operations.

Recommendations: Senior leaders should recognize the importance of ACTDs for BW defense issues and support Joint BW ACTDs. Proposed ACTDs dealing with bio-defense should be given top priority consideration.

CONCLUSION

The military services, PACOM, DTRA, OSD, Joint Staff, and many others are addressing solutions to BW defense. A DoD organization should be identified as a focal-point to ensure communication between all groups working programs related to BW defense. This focal-point will ensure all lessons learned are shared to develop an effective BW program more efficiently.

The DoD, services, and MAJCOMs are encouraged to aggressively support and implement the ten recommendations in Tier 1 and Tier 2. Serious consideration should be given to implement at least some of the ideas in Tier 3. Most of these recommendations have been initiated in various services or MAJCOMs. By capitalizing on the work already done, DoD can rapidly improve its BW defense posture and at least be "85%" ready. We cannot afford to be the unready confronting the unthinkable.

[119] Ibid.

Appendix A

Needed Now:
The "85% Quick Fix" in Bio-Defense

Jim A. Davis and Bruce W. Bennett

I. Introduction

Some new proposals are presented to provide an "85% Quick Fix," including implementation of a Bio-Threatcon level, building preparation, providing off the shelf 1/2 mask respirators and more.

The search for the "best solution" for bio-defense is proving to be an obstacle to finding the more immediate "good solution." In the day when Americans have grown used to fast food, instant access to the Internet, and minimal United States' casualties during war, many have come to expect a "silver bullet solution" for almost any problem. The military, like the rest of America, is often in quest for the 100% solution to its challenges. For example, the military, now awakened to the biological warfare/biological terrorism (BW/BT) threat, is in search of the perfect solution to the problem posed by biological weapons. The pursuit of the 100% solution often diverts efforts from potential quick (though incomplete) fixes for such tough problems that could provide valuable protection. Some new proposals are presented to provide an "85% Quick Fix,"[1] including implementation of a Bio-Threatcon level, building preparation, providing off the shelf 1/2 mask respirators and more. While the technical information in this paper needs further study, it is hoped this chapter will provoke discussion and stimulate the development of new ideas for immediate solutions (albeit partial solutions) rather than waiting on the 100% solution.

In April 1990, two U.S. naval bases, Yokosuka and Yokohama, were attacked with botulinum toxin, and although they failed, the scenario could have turned out much different. A home-grown Japanese terrorist organization, Aum Shinrikyo, had amassed over a billion dollars in net worth and had developed a clandestine biological warfare program. This group became famous for its nerve

[1] The 85% number here is notional. We believe that a large percentage of potential BW casualties can be averted through a series of quick fixes, but the actual percentage will vary by type of BW and other issues. We cannot say with precision what the actual improvement will be with detailed scientific studies. Nevertheless, the basis for the 85% number is derived from a scientific understanding of Biological Warfare.

agent attack in the Tokyo subways in March 1995 that killed 12 and injured 5,500. Fortunately, in 1990, technology and scientific know-how were not as accessible as they are today, and as a result, the Aum Shinrikyo cult had not perfected its program.[2] To our knowledge, no U.S. forces became ill from this attack. But if this attack occurred today when technological capabilities and the proliferation of information are rampant, it seems far more likely they would have been successful, leading to thousands of U.S. forces casualties.

Likewise, consider the Gulf War in 1991 when the U.S. had 320,000 military personnel massed in a 50 by 150 mile rectangular area southeast of Iraq. The Office of the Secretary of Defense estimated if an anthrax attack had occurred on our troops, 76,300 individuals would have died if they were not vaccinated. On the other hand, if all were vaccinated, it was estimated that only 122 would have died. Conversely, what if the attack had been tularemia, Q-fever, or a host of other biological agents for which we do not have a vaccine? Thousands would have died or become ill because we did not have even a partial protection from such agents. Yet, if an "85% Quick Fix" was put into place, hundreds or possibly thousands of lives could be saved, allowing the military mission to continue.

Since there is no mechanism in place today to provide even partial protection from a biological warfare attack at most military installations, both the Aum Shinrikyo and the Gulf War scenarios have grave implications. U.S. military forces could suffer death tolls higher than the tragic events of September 11, 2001, unless some interim efforts for partial protection occur prior to finding the 100% solution. With the "85% Quick Fix," it is hypothesized 85% of the affected soldiers would be protected.

Indeed, there is an obligation to protect our forces completely from threats when practical. We owe that protection to U.S. military personnel, to their families, and to our nation. Yet, the complexities of this threat make it difficult to field comprehensive defensive measures in the near-term — and BW/BT threats exist today. The weapons of this threat are bacteria, viruses, other microorganisms, and toxins. Unlike TNT, chemicals, and radioactive material, biological organisms are alive and can adapt to new challenges in the quest for survival. These invisible weapons are much different from other threats. They can be released to travel difficult terrain silently and effortlessly over long distances, creating sickness and death in their wake.

Sometime in the 21st century we may be able to provide 100% protection against all the dozens of pathogens that might be used as weapons. However, unless we adopt a group of partial fixes now, our military forces will be left grossly vulnerable to the BW/BT threat while we search for a more comprehensive breakthrough in vaccines, sensors, and other counters. We have

[2] David E. Kaplan and Andrew Marshall, *The Cult at the End of the World* (New York: Crown Publishers, 1996), 92, 251, 294.

much ground to make up in biodefense. Until very recently, senior DoD leaders were unable to grasp the urgency in protecting military forces and were unwilling to obligate large investments necessary to counter an unlikely event. Hopefully that has changed.

The anthrax attacks in the United States during the Fall of 2001 have helped convert many such doubters, but further complicating a solution is the fact that some within DoD have seen this problem as "too hard to do." Not knowing just what to do and not sure the threat was real, they did little. Also, one of the difficulties in preparing for this threat is the military's fixation on technological answers more than procedural solutions. That finally may be changing, because a few in the military are beginning to ask, "Is there an inexpensive, quick fix that can provide partial protection for our forces while we look for the 100% solution?"[3] Our frustrating quest for such items like the "detect to protect"[4] technology provided by biological detectors or highly reliable vaccines for a myriad of pathogens has led many to despair. Others have realized that for immediate protection, new technology innovations may not be the major portion of the immediate solution.

Today, more than a dozen countries are suspected of having some level of a biological warfare program. It is also true that terrorist organizations such as Al-Qaeda have shown a keen interest in obtaining these weapons. Since Al-Qaeda says it is their God-ordained responsibility to kill Americans and most of the countries with BW/BT programs are not our best of friends, it is important we get to the immediate business of what might be termed the "85% Quick Fix"–some simple, effective, and immediate counters to today's biological weapons threat. Effective interim and partial protection might be accomplished with several simple procedural changes and by minor applications of current technology at modest expense.

The quest for the perfect answer can be the enemy of the "good solution," and no one would credibly argue that 100% of personnel left unprotected in the near term is better than protecting 85% of personnel immediately through quick-fix procedures.

[3] An example of one effort is the U.S. Air Force's *Biological Defense Task Force*, which was a 120-day project in the summer and fall of 2002. This was an effort directed by the Chief of Staff of the USAF through HQ USAF/XONP to assist in developing a concept of operations for military installations in the event it was faced with biological warfare.

[4] "Detect to protect" means that a biological attack can be detected before people are infected, giving them time to protect themselves from infection before it arrives.

II. Defining the BW/BT Threat

The biological threat can be quantified by integrating three distinct variables:[5]

- An adversary's *intent* to use biological weapons
- An adversary's *capability* to use biological weapons
- Our own *vulnerability* to biological weapons

Enemy *Intent* + Enemy *Capability* + U.S./Allied *Vulnerability* = Threat

It is beyond the scope of this chapter to thoroughly analyze the possible intent of various rogue states/adversaries or to fully describe the myriad of biological weapon agents that may be used in an attack. Likewise, it is important to understand that to appropriately defeat BW/BT a full range of activities should be pursued, including: arms control, export controls, diplomatic and economic sanctions, deterrence, counterforce, active defense, passive defense and consequence management. However, this analysis will look at how a few simple and immediate steps can be taken to mitigate the hazards from biological weapons in the areas of passive defense, intelligence and warning, consequence management, and active defense/offensive options.

Understanding BW Agents

Threats like biological warfare/biological terrorism can be serious when the United States and/or its allies are vulnerable, and this is generally the case for every BW agent. This vulnerability is in turn a function of the characteristics of the BW agents and their various delivery systems. Nevertheless, the details of U.S. vulnerability are critical to determining the potential impacts of a BW attack.

Many sources suggest that BW threats can be overwhelming. The actual area in which people would be affected by BW would vary depending upon the means of delivery (aerosol delivery is generally expected to be the most serious),[6] the quantity and positioning of the BW source, time of day, weather conditions, where people are

[5] Lt Col Don Noah, USAF, "Medical Intelligence with a Weapon Focus on Biological Warfare." Presentation was at the USAF Counterproliferation Center, Maxwell AFB, on 11 Jan 2000 to an Air War College elective class. He stated that U.S. national threat assessments often uses the formula of: intent + capability + vulnerability = threat. Lt Col Noah was the primary author of the National Medical Intelligence Threat Assessment for the United States, published in January 2000.

[6] "Biological weapons can be deployed in three [primary] ways: by contaminating food or water supplies; releasing infected vectors, such as mosquitoes or fleas; or creating an aerosol cloud to be inhaled by the victims. By far, the most effective mode for applying biological weapons [to produce mass casualties] is an aerosol cloud. Such a cloud is made up of microscopic particles and is therefore invisible." Ken Alibek, Testimony to the House Armed Services Committee Oversight Panel on Terrorism, May 23, 2000.

located, what they are doing when exposed, and various other factors. For example, the Congressional Office of Technology Assessment indicated that 100 kilograms of anthrax could cover 46 to 300 square kilometers with lethal effects, depending upon weather conditions,[7] while other sources suggest potentially larger areas.[8] Another source suggests that spray from "… a single airplane could be expected to infect a high percentage of individuals within an area of at least 10,000 km^2" with equine encephalitis (VEE, EEE, or WEE).[9] These large areas suggest that even Special Forces carrying a kilogram or so of BW, could affect large parts of a city, airfield, port, ground force base, or command/control or logistics facility. An aircraft or missile carrying tens of kilograms of BW agents could thoroughly overwhelm most military targets and cover much of the surrounding areas.

There are a significant number of biological agents that have different characteristics, as shown in Table 1. These weapons vary in their potency (ECt_{50}),[10] their lethality, their survivability in air and other media, their period of incubation and duration of effects, whether they are contagious between people, the degree to which they can be prevented (e.g., by vaccines) or treated (e.g., by antibiotics), and their potential resistance to various forms of treatment (e.g., in antibiotic resistance). For example, a toxin like Staphylococcal Enterotoxin B (SEB) could rapidly affect a military population (starting within 2 hours or so), would have serious effects for perhaps a day or so, have residual effects for as long as weeks, should cause few fatalities, and could be treated only by supportive treatment. Alternatively, some

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[7] *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, U.S. Congress Office of Technology Assessment, August 1993, 53-54.

[8] See Steve Fetter, "Ballistic Missiles and Weapons of Mass Destruction," *International Security*, Summer 1991. Computer models like Hazard Predication and Assessment Capability (HPAC) show areas where varying fractions of those present will become anthrax fatalities. Dr. Bruce Bennett did four HPAC runs assuming the use of five kilograms of anthrax, the results of which provide a useful comparison. For an untreated and non-vaccinated population the 90 and 50 percent lethality areas range from 2 to 26 square kilometers (90 percent lethality) and from 31 to 2,600 square kilometers (50 percent lethality). The 20 percent lethality areas run from 500 to 15,000 square kilometers, and the 2 percent fatality areas run from 6,000 to 32,000 square kilometers.

[9] Jonathan F. Smith, et. al., "Viral Encephalitides," in *Medical Aspects of Chemical and Biological Warfare*, eds. Frederick R. Sidell, Ernest T. Takafuji, and David R. Franz, (Washington, D.C.: Office of the Surgeon General, U.S. Army, 1997). (VEE is Venezuelan Equine Encephalitis; EEE is Eastern Equine Encephalitis; and WEE is Western Equine Encephalitis.

[10] ECt50 is Effect Concentration Time 50%. The ECt50 is a measure of the dose at which 50 percent of the population experiences the agent's primary effect. "For a vapour cloud or aerosol presenting a respiratory hazard, the exposure can be conveniently expressed as the product of the agent concentration (C) and the exposure time (t), which is known as the 'Haber Product', or 'Ct' exposure, with units of milligrams minutes per metres cubed (mg.min.m-3). (33) Since the susceptibility to CW agents varies from human to human, it is not possible to specify an exact minimum effective dosage or lethal dose for each agent. As a result, scientists can only define the dosage that has a specified probability of producing a particular effect. It is possible to define the term 'Effect Ct50' (ECt50) which indicates the Ct exposure that has a 50% probability of producing some kind of an effect." Found at British Ministry of Defence site: http://www.mod.uk/issues/gulfwar/info/ukchemical/annexa.htm on 17 January 2003; Also see Brian G. Chow, et. al., *Air Force Operations in a Chemical and Biological Environment*, RAND, DB-189/1-AF. 1998, 29.

bacterial weapons like anthrax and plague take longer to incubate, are highly lethal, but can generally be countered by certain antibiotics if these are taken in a timely manner and the BW agent has not been engineered to resist the antibiotic.

Table 1. Characteristics of Some BW Agents

Agent	ECt_{50}* (µg)-min/m^3	Nighttime Decay (%/min)	Untreated Mortality(%)	Incubation (Days)	Contagious	Treatment	Vacc.
Bacteria							
Anthrax	0.01	0-0.1	100	1-6	No	Antibiotic	Yes
Plague	0.01	10	100	2-3	Yes	Antibiotic	No**
Tularemia	0.0001	5	5-60	2-10	No	Antibiotic	IND
Q Fever	0.00002	0-0.1	0-1	10-40	Rare	Antibiotic	IND
Toxins							
Bot Tox	0.1	5	5	1-5	No	Antitoxin*	IND
Ricin	200*	?	High*	18-24 hr*	No*	Support*	No*
SEB	0.03*	1	1	3-12 hr	No	Support*	No
Viruses							
VEE	?	?	Low*	2-6*	Low*	Support*	IND*
Ebola	?	?	50-90*	4-21*	Moderate*	Support*	No*
Smallpox	0.1	0.5	15-40	7-17	Yes	Support*	Yes

* ECt_{50} - Exposure Concentration Time 50%; Vacc. – Vaccine; SEB-Staphylococcal Enterotoxin B; VEE - Venezuelan Equine Encephalitis; IND – Investigational New Drug

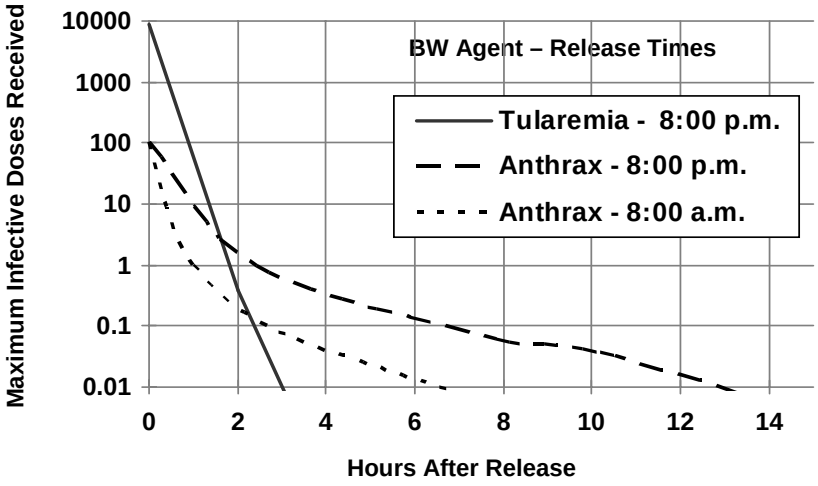
Source: Brian G. Chow, et. al., *Air Force Operations in a Chemical and Biological Environment*, RAND, DB-189/1-AF. 1998, 29. Values with a "*" come from USAMRIID, *Medical Management of Biological Casualties Handbook*, February 2001, 64 and Appendices C, D, and I. The vaccine for plague "**" (actually for bubonic as opposed to pneumonic plague) is no longer being produced per Thomas V. Inglesby, et. al., "Plague as a Biological Weapon," *JAMA*, May 3, 2000, 2285.[11]

The impact of the different potency and decay rate values is illustrated in Figure 1, based on a series of biological weapons exposure curves produced by the Hazard Prediction and Assessment Capability (HPAC) model for a one-kilogram BW agent release of one-kilometer width. The model also assumes a temperature inversion and a wind speed of approximately 10 mph. Even in daylight (8:00 a.m.), the model

[11] This table is a modification of the unclassified table at: Brian G. Chow, et. al., *Air Force Operations in a Chemical and Biological Environment*, RAND, DB-189/1-AF. 1998, 29. On-line. Internet, 9 September 2002. Available from http://www.rand.org/publications/DB/DB189.1/DB189.1.pdf/DB189.1.sec2.pdf. Values with a "*" come from USAMRIID, *Medical Management of Biological Casualties Handbook*, February 2001, 64 and Appendices C, D, and I. The vaccine for plague "**" (actually for bubonic as opposed to pneumonic plague) is no longer being produced per Thomas V. Inglesby, et. al., "Plague as a Biological Weapon," *JAMA*, May 3, 2000, 2285.

shows that the concentration of viable anthrax stays above the median infective dose for an hour or so after the release (reflecting its relative resistance to UV degradation). This is enough time to cover most fixed military targets as long as there is a temperature inversion, the wind was properly forecast, and the original release was sufficiently wide. At night (8:00 p.m.), the anthrax concentration stays above the median infective dose for several hours, sufficient to cover large military assembly areas with a favorable breeze. In contrast, the greater potency (determined by the reduced number of microorganisms required to induce infection) of tularemia starts with far higher infective dose levels, but the infective dose declines much more rapidly because of the decay rate of tularemia in air. Still, the dosage for tularemia is well above the median infective dose for almost two hours, giving reasonable time to cover most fixed targets. Indeed, even modest amounts (a kilogram or so) of both anthrax and tularemia should carry well beyond an intended military target and could affect large civilian areas under ideal conditions. With anthrax, doses well less than the median infective dose may still cause some lethal exposures many hours after the release, well downwind of the target.[12]

Figure 1. Maximum Infective Dose Received at the Front of a BW Cloud traveling at approximately 10 mph.[13]



[12] In the aftermath of the anthrax letters, the threshold dose required for some level of anthrax lethality was widely debated. A recent article indicated that even a few spores (about 0.0003 median lethal dose) might cause lethality in a small percent of those exposed, well below the 0.01 levels shown in this chart. See C.J. Peters and D.M. Hartley, "Anthrax Inhalation and Lethal Human Infection," *The Lancet*, February 23, 2002, 710.

[13] Decreased dose over time is primarily due to degradation from ultraviolet light and dispersion of the agent in the air. This figure is based on a one kilogram released over a distance of one kilometer. Dr. Bruce Bennett employed a series of eight HPAC forecasts to estimate these curves; the results showed some variability for other factors, with these curves reflecting roughly median values.

Antibiotics against bacterial weapons can often be effective, whether used for treatment[14] or for post-exposure prophylaxis.[15] Nevertheless, use of antibiotics could still lead to some debilitating side effects[16] that could impact both civilian and military operations. While antibiotics fight bacteria, many toxins and viruses lack a direct means of treatment (as shown in Table 1), meaning that victims will be sick and many will be incapacitated for some period of time.

The Soviets, recognizing the potential for antibiotics to defeat many biological agents, developed genetic variations of BW agents (such as plague, anthrax, and tularemia), that were resistant to various antibiotics. One of the Soviets' former leading bio-weaponeers stated:

> "There was a task force to develop a new strain of weapon with a resistance to ten antibiotics. These antibiotics were first released in the United States and some European countries just to treat infections. In 1989 it was very difficult to have strains of plague resistant to antibiotics. But one of our facilities developed a new approach. They developed two different strains resistant to five antibiotics each. And they cultivated them together and they have a mutual relationship, one with another. That was about ten, twelve, fifteen years ago. Recently, Russian scientists have proclaimed success in developing a *Bacillus anthracis* strain resistant to most antibiotics."[17]

III. Mitigating U.S./Allied Vulnerability Against Bio-Weapons

The U.S. military has studied the BW threat and concluded that the military's goal of full-dimensional protection, enshrined in *Joint Vision 2020*,[18] cannot be achieved against BW today (no 100% solution). Each element of a potential response to BW use is limited in its ability to resolve the threat. Therefore, no individual element can mitigate the BW threat. Yet, the "85% Quick Fix" could be

[14] For example, 6 of the 11 victims of inhalation anthrax from the 2001 anthrax letters survived based upon antibiotic treatment that started after the development of symptoms. Indeed, in all cases where antibiotic treatment was started during the initial phase of the illness (post-symptoms), the victims survived. See John A. Jernigan, et. al., "Bioterrorism-Related Inhalation Anthrax: The First Ten Cases Reported in the United States," *Emerging Infectious Diseases*, November-December, 2001, 933-944.

[15] After potential anthrax exposure, antibiotic use (referred to as prophylaxis) can prevent the disease from developing. See Thomas V. Inglesby, et. al., "Anthrax as a Biological Weapon, 2002," *Journal of the American Medical Association*, May 1, 2002, 2244-2248.

[16] See CDC, "Update: Adverse Events Associated with Anthrax Prophylaxis Among Postal Employees – New Jersey, New York City, and the District of Columbia Metropolitan Area, 2001," *Morbidity and Mortality Weekly Report*, November 30, 2001, 1051-1054.

[17] Alibek Interview, *Op. cit.*

[18] *Joint Vision 2020* is the vision document from the Chairman of the Joint Chief of Staff.

realized if the following four areas are addressed: passive defense, intelligence and warning, consequence management, and active defense/offensive options.

Passive Defense Quick Fixes

Passive defenses seek to prevent the infection of people by a BW attack. Passive defenses include several elements:

Vaccines - A vaccine is an antigen that is introduced into the body to stimulate the immune system to build defenses against that antigen. An effective vaccine will neutralize a specific virus, bacteria, toxin, or rickettsiae - the four categories of BW agents. In the future it is hoped one vaccine will be developed that boosts the immune system against all or many diseases. But for now, vaccines are disease-specific. Relatively few vaccines are FDA approved for use against BW agents, and all of those, specifically the anthrax and smallpox vaccines, are controversial. Nevertheless, vaccines are one of the most effective ways to reduce BW vulnerability, especially against the most serious BW agents like anthrax and smallpox. This is probably the greatest payoff area for protecting military forces long term and DoD should fund this at much higher levels.

Individual protective equipment (IPE) - includes various kinds of masks and suits; it keeps BW agents away from people and thereby prevents infection. The quandary with IPE is that its use reduces operational effectiveness, and in many weather conditions, it can only be used for a limited period of time (it causes heat casualties and other effects after a period of minutes to hours). The most devastating BW threats come from aerosol delivery; a commercial half mask respirator will significantly reduce biological agent inhalation providing protection factors of 50 to 500 or more against BW stimulants—a level of protection often adequate to prevent infection, without the operational degradation and heat burden of traditional chemical masks.[19]

Collective protection systems (CPS) - are facilities that provide a BW-free area by filtering incoming air. These are places where people can eat and sleep, change clothes, and perform other operations without being vulnerable to BW agents or having to wear the hot and cumbersome protective boots, gloves, masks and over garments. Many facilities could provide much protection from BW agents, albeit not 100% protection, with minimal upgrades as outlined later.

Biological decontamination - includes solutions and delivery devices to neutralize BW agents in the air, ground, water, or on people or their clothing.

[19] "Protection Factor (PF) and Saturation Testing of Commercial Negative Pressure Half-Mask Respirators," Edgewood Chemical & Biological Center (ECBC) Interim Technical Memorandum; Soldier and Biological Chemical Command (AMSSB-REN), Aberdeen Proving Ground, MD, November 9, 2001.

Advances are being made technologically in this field and will help us move toward the 100% solution.

Avoidance and Operations - With chemical weapons, rapid detection of an attack allows commanders to direct personnel to avoid exposure, for example by moving in-doors and turning off heating, ventilation, and air conditioning (HVAC) systems that would otherwise draw the agent into the building. Because biological weapon detection is so slow, such procedures generally will not be implemented quickly enough after detection to help; indeed, by the time BW detection occurs, the air outside will likely be clear of contamination while the air inside buildings may be contaminated because of HVAC operations.[20] Therefore, if the HVAC was shut off shortly after an attack the levels of BW agent might linger in a building long after the outside air has cleared.

Dissimilarly, the sensitivity and rapid response of chemical detectors allows users to fairly quickly identify the area of contamination and mark it so that people can be directed to stay out. But with BW, most detectors, due to sensitivity and specificity shortfalls, may not identify some contaminated areas and may not be sufficiently sensitive to identify some potentially infectious dosages. As a result, an extremely conservative view is often taken whereby detection of any BW agent usually becomes the basis for complete isolation of that and surrounding areas; this will probably help people to avoid contamination but often restricts the use of more areas than necessary, while missing some areas that may be contaminated.

One concept of military operations when potentially facing chemical or biological weapon threats is similar to the concept when facing nuclear threats: forces should disperse to operate at low density to reduce the damage that can be done by any given attack. Currently most concepts of operations are designed to build tent cities that force all the personnel in a small area. It is not clear, however, that military units are prepared to execute dispersion of personnel on a base. While this would be beneficial for a point release close to the base, this concept would not be as helpful for a line source release that would disperse BW agent over a large area. Nevertheless, an effort to disperse people on a base if there is a potential BW attack might lessen the likelihood of some individuals being exposed once an attack occurs.

Operational procedures can also help when combined with knowledge of the limits of various biological weapons. Most biological agents degrade rapidly with

[20] "Once the outdoor concentration has diminished to safe levels (as determined by emergency response teams), evacuate the building and flush it with outdoor air. After the contaminated plume passes, the concentration of contamination will actually be higher inside the building than outside, because the building will tend to retain contamination that managed to enter" Phillip N Price, Michael D Sohn, Ashok J Gadgil, et.al., *Protecting Buildings From a Biological or Chemical Attack: actions to take before or during a release*., *LBNL/PUB-5195.* (Berkeley, California: Lawrence Berkeley National Laboratory, January 10, 2003), 11.

ultraviolet (UV) light. For instance, *Francisella tularensis* dies at a rate of 50% every 20 minutes on a bright sunny day. There are only two biological agents that are generally considered "UV resistant" and those are *Bacillus anthracis* (anthrax) and *Coxiella burnetii* (Q Fever). Even though their degradation is refractory to UV light, they still decay at a rate of approximately or less than 0.1% per minute in sunlight.[21] Based on this understanding, it is far more productive and, therefore, likely for an adversary who wants mass casualties to launch a BW/BT attack when there is no sunlight, since such an attack has a much greater potential for delivering higher concentrations of virulent organisms.

Although biological agents can be delivered by several mechanisms, biological agents that are aerosolized would be dependent on the wind to move them. If it is a day with less than 3 mph of wind and an attacker is outside the fence of a military installation spraying a biological agent, the germ cloud will not move very far and probably will not pose a major threat to personnel on base. Conversely, if the wind is too strong, perhaps at speeds greater than 23 to 25 mph, the cloud of agent is thought to become so unstable and diffuse so rapidly that it is unlikely to deliver enough concentration to infect many individuals and cause a mass casualty event. Of course, distance from the point of dissemination is also important here. If an individual or group was very close to the release point, whether there was slow or fast wind speeds, concentrations may still be high enough to infect large numbers of people.[22]

In order for a biological weapons attack to be optimally successful, the wind needs to be blowing at certain velocities and no UV light should be present. Additionally, biological agents will not infect anyone unless they are close to the ground in the human breathing zone, 3 to 7 feet above the surface. This means a temperature inversion would be necessary to keep large concentrations of the BW agent close to the ground. Temperature inversions, where cold air overlays and pins warmer air against the ground, may occur at various times of the day but usually occur at dawn, dusk, or night. Also, certain seasons of the year are more likely to have temperature inversions than others, helping forecasters to predict their occurrence. Additionally, it may seem counterintuitive, but Bill Patrick, an expert in offensive biological warfare, has stated that light to moderate rain or snow will not appreciably affect the delivery of aerosolized BW agents. In other words, light to moderate rainstorms do not wash the skies clean of BW particles.[23]

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[21] Bill Patrick, Biological Warfare Consultant, "The United States Offensive Biological Program (1940-1972)." Presentation was at the USAF Counterproliferation Center, Maxwell AFB, on 19 Feb 1999 to an Air War College elective class.

[22] Bill Patrick, Biological Warfare Consultant, "Fundamentals of Biological Warfare." Presentation was for the USAF Counterproliferation Center at USAMRIID, Ft Detrick, Maryland, on 13 Sept 2002 to an Air War College elective class.

[23] This can be understood by realizing that only a small portion of each cubic foot of air will have water passing through it during a light or moderate rain or snow. This allows most BW agents to escape being washed to the ground by the water particles passing through it. Bill Patrick, Biological Warfare Consultant, "The United States

Building Preparation Before the Attack - All buildings, including homes, where persons might be present during dawn, dusk or night should be inspected and made as airtight as possible. Simple efforts such as caulking, painting, taping, or sealing around doors or windows might greatly reduce the airflow through a building.[24]

Inexpensive small particle air filters are now available at hardware stores that can be installed in most existing air conditioning or heating units. This is not as good as creating positive pressure throughout a building to keep air flowing into it, nor does it provide as good a filtration as provided by a High Efficiency Particulate (HEPA) filter, but it is something that can be done now with minimal expense.

Although there are many manufacturers of these types of filters, here are two examples of filters that can be purchased at local hardware stores. Web Products from Kansas City, Kansas has a filter called *The Web Plus* that is marketed as "trapping 91% of the pollen, dust, and dander sized particles from 0.245 to 85 microns" and the fourteen by twenty inch version was priced at $8.40 per filter.

3M Construction and Home Improvement Markets Division from St. Paul, Minnesota has a filter called *Filtrete: Ultra Allergen filter* that is marketed as "90% effective at capturing large allergens like mold spores and pet dander … captures bacteria and particles that can carry viruses" and in calling their toll free number, one of the authors was told that it is "90% efficient at removing particles from 0.1 to 10 microns." The 3M filter was $15.97 per filter for the sixteen by twenty inch size. The idea of using these higher efficiency filters is to get a quick improvement in filtering BW/BT agents without requiring new blowers or other expensive, time consuming modifications to be made to existing ventilation systems.

Since buildings with larger concentrations of people might elevate the risk of mass casualties if they became contaminated, some extra precautions might be reasonable for them. Buildings that would likely house over, perhaps, 50 people at dawn, dusk, or night could be equipped with counter-bactericidal UV lights in the ventilation systems. Rather than turning them on during higher Bio-Threatcon levels, it would probably be easiest to have them lit whenever the ventilation system is running. The lights would need to be arranged in ventilation ducts to provide maximum contact with BW agents. Although these may not affect *Bacillus*

Offensive Biological Program (1940-1972)." Presentation was at the USAF Counterproliferation Center, Maxwell AFB, on 19 Feb 1999 to an Air War College elective class.

[24] Phillip N Price, Michael D Sohn, Ashok J Gadgil, et. al., *Protecting Buildings From a Biological or Chemical Attack: actions to take before or during a release, LBNL/PUB-5195.* (Berkeley, California: Lawrence Berkeley National Laboratory, January 10, 2003), page 30; Centers for Disease Control and Prevention, "Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks, " May 2002, 19; and on-line, Internet, 10 November 2002, available from http://www.cdc.gov/niosh/bldvent/2002-139.html.

anthracis, *Coxiella burnetii*, or smallpox appreciably, the lights, if properly arranged, would likely have significant effect on many other bacterial agents.

Stand-alone room filtering devices are now available as commercial off-the-shelf items. These small freestanding units re-circulate the air in rooms through the unit's filter thereby trapping particles. If biological agents get into the building, these devices might greatly reduce the level of concentrations that people would breathe. This would be effective as long as the filter captured particle sizes in the 1 to 10 micron diameter range, the size that tends to lodge in the lungs of those exposed. A side benefit filters like this might offer is that if a BW attack did occur they could be sent to a diagnostic lab for confirmation of the particular agent that had been in the air.

Intelligence and Warning

The greatest problem in defending against BW attacks is the limited amount of intelligence and warning we will likely have. In contrast to chemical weapon attacks, where there are a multitude of detectors that can provide tactical warning of attacks, there are BW detectors at very few bases today (though the number of bases is expanding), and in general, they take too long to provide adequate attack warning.

For example, the Portal Shield system deployed at a number of U.S. military bases takes roughly half an hour to process an air sample and determine that it potentially contains a BW threat. By that time, an aerosolized BW cloud has usually passed through a military base being attacked, exposing almost everyone before protection can be applied in response to warning. This type of warning is usually referred to as "detect to treat" rather than "detect to protect," the preferred approach. Detect to treat allows the base to promptly begin treatment for BW exposure, which could significantly reduce or eliminate casualties in the case of most bacterial and some other biological weapons.

A preferred solution for warning would involve rapid standoff detection: the ability to see BW agents in an approaching cloud and quickly identify them. If this can be achieved, then personnel would have time to don protective clothing or move into protected buildings before arrival of a BW cloud, and thereby, not be infected. Work is ongoing to develop such detectors, but they appear to be still several years away from production and deployment.

In places where there are no BW detectors or as a back-up to BW detectors, discovery of a BW attack can be achieved by disease surveillance at hospitals and other medical facilities. Recognition of a BW attack may not happen until symptoms develop, which, according to the incubation periods in Table 1, will normally be days after the attack. Still, aggressive disease surveillance is an

important part of the "85% Quick Fix" and should receive major attention and resourcing at installations.

However, when the initial detection of a BW attack has happened, it is then necessary to confirm that the suspected biological agent is indeed what it appears to be, and also to determine if it has been mixed with other biological agents (especially contagious ones) which have not yet been detected. This process is pursued through advanced medical laboratory capabilities. Once such a confirmation is accomplished, medical officers have a stronger basis for taking actions to treat for the identified BW agent.

While the military has labs capable of such confirmation in a few locations overseas, it needs to deploy more labs and enhance the capabilities of these facilities (giving them the ability to identify more types of BW agents)—an important part of the "85% Quick Fix." Although each year technology greatly improves the ability to detect and identify particular BW agents, appropriate resourcing with today's technology would provide a large and immediate improvement. The ongoing cost will be that the Department of Defense will need to be willing to switch out old systems as new technologies for bio-detection are developed, much like it does as it continually updates its computer and software systems.

Bio-Threatcon Levels - To reduce U.S. forces, Allied Forces, and civilian *vulnerability* to BW/BT attacks, military installations should develop and issue warnings of the daily Bio-Threat condition (Bio-Threatcon) level**,** reflecting the likelihood of a successful aerosol BW attack that could inflict massive numbers of casualties. Then decision guidelines can be established to help commanders make reasonable and logical force protection decisions.

The Bio-Threatcon level would be determined by two pieces of information – the first, "BW/BT Intel Threat (BIT)" levels, is designed to help predict the likelihood of a BW attack. The intelligence officer at each installation could fuse at least four and perhaps more types of information to assign a BIT level: (1) the current overall force protection level (alpha, bravo, charlie, delta), (2) current intelligence assessments of the BW/BT *capability* of an adversary, (3) assessments of the predicted *intent* of the adversary, and (4) assessments of adversary movement of SOF or activity with other potential BW delivery systems.

This data, some objective and some subjective, would be amalgamated to come up with a BIT level (ranging from 1 to 4). "One" would indicate that an adversary is very unlikely to use BW on the given military installation, whereas, "Four" would indicate a BW attack was very likely. Two and three would be interim ranges between one and four.

The BIT level would be integrated with another variable, the "Bio-Attack Climatology Effectiveness" (BACE) level, which would be made up of meteorological factors such as wind speed, ultraviolet light levels, and the probability of a temperature inversion. A meteorological computer model could be

developed without great difficulty to integrate these three variables, as a minimum, giving current and projected BACE levels that would predict the likelihood of specific meteorological conditions for successfully delivering enough biological agents to cover an airfield or other military facility to cause mass causalities. Note, though, that depending upon the size of the target to be affected and other factors, a successful BW attack might still be carried out in conditions that are not climatologically ideal.

The BACE levels would be assigned so that BACE-1 means the climatogical conditions are extremely adverse toward a successful biological attack, whereas a BACE-4 rating would indicate the existence of optimal climatic conditions for a successful enemy biological attack.

For BIT level 2 and above (heightened likelihood of an attack), the BACE computer model should be run continuously. At these heightened threat levels the "Bio-Attack Climatology Effectiveness" levels should be available instantly to the Intelligence Officer and the Command Staff because BACE is meaningless unless it is combined with the "BW/BT Intelligence Threat" level. At the BIT level 1, "Bio-Attack Climatology Effectiveness" levels would only be calculated intermittently to indicate the conditions that would be climatologically ideal for a mass casualty attack using a BW agent.

After the "BW/BT Intel Threat" (BIT) level and "Bio-Attack Climatology Effectiveness"(BACE) levels are determined, it would be easy for a commander to see where their axes intersect and determine an overall Bio-Threatcon level (**BIT + BACE = Bio-Threatcon Level**). This intersection would be assigned a designator of alpha, bravo, charlie, or delta. Similar to other threatcon levels that the military are accustomed to, the alpha is the lower threat level while the delta is the highest threat level. The model (Table 2) shows alpha where the threat is so low that a commander would not need to implement protection procedures. But a delta would mean the highest level of threat for a successful biological attack that might cause mass casualties has been achieved, and all personnel on the installation are at great risk. Obviously, bravo and charlie are in between areas where there is a heightened threat of exposure but are less likely than delta.

A notification system for base personnel at military facilities also would need to be designed. Some options available are the installation "Giant Voice," audio and visual alarms, individually carried beepers, and/or television broadcast warnings. Base personnel should exercise these notification procedures during dawn/dusk hours or the times a given base is most likely to be vulnerable. The entire base populace, even civilians and dependents, will need to become familiar with these procedures because any large number of people that become casualties would affect the mission regardless of who they are.

Currently, most installation meteorologists, bioenvironmental engineers, epidemiologists and intelligence officers at the installation level do not have

adequate training in biological warfare issues. To properly manage the Bio-Threatcon levels and be a valuable consultant to the commander, these individuals would require scientific training dealing with aerodynamics of BW agents, signatures of BW facilities, etc.

The idea of including a biological warfare threatcon level into the more well known "Force Protection Condition Level" (FPCON) is attractive to help simplify the number of indices a commander would have to keep track of to protect his forces, but it would undermine the awareness needed. Just as there is an "Information Threat Condition Level" (INFOCON) that is distinct from FPCON, Bio-Threatcon levels should also be distinct.[25]

Several unique aspects of BW/BT make it appropriate that the Bio-Threatcon level be separate from FPCON. Some examples of these unique aspects include: (1) silent weapons that can be delivered many miles from the base, (2) some adversaries are known to already possess BW/BT capability, (3) some adversaries are thought to be very unlikely to use BW/BT, (4) the intent of certain adversaries may be clearly toward civilian rather than military targets, (5) detection of an ongoing attack is not very likely because of the level of sophistication of today's detection systems, or, (6) unlike conventional weapons, aerosol delivered biological weapons can be greatly affected by meteorology.

[25] There may be some who will complain that BIT, BACE, INFOCON, FPCON and the nation's new homeland security threat levels are all a bit too much for commanders to remember. Yet, the high consequence of an effective BW/BT attack necessitate it receive a separate threat condition from the FPCON. By commingling it with the existing FPCON, this will reinforce in commander's minds that BW/BT is like the chemical threat or other threats. Over time, this will ultimately diminish the commander's understanding of this threat and hence, decrease the proper emphasis that should be placed against this potentially catastrophic and unique danger.

Table 2. <u>Commander's Decision Matrix</u> to <u>Avoid Mass BW/BT Casualties</u>
Bio-Threatcon Levels[26]

(BIT-4: Attack most likely)	BIT-4	*Bravo*	*Charlie*	*Delta*	*Delta*
	BIT-3	*Alpha*	*Bravo*	*Charlie*	*Charlie*
	BIT-2	*Alpha*	*Bravo*	*Bravo*	*Bravo*
(BIT-1: Attack least likely)	BIT-1	*Alpha*	*Alpha*	*Alpha*	*Alpha*
<u>BW/BT Intel Threat (BIT) level</u>		BACE-1	BACE-2	BACE-3	BACE-4
		(Low effectiveness)		*(High effectiveness)*	

(BIT level is derived from at least four components of information)
1. FPCON level
2. Capability of adversary
3. Intent of adversary
4. Adversary's movement of BW/BT delivery systems

<u>Bio-Attack Climatology Effectiveness (BACE)</u>
(UV light, Wind Speed, Probability of Temperature Inversion)

<u>Bio-Threatcon Levels</u>:	*Alpha* = Minimal Threat	*Charlie* = Partially Effective BW/BT attack possible with elevated risk
	Bravo = Partially Effective BW/BT attack is possible	*Delta* = Effective BW/BT attack is likely

Below are some thoughts on how a commander could respond at the different Bio-Threatcon Levels:

1. A (*Alpha*) - No precautions needed.
2. B (*Bravo*) -
    - All outside personnel on duty must wear lightweight half mask[27] respirators that cover nose and mouth, which can be purchased inexpensively using commercial off the shelf (COTS) technology.
    - All other personnel are encouraged to stay indoors or, if they must go outside, to wear the half mask respirator.

[26] The complex nature of command requires commanders to make assessment of risk and deal with those risks while completing the military mission. Dr. Jim Davis developed this table as one concept that could be used to help commanders make simple, yet critically important decisions. A table like this could be applied across the spectrum of all military installations. For instance, an installation in the continental U.S. would hopefully never reach a BIT-2 and would therefore never reach a Bio-Threatcon level of Bravo. Likewise, an installation located in South Korea might frequently be at BIT-2 necessitating its Bio-Threatcon level to change with as climatology (BACE) changes.

[27] Two inexpensive respirators were bought randomly from a local hardware to show the accessibility of protective gear. Mine Safety Appliances (MSA) Company had two respirators priced reasonably: *Dust Respirator with odor filter for Harmful Dust* ($4.93) and *Dust Respirator with exhalation valve for Harmful Dust* ($6.97). Both respirators were rated N95. According to a manufacturer representative this means the filters in these masks can filter 95% of the particles down to 0.3 microns. The main concern for human infectivity of BW/BT agents is the 1 to 10 micron range.

- Outside personnel are educated to stand with their back to the wind as much as is possible when outside as long as it does not affect completion of the mission.[28]
- Building ventilation systems should be turned off unless special filters are installed. (Discussed in section titled "Building preparation before the attack.")
- Keep all windows and doors shut.
- Assigned installation personnel should increase air-sampling procedures.
- The medical staffs in hospitals/clinics are notified of the Bio-Threatcon level to give a heightened awareness of a biological threat and exhibit greater vigilance in disease surveillance.
- Inside buildings and shelters, personnel must turn on room airflow filter units (Discussed in section titled "Building preparation before the attack.")

3. C (*Charlie*) -

- All outside personnel on duty must wear lightweight half mask respirators that cover nose and mouth, which can be purchased inexpensively using commercial off the shelf (COTS) technology.
- Only in an emergency situation should dependents or other personnel exit a building. In that case they should wear their half face respirator.
- Outside personnel are educated to stand with their back to the wind as much as is possible when outside as long as it does not affect completion of the mission.
- Building ventilation systems should be turned off unless special filters are installed. (Discussed in section titled "Building preparation before the attack.")
- Keep all windows and doors shut.
- Assigned installation personnel would increase air-sampling procedures.
- The medical staffs in hospitals/clinics are notified of the Bio-Threatcon level to give a heightened awareness of a biological threat and exhibit greater vigilance in disease surveillance.

[28] Bill Patrick related through personal anecdotal experience that by having his back to the wind with even crude respiratory protection reduced the concentration of deposited BW agent simulate around his face. Bill Patrick, Biological Warfare Consultant, "Fundamentals of Biological Warfare." Presentation was for the USAF Counterproliferation Center at USAMRIID, Ft Detrick, Maryland, on 13 Sept 2002 to an Air War College elective class.

- Inside buildings and shelters, personnel must turn on room airflow filter units (Discussed in section titled “Building preparation before the attack.”)
- Personnel must have sleeves rolled down.
- Upon detection of BW agents in the area, prophylaxis must begin immediately.

4. D (Delta)-

- All outside personnel on duty should wear a full-face military protective mask and hood.
- Only in an emergency situation should dependents or other personnel exit a building. In that case, they should wear their half face respirator.
- Turn off ventilation units unless unbearable temperature demands they run; even then, let operate only if they have a special filter installed. (Discussed in section titled “Building preparation before the attack.”)
- Keep all windows and doors shut.
- Assigned installation personnel would increase air-sampling procedures.
- The medical staffs in hospitals/clinics are notified of the Bio-Threatcon level to give a heightened awareness of a biological threat and exhibit greater vigilance in disease surveillance.
- Inside buildings and shelters, personnel must turn on room airflow filter units (Discussed in section titled “Building preparation before the attack.”)
- Personnel must have sleeves rolled down.
- Upon detection of BW agents in the area, prophylaxis must begin immediately.

Consequence Management Suggestions

Once a BW attack has occurred, military efforts can be organized to manage the consequences of those attacks. A major aspect of consequence management involves medical treatment with antibiotics, serums, and other appropriate therapies designed to prevent, mitigate, and cure various diseases caused by BW agents. Sufficient medical care personnel will be required to handle casualties, and plans should be made for how to handle mass casualties. Likewise sufficient medications and supplies can be stockpiled in advance in specified locations.

Greater care needs to be taken after a contagious biological weapons attack to prevent further spread of the disease. Quarantine procedures need to be put in

place to handle such situations, and police and other security personnel will need to be mobilized to enforce such quarantines. Unfortunately, it is often impossible to know whether a person is infected with a contagious disease until they show symptoms. Therefore, once it appears that a biological weapon has been used, it may be necessary to impose a local quarantine until medical authorities can explicitly rule out the possibility that contagious diseases were not included in the attack.

Note that this may impair the most likely approach to handling mass casualties: moving casualties to other medical facilities. It will often be necessary to solve the mass casualty problem in the area of the initial outbreak until the incubation period has passed for potential contagious diseases (as long as a couple of weeks) or until other actions can be taken to prevent the disease in those not yet symptomatic. This approach will be a serious problem for the U.S. military, which normally plans to stabilize and then evacuate all casualties. Instead, they may be forced to bring in medical care personnel, supplies, and equipment, and thereby potentially disrupt the force flow into a combat region. By resolving these quarantine, manpower, and supply issues in advance, the "85% Quick Fix" will help enhance protection immediately at other locations.

It may also be necessary to impose some travel restrictions after a biological warfare attack, even when it was clearly not contagious. For example, if a military service member were exposed in Country A, but was transported to Country B and then developed symptoms there, the military may not be able to prove whether this person was exposed in Country A or in Country B, potentially causing hysteria to spread to Country B unnecessarily. All travel should likely be restricted from the area where a BW attack occurred until enough time has passed to definitively diagnose the disease as non-contagious. Note that whether quarantine or travel restrictions are imposed, these will likely disrupt noncombatant evacuation and even conventional casualty evacuation from the area attacked.

With BW attacks, it will not be uncommon for psychological reactions to occur in greater numbers than actual BW/BT casualties. Masses of people, including many with little chance of having been in the infected area, will insist upon receiving medical treatment, potentially exhausting medical supplies in that area. Some will even develop psychosomatic symptoms, making them difficult to differentiate from actual casualties until laboratory work can be accomplished (and thus heightening the laboratory workload.) Many will also try to flee the area of infection, potentially seeking to break quarantine or travel restrictions.

Every effort needs to be made to prevent and then later treat psychological reactions. Efforts to understand the "panic phenomena" and the "worried well" in a BW event should be a priority but often remain under-funded. Aggressive efforts in planning and executing public relations and public information before an attack will probably be one of the commander's most valuable investments to en-

sure mission completion and prevent chaos. This will usually be best done with an active public information campaign to explain to people what has happened and what they should do about it. The public information effort can be vastly aided if authorities can accurately determine the time and area of the attack, thereby excluding many people from fear. But the capabilities to do so today are inadequate, and efforts to make such projections may only undermine the effectiveness of the public information as mistakes are made.

Every military facility should have public information packages for various BW agents and various scenarios detailing the types of information that should be released to the public or military forces and when they should be released. The Israeli Home Front Command has had hands on experience with many threats to their population over the last decade. As a result, they have a comprehensive system of communicating with the entire country through television, radio, faxes to key personnel, etc. Additionally, they have prepared thousands of information messages ready to be disseminated depending on the type of event. Their appreciation for minimizing panic and minimizing the numbers of "worried well" has helped them to come up with these valuable mitigation procedures.[29]

Active Defense and Offensive Options

Some BW threats may be best countered using active defenses or offensive options. Active defenses seek to intercept and destroy the means of WMD delivery before they reach the target area. U.S. and allied forces are normally very effective in intercepting opposing aircraft threats, though they would likely be less effective at intercepting ballistic and cruise missiles or terrorists/special forces. Since SOF-delivered BW is perhaps the largest BW threat, active defenses need to be augmented in the form of a more robust security system that is capable of patrolling and monitoring upwind of an installation.

Another way to defeat biological weapons use is to destroy BW through attack operations (counterforce) before the BW can be used. To do so, one must be able to locate the biological weapons storage and production sites and have the proper agent defeat type munitions available to destroy the BW in these sites. As noted earlier, it is difficult at best to locate these sites using current methods. These actions need to be taken before the adversary can disperse its BW agents.

Perhaps one of the strongest defenses against biological weapons use is the ability to inflict unacceptable levels of damage on countries that use such weapons.

[29] Col Gilad Shenhar, Head of Doctrine & Development Dept., Israeli Defense Force Home Front Command, "Home Front Command Overview with Emphasis on Chemical and Biological Warfare Issues. " Presentation was given at Home Front Command Headquarters, Israel on 30 Oct 2002 to a delegation of USAF officers (one of the authors was part of the delegation) supporting the Office of the Secretary of Defense's Bilateral Counterproliferation Working Group.

Such a retaliatory capability may deter BW attacks if the U.S. leadership possesses both the tools and the will to strike back. Nevertheless, even if he fears capture, a terrorist may not be deterred by retaliatory threats because the terrorist may lack a home location or some other valued item that he would not want damaged by retaliation.

IV. Conclusions

The quest for the "perfect" long-term protection against biological warfare or terrorist attacks must not become the enemy of the "good" solution today. Partial measures can provide significant levels of protection against biological threats at U.S. and allied military bases and facilities.

First, a new Bio-Threat condition alerting system needs to be created, and personnel need to be trained in its use.

Second, each military base must make upgrades to its facilities and acquire commercial off-the-shelf technologies to provide protection to building occupants.

Third, inexpensive masks must be purchased and personnel, including civilians and dependents, should be trained in their use.

In addition, we must deploy biological agent detectors more broadly, enhance disease surveillance systems, enhance stocks of medical supplies needed to treat casualties of biological attacks, design realistic plans to handle mass bio-casualties, develop procedures for quarantine and travel restrictions, and prepare to manage the psychological effects that are expected in the wake of biological weapons attacks.

These are some of the effective quick fixes available to United States now to counter mass casualty bio-events. We need to bolster protection today via the "85% Quick Fix" while working on longer-term, more perfect countermeasures to protect against emerging biological warfare and terrorist threats.

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Appendix C1: Workshop Initial Letter

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Making the World Safer

The USAF Counterproliferation Center (CPC) invites you to be an active participant in a one-day biological warfare (BW) workshop at the SAIC office (1235 Jefferson Davis Highway, Suite 1211, Arlington, VA), entitled: "The 85% BW Solution Workshop – Phase I." We have identified you as one of the top BW issue "thinkers" or subject matter experts in our nation. The goal of the workshop is to generate new ideas to address the vulnerability our military forces face today.

First, I would like to provide one brief example to demonstrate my concerns. As Operation Iraqi Freedom grew near and an imminent chemical warfare and BW battle troubled each of us, I pondered what we would say to the American public if we lost 5, 10, 15, or maybe even 50,000 of our forces due to BW. More than a decade had passed since Desert Storm, yet our forces' BW protection had only marginally improved. In Operation Iraqi Freedom our forces were more current on anthrax and smallpox vaccinations, but what about the many other BW possibilities—plague, Q-fever, glanders, Marburg virus, botulinum toxin?

The USAF CPC "85% BW Solution Project" is sponsored by Defense Threat Reduction Agency, Chemical-Biological Directorate (DTRA/CB), and we appreciate their support to formally pursue a long overdue effort. The "85% BW Solution" recognizes that there are no "silver bullets" to solve 100% of the BW problem. There may be some immediate, partial solutions that we have not yet tapped, and we would like you to be part of brainstorming these novel ideas.

At present, we plan on inviting 35 subject matter experts such as yourself for the workshop on October 20, 2004 (reference attached agenda). We will meet corporately for 45 minutes to explain the rules of engagement and objectives. The next 2 ½ hours will be spent in Defensive Biological Warfare Innovation Subgroups. Each subgroup will have approximately seven members, one of which will be the facilitator. A lunch will then be provided and all participants are encouraged to mingle and discuss their ideas. After lunch, the facilitator of each subgroup will give a 15 to 30 minute presentation of their group's recommendations. This will be an open discus-

sion forum. Around 4:00 p.m. the workshop will end, however new ideas generated by individuals can be communicated to the USAF CPC any time after the workshop.

We are making an effort to have a very broad range of experts. However, in an attempt to keep the workshop manageable, only a few people could be invited to participate. Therefore, some of your recognized, world-class BW defense colleagues regrettably could not be invited.

I hope you will seriously consider participation in this critical endeavor. My Assistant Project Director for this project is Major (Dr.) Tasha Pravecek. We must have you confirm your participation before 31 September by contacting her at:

Major Tasha Pravecek: (334) 953-6474, DSN 493-6474
e-mail: Tasha.Pravecek@maxwell.af.mil

We hope that you can find time in your schedule to participate in this workshop. We look forward to seeing you!

JIM A. DAVIS, Col, USAF, BSC
DVM, DrPH, DACVPM, FADD
Deputy Director, USAF Counterproliferation Center
Project Manager, The 85% Solution Project

Attachment:
Agenda

USAF Counterproliferation Center (CPC) Sponsors

"THE 85% BW SOLUTION WORKSHOP – PHASE I"

October 20, 2004
Location: SAIC, 1235 Jefferson Davis Highway
Suite 1211
Arlington VA, 22202

Project Director: Col (Dr) Jim Davis (334) 953-7530
Jim.Davis@maxwell.af.mil

Assistant Project Director: Maj (Dr) Tasha Pravecek (334) 953-6474
Tasha.Pravecek@maxwell.af.mil

Agenda

8:00 a.m. – 8:30 a.m.	Registration and Refreshments
8:30 a.m. – 09:15 a.m.	ROE and Objectives **Col Jim Davis**
9:15 a.m. – 09:25 a.m.	Break
9:25 a.m. – 12:00 p.m.	Defensive BW Innovation Subgroups Meet Separately
12:00 p.m. – 12:50 p.m.	Lunch
1:00 p.m. – 3:45 p.m.	Brief by Each Subgroup Facilitator - Open Discussions **All Participants**
3:45 p.m. – 4:00 p.m.	Closing Remarks and Thoughts on the Future **Col Jim Davis**

Appendix C2: Workshop Second Letter

USAF Counterproliferation Center
AWC/CPC, 325 Chennault Circle
Maxwell AFB, AL 36112-6427
Tel/ (334) 953-2103 Fax/ (334) 953-7530

Making the World Safer

4 October 2004

We are pleased you have accepted our invitation to attend "The 85% BW Solution Project Workshop." We know this will be a productive and exciting endeavor in generating quickly attainable ideas to address the vulnerability our military forces face today.

Our challenge to you is to **come with at least two and maybe even four ideas of current off-the-shelf technology or processes** that could be implemented **now** to provide partial protection against and/or recovery of a fixed-site base or facility from a BW attack. Improved recovery capability may not directly protect forces but may help provide a deterrent effect on would-be aggressors. Even if you do not have documentation or other proof your ideas will work, we still want to hear them. If you do have proof or other documentation in support of your ideas, please bring that to the workshop.

There are probably a great number of new counter-BW technologies and new ways of doing things that could make us safer in the near term. The attached article, "Needed Now: The '85% Quick Fix' in Bio-Defense" is enclosed with the purpose of stimulating your imagination and giving you just one example of a set of some quick-fixes to help protect personnel and operations, our airbases, ports and other facilities. The concepts in this article and the ideas you add in our forthcoming workshop are aimed at moving us forward toward at least a partial solution to the BW threat.

As we detailed in the invitation letter, we plan on having 35 subject matter experts such as yourself for the workshop on October 20, 2004. We will meet corporately for 30-45 minutes to explain the rules of engagement and objectives. The next 2 ½ hours will be spent in subgroups where we ask you to share your going-in ideas, brainstorm for others, and discuss the merits of each. Each subgroup will have seven to ten members, one of which will be the facilitator. The goal of each subgroup will be to come up with a prioritized list of new counter-BW innovations in any area you think is relevant, including but not limited to, medical surveillance,

medical treatment, protective masks and suits, contaminated remains, decontamination (personnel, equipment environmental), detection (stand-off, environmental, laboratory), building protection, and quarantine. These may be proposed in the form of new technologies, concepts of operation, or Tactics, Techniques and Procedures (TTPs). We are particularly interested in your suggested innovations for improving our capabilities in passive defense and consequence management, but if you have ideas in other components of counterproliferation that you think we should hear, bring them.

A lunch will be provided and all participants are encouraged to mingle and discuss their ideas. After lunch, the facilitator of each subgroup will give a 15 to 30 minute presentation of their group's recommendations. This will be followed by questions, answers and an open discussion forum to further stimulate new ideas and explore the validity of each group's concepts. Although the workshop will end at 4:00 p.m., additional new ideas generated by participants would be welcomed any time after the workshop. Please call or mail these to the USAF Counterproliferation Center.

Attached to this e-mail is some logistical information. Due to the limited funding for this workshop, we are not able to provide funds for lodging or travel. However, we will provide light snacks at the breaks and lunch. There is no workshop fee. We have included a list of hotels in the local area. We ask that you secure your reservations individually. We have also included directions to Crystal Gateway I where SAIC is located (12th floor, 1235 Jefferson Davis Highway, Suite 1211, Arlington, VA 22202).

We will keep this workshop at an unclassified level, therefore no security clearance information is required.

If you require any further information, please contact my Assistant Project Director for this project:

Major Tasha Pravecek: (334) 953-6474, DSN 493-6474
e-mail: Tasha.Pravecek@maxwell.af.mil

We look forward to working with you and hearing your innovative solutions!

JIM A. DAVIS, Col, USAF, BSC
DVM, DrPH, DACVPM, FADD
Deputy Director, USAF Counterproliferation Center
Project Manager, The 85% Solution Project
Jim.Davis@Maxwell.af.mil

Appendix D1: Workshop Slides:
Overview of "The 85% Biological Weapons Solution Project"

The 85% Biological Warfare Solution *Workshop*

Col (Dr) Jim Davis
October 20, 2004

President Bush
Fort McNair - National Defense University
11 February 2004

"The *greatest threat before humanity* today is the possibility of secret and sudden attack with *chemical or biological or radiological or nuclear* weapons."

Workshop Objective

Identify 85% Solutions

- Have Sense of Urgency – What happens today if an adversary initiates a BW attack ?

- Identify material and non-material solutions to improve our military force's protection now or in the near future against a BW attack

"85% Solution" in Bio-Defense

- What is the "85% Solution?"
- Why do we need it ?
- What are some ideas to create one ?
- What could help us develop an "85% Solution?"
- Today's agenda, objectives, and ROE

What is the "85% Solution?"

***George Washington* dealing with the threat of BW**

"… the enemy intended spreading smallpox among us …. I now must give some credit to it [and take] Every necessary precaution …."

- **Mortality - naturally 16%, vaccination 0.33% (1 per 300 died)**

- **January 6, 1777 - Washington ordered vaccination of all forces in Colonial Army**

What is the "85% Solution?"

- Not the Long Term Solution
- The Best Solution for TODAY!
  - Key is to fill the gap between the present & the long term solution
- Goal – Prevent 85% of casualties (85% is notional but the % is significant)
- Stimulate debate, innovation, ideas over new ways to protect forces

Why do we need an "85 % Solution?"

- The military must fight & win the nation's wars
- There are NO SILVER BULLETS
  - **Current focus is new technologies with a 100% solution**
  - **Some technologies are years from being fielded**
  - **Some don't live up to expectations when fielded**
- We have just been lucky
  - **Aum Shinrikyo**
  - **Desert Storm**
  - **Fall 2001 – Anthrax delivered by aerosol**
- We probably will not know about the next attack unless it is successful

Bio Warfare Programs

German Anti-Animal Biological Warfare Program: 1915 - 1917

- Germany leader in medical & Veterinarian Science
- 1917 German saboteur infected 4,500 mules w/ glanders in Mesopotamia
- German Agents disseminated glanders in the US with limited success

Japanese Biological Warfare Program & Unit 731, 1939-1945

- Experimented on Humans (Chinese & POWs)
- Used bubonic plague, typhoid, & other diseases
- Released plague infected animals caused 1946-48 plague outbreaks in Harbin area 30,000 deaths

200,000 Chinese were killed

America's Biological Warfare Program 1940s - 1969

- Some Agents Developed
  - Anthrax
  - Q-Fever
  - Tularemia
  - SEB Toxin
- Cuba Plan (Q Fever)
- Nixon Canx Program

South African Bio Program Project Coast, 1981-93

- Top secret program run by S.A. Military Health Service
- Collected & tested most USSR BW agents
- Plans for mass production, weaponization of BW agents.
- Collected pathogens "never seen before."

Soviet Union's Biological Warfare Program

•1980 - Russians - Smallpox, Ebola-like, Plague, and Anthrax in ICBMs targeting major cities

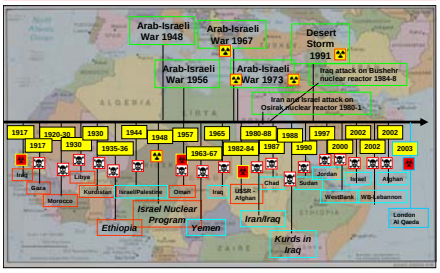
- Apply against strategic and operational targets (not tactical use)
- Apply in massive concentrations to:
  - Cause mass panic
  - Disrupt vital (including military) activity
  - Make it impossible to treat all exposed
  - Cause difficulty in liquidating epidemic consequences

Agents Developed for BW:

- •Anthrax
- •Tularemia
- •Plague
- •Cholera
- •BOT
- •VEE
- •Smallpox
- •Ebola
- •Marburg
- •Ricin
- •Typhus

Why do we need an "85 % Solution?"

NBC in the Middle East



CBW "How to" Materials

Why do we need an "85 % Solution?"

Biological & Other Chemical Agent Incidents

Aum Shinrikyo
Chemical Programs

1995 Tokyo Sarin Nerve Agent Attack

- **CW - Sarin & VX**

(Australian Outback (Banjawarn Station) - Sheep Ranch

Al Qaeda Experimentation With Chemicals: 2001-02

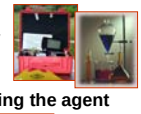
One of the tapes obtained by CNN shows the killing of three dogs with poison gas.

Al Qaida Plot's to Set off a Chemical Bomb in Jordan - April 2004

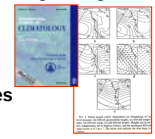
- **6 terror suspects captured**
- **Approx 20 tons of chemicals, & explosives**
- **Attackers hoped to kill 80,000 people & injure 160,000.**

What are some ideas to create an "85 % Solution?"

- **Based on current Technology**
  - **(both COTS and DoD technology)**



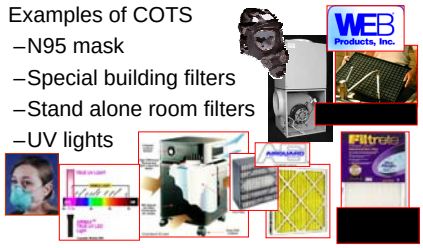
- **Based on current understanding the agent**
  - **Climatology**
  - **UV Degradation**
  - **Infectivity**



- **Based on Doctrinal changes**

What are some ideas to create an "85 % Solution?"

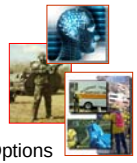
- Examples of COTS
  - N95 mask
  - Special building filters
  - Stand alone room filters
  - UV lights



What are some ideas to create an "85 % Solution?"

85% Quick Fix Focused on:

- Passive Defense
- Intelligence & Warning
- Consequence management
- Active Defense & Offensive Options
- CONOPS



What are some ideas to create an "85 % Solution?"

- Passive Defense – Quick Fixes
  - Vaccines
  - IPE – N95, etc
  - CPS
  - Biodecon
  - Avoidance & Operations
  - Building Preparations

What are some ideas to create an "85 % Solution?"

- Intelligence & Warning
  - Detection Devices
  - Medical Surveillance
  - *Bio-Threatcon Levels*

What are some ideas to create an "85 % Solution?"

- Consequence Management
  - Plans & resources to handle mass casualties
  - Quarantine/Policing issues worked out in advance
  - Travel restrictions
  - Psychological reactions (Panic phenomena)
  - Public information - preplanned

What are some ideas to create an "85 % Solution?"

- Active Defense & Offensive Options
  - Monitor upwind of installation
  - Counterforce
  - Clear communication of retaliatory capability

What are some ideas to create an "85 % Solution?"

- Why a Bio-Threatcon Level (BIOCON)?
  - FPCON
  - INFOCON
  - High consequence vs. Low probability

- Unique aspects that dictate a BIOCON
  - Silent weapons
  - Can be delivered miles away
  - Some adversaries possess BW agents
  - Some adversaries are unlikely to use
  - Some adversaries focus on civilian targets
  - Detection of ongoing attack is unlikely
  - Aerosol delivered agents affected by meteorology

What are some ideas to create an "85 % Solution?"

- Arguments against a Bio-Threatcon?
  - To confusing on soldier to have another threatcon
  - The BW threat is just too low
  - A "big event" hasn't happened

    (Do we need to wait for the "Pearl Harbor" Effect? – perhaps Korea?)
  - Current protective measures would almost provide NO protection (don't know when)

What are some ideas to create an "85 % Solution?"

- How could a Bio-Threatcon Program work?
  - **Merge two pieces of information**
    - **Intelligence (best guess of likelihood of an attack)**
    - **BW Agent Climatological Model**

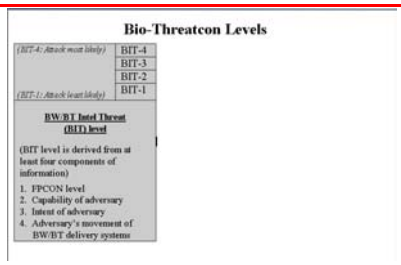
- What is the value of a Bio-Threatcon Level ?
  - **Commander's Decision Matrix to Avoid Mass BW/BT Casualties**

What are some ideas to create an "85 % Solution?"

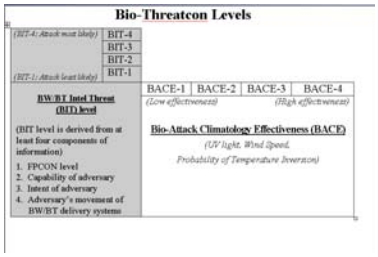
Bio Threatcon Levels (2 parts)

- Bio-Attack Intelligence Threat Level (BIT)
  - **Current overall Force Protection (FP Con)**
  - **Current Intel on adversary capability**
  - **Predicted intent of adversary**
  - **Movement of SOF or other potential BW delivery systems**
  - **Others**
- Bio-Attack Climatology Effectiveness Level (BACE)
  - *** UV Light * Wind Speed * Others**
  - *** Probability of Temperature Inversion**
- BIT + BACE = Bio-Threatcon level

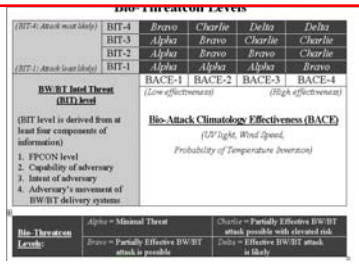
Commander's Decision Matrix Bio-Threatcon Model



Commander's Decision Matrix Bio-Threatcon Model



Commander's Decision Matrix Bio-Threatcon Model



What are some ideas to create an "85 % Solution?"

Examples of Potential Action

- Alpha – No response needed
- Bravo
  - Outside personnel wear N95 respirators
  - Dependants and non-essentials encouraged to stay indoors
  - Turn off ventilation unless special filters installed
- Charlie
  - Only in emergencies- Dependents and non-essentials leave building
  - Security monitor upwind roads
- Delta
  - Outside personnel in military full-face respirator
  - Only essential personnel allowed outside

What could help us develop an "85% Quick Solution?"

- **Clear definition of various BW agent characteristics**
  - **Literature and Organizational research**
  - **Defining quickest payback hard science research**
  - **Research study on lesson learned in**
    - **Old U.S. program**
    - **Old Soviet program**
    - **Old Japanese program**
    - **New research and new programs**

- **Generation of new ideas and ways to possible quickly vet them to produce the best yields (workshops/reports?)**
- **Select current technologies for quick and inexpensive use with new doctrine**
- **Top down authority willing to implement recommendations**

"We Cannot Afford to be THE UNREADY Confronting THE UNTHINKABLE"

USAF CPC

An "85% Quick Fix" is better than waiting for the Silver Bullet

Workshop Objective

Identify 85% Solutions

- Have Sense of Urgency – What happens today if an adversary initiates a BW attack ?

- Identify material and non-material solutions to improve our military force's protection now or in the near future against a BW attack

Workshop Agenda

8:00 - 8:30 am	**Registration & Refreshments**
8:30 – 9:15 am	**ROE and Objectives Col Davis**
9:15 – 9:25 am	**Break**
9:25 am -12:00 pm	**Defensive BW Innovation Subgroups Meet Separately**
12:00 – 12:50 pm	**Lunch**
1:00 – 3:45 pm	**Brief by Each Subgroup (Facilitator) Open Discussion (All Participants)**
3:45 – 4:00 pm	**Closing Remarks and Thoughts on the Future (Col Jim Davis)**

What Happens to IDEAS?

- Final report upon approval of DTRA/CB, will be forwarded to workshop participants and the USAF CPC's mailing list of approximately 400 individuals – All COCOM, MAJCOMS, and Services

- Goal 1: Rapidly Implement viable ideas now for both war plans & homeland security

- Goal 2: Stimulate improved research by DoD, DHS, and HHS on BW Defense

Appendix D2: Workshop Slides:
Brief Summary and Closing Remarks

The 85% Biological Warfare Solution
Workshop

Col (Dr) Jim Davis
October 20, 2004

What Happens to Your IDEAS?

- Final report upon approval of DTRA/CB, will be forwarded to workshop participants and the USAF CPC's mailing list of approximately 400 individuals – All COCOM, MAJCOMS, Services
- Our hope is that these will stimulate research by DoD, DHS, and HHS on your ideas
- Our hope is that the most viable ideas will stimulate consideration for inclusion in TTPs, Conops, and war plans

What Happens to IDEAS?

- Final report upon approval of DTRA/CB, will be forwarded to workshop participants and the USAF CPC's mailing list of approximately 400 individuals – All COCOM, MAJCOMS, and Services
- Goal 1: Rapidly Implement viable ideas now for both war plans & homeland security
- Goal 2: Stimulate improved research by DoD, DHS, and HHS on BW Defense

Will there be a Phase II ?

- Propel research and/or implementation of viable ideas by different organizations
- Possibly explore quick partial solutions to counter chemical, radiological, or IED threats
- Readdress these BW ideas and look for new ones several months or a year from now

"We Cannot Afford to be
THE UNREADY
Confronting
THE UNTHINKABLE"
USAF CPC

Thanks for being a part of our nation's "85% Solution" for the BW threat

Appendix E1: Group 1 Workshop Notes and Slides

GROUP 1 NOTES

Facilitator: Dr. Bruce Bennett
Recorder: Mr. Walt Studdard

FOCUS

The group began by discussing where to focus, given we had limited time to arrive at recommendations for "The 85% Quick Fix in Biological Defense." We had been directed to concentrate our efforts on protecting military forces (U.S. and coalition) and their ability to operate, survive, and be sustained in an operational environment. We were further directed to focus on a threat in the 2006 time frame—considering changes that could be made in the short-term.

The group noted that the best targets for biological weapons (BW) attacks are troop concentrations either at fixed facilities (like airfields or ports) or in the field, prior to operational employment. We therefore focused our discussion on protection of such facilities and deployments. While biological defense encompasses all levels (strategic to tactical) and many activities (e.g., national-level controls and sanctions, active and passive defense, counterforce, deterrence, and consequence management), because of time limitations the group chose to focus on defensive measures rather than offensive measures (like counterforce and retaliation).

ASSUMPTIONS

Technology Options

Based on input from group members currently working in research and development (R&D), the group made the assumption that there are no substantial new material solutions on the horizon for 2006 or sooner. That is, some new equipment might be fielded at one or two places, but there is no major fielding of equipment planned that would affect large numbers of U.S. forces.

While not expecting the fielding of substantial new technologies, the group argued strongly for the need to increase joint experimentation (like Advanced Concept Technology Demonstrations (ACTDs), including more limited user tests), and to make this process quicker. These efforts help field new technologies more rapidly, but they also educate military personnel on the nature of the threats they face and how to respond to them, assist in the development of non-material solutions, and help the military understand how to better use the technologies it already has available. In addition, we must provide a better, quicker way for civilian industry to bring good

ideas/new technology to DoD science and technology personnel and decision-makers (we recommend that the Joint Science and Technology (S&T) community address this issue).

To better field new technologies, the group also argued that DoD needs to improve the BW-related testing infrastructure. It is too small and lacks many of the kinds of facilities necessary to test and support fielding new technologies.

The group agreed that U.S., coalition, and host nation forces must be considered in determining solutions, since all could be targets or could suffer equally from the spread of contamination or infectious diseases.

Threat

The biological threat must consider three aspects:

- An adversary's capability to use biological weapons.
- Adversary's intent to use biological weapons.
- Our own vulnerability to these weapons.

The group decided to concentrate on our own vulnerability because we would normally know little about an adversary's intent to use BW and often know little about his capabilities, as well. We also chose to focus on aerosol threats because the greatest vulnerability is from clandestine use of BW aerosols (e.g., use of a BW line source at Diego Garcia). We spent only a modest amount of time discussing food, water, and vectors as vehicles for delivery of BW agents (e.g., adversary uses contaminated host nation personnel as food servers for U.S./coalition forces or the adversary contaminates food stores).

RECOMMENDATIONS

Training, Education, and Information

DoD should train and educate all personnel (military, civilian, dependants) on biological threats and defense, including information at all levels of PME. The BW threat and responses should be discussed during Command information sessions to increase Command emphasis at all levels. Such action would increase individual and command awareness and prepare all to respond to BW use. Such actions would also reduce the negative psychological reactions that would occur with BW use.

Military installations should prepare in advance public information packages on how to respond to various forms of BW. They should prepare to distribute them in the event of a BW attack, but be extremely careful about their release because of the psychological impact they could cause if BW is not being used.

Achieving Warning and Situational Awareness

The ultimate goal of BW defense is to get more rapid identification of an attack—improve situational awareness by providing information on imperfect cues that indicate the use of BW agents. We must also have a better, more inte-

grated method of providing information to the entire community—military, civilians, and dependants. Early detection and warning involves assessments of:

- Threat
- Indication
- Warning
- Detection
- Identification

Early Indication (e.g., people showing up at hospitals or quick, tentative identification from detectors) is critical to prompt response. People showing up with unexplained sicknesses at hospitals/clinics may well be the first indication of attack even at facilities with BW detectors because of the limitations with current detectors. Recognition that an attack occurred may not happen until symptoms develop, which may be days (or weeks) after the event. Therefore, proactive disease surveillance at hospital and other medical facilities is paramount to successful defense against a BW attack. In environments with BW threats, the rules for military personnel reporting illness need to be adjusted to require such reports promptly, allowing medical professionals to more rapidly determine that a BW attack has occurred.[1] Making warning more rapid will speed medical responses at the site(s) attacked, and allow protective actions to be taken at other sites.

U.S. forces need to integrate their surveillance of indicators with civilian medical and environmental surveillance in surrounding areas. The civilians may well show symptoms first.

Full warning of BW attack will not normally be achieved until one or more BW diseases are identified in the laboratory. The few overseas (in-theater) labs currently have limited capability to identify specific BW agents. Shipping samples to the U.S. is time-consuming and may not always be possible because of the risk of contamination at en route locations or the potential for the BW in the sample not to survive the trip. DoD should deploy more labs in the theaters with BW threats and give them the capability to identify more types of BW agents, with particular focus on BW agents that tend to perish in transit or pose a high threat in transit.

The current BW detectors are limited in part by the assays being used. Significant efforts should go into improving those assays.

DoD must adopt a systems approach to combine information from all sources (e.g., adversary capabilities and intent, friendly vulnerability, detectors, local nationals, medical surveillance etc). Strategic warning (theater level) is paramount. Warning conditions need to be developed to reflect varying levels of potential threat, and varying levels of actual BW use. Theaters need to think about warning from a theater, and not an individual base perspective. The first use of BW should cue substantial

[1] The "922" concept was introduced in another group, and would apply equally to the military population. If all military personnel were required to report any illness to an automated telephone exchange, a relatively prompt assessment of BW is more likely.

protection efforts at all other facilities in the theater.

The systems approach to warning should also cue actions on imperfect information. For example, it may be appropriate to begin antibiotic prophylaxis on the suspicion of BW use (based on detector hits or clinical observations) rather than waiting for full laboratory confirmation.

PROTECTION MEANS

Preventive

Vaccines are very effective in reducing vulnerability to adversary use of BW agents. The group agreed that DoD should increase funding for vaccines so that more personnel can be vaccinated. Even though vaccines are not available for all BW, DoD has taken an appropriate approach of focusing on vaccination against the most serious BW agents (like smallpox and anthrax), seeking to blunt these serious threats and perhaps deter their use.

Not all active duty personnel in DoD are eligible to receive smallpox vaccinations in peacetime. Some are not vaccinated because they are not assigned to theaters with a serious threat, and some are not vaccinated because of the potential for personal or family side effects (about 10 percent of personnel in theater, and closer to 20 percent in CONUS). Strategic warning conditions should be established for vaccinating these personnel, a plan established for rapidly vaccinating personnel, and adequate stocks of vaccine maintained at all DoD facilities to cover them.

Plans should also be made for vaccinating dependents, essential civilians, and key host nation and coalition personnel at appropriate levels of strategic warning. These plans should include the personnel and stocks adequate to perform the vaccination function. DoD should also develop the ability to promptly vaccinate a significant portion of host nation personnel, something that is important for both defensive and deterrence purposes.

In this regard, rules also need to be developed for who can be vaccinated. For example, the anthrax vaccine is currently licensed only for people 18 to 64. At what point in the warning process should it be used more broadly? Similarly, theater commanders are authorized to designate whom they would like to vaccinate among host nation personnel—they need to make these determinations so that their requirements can be resourced.

Post-Exposure Prophylaxis

Antibiotics have been approved by the FDA for post-exposure, pre-symptomatic use against certain bacterial BW. But the rules for what constitute "post-exposure" need to be developed. Absolute laboratory proof of BW use takes too long to develop, putting many more people in jeopardy. And often military commanders will not know what areas a BW cloud affected, which people have been exposed, or even whether an attack has occurred. Commanders need decision rules to cue action on post-exposure prophylaxis based upon imperfect in-

formation; DoD needs to develop these rules promptly. It also needs to determine who will receive antibiotics besides active duty personnel, and develop an "Other Than U.S. Forces Antibiotic Prophylaxis Policy" like to its similar vaccination policy. And DoD needs procedures for distributing these antibiotics, insuring their use, and monitoring and handling side effects.

Because adversaries know the standard antibiotics the U.S. will use against specific BW agents, they may well engineer resistance in the BW agent strains they use against these antibiotics (not difficult scientifically). DoD needs to be prepared to promptly assess resistance (both in the theater laboratories and clinically), and have plans for adjusting antibiotic use. DoD needs to establish its antibiotic supply requirements based upon the diverse population it may have to cover, the duration of coverage required, the potential for re-supply, and the potential requirement to respond to antibiotic resistance.

Operational Considerations

The World Health Organization (WHO), Centers for Disease Control (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR), and regional/coalition partners should be consulted in establishing policies for vaccination/post-exposure prophylaxis.

In this regard, it may be impossible to perform a non-combatant evacuation operation (NEO) or other aspects of retrograde from a theater where BW is being used without vaccination and other forms of prophylaxis for those to be moved. DoD needs to establish policies for retrograde activities, coordinated with coalition partners, the WHO, and the U.S. interagency environment. It also needs to identify where the needed stocks of vaccine and antibiotics would come from.

Individual and Collective Protection

In an environment where BW use is occurring or expected, some forms of individual and collective protection are required. Unfortunately, BW use will normally not give tactical warning at the facility being attacked. Instead, individual and collective protection against BW use is likely a long-term, ongoing effort, potentially required 24 hours per day for weeks or months. It is not possible to use standard chemical weapon-related individual protective equipment (IPE) continuously for a long period, though in practice if there is only a BW threat, only the mask and not the full suit will generally be required for protection. But even the use of just the M40 mask for most hours in the day over many days is impractical in most operating environments.

Some have therefore turned to the medical community to examine how long-term protection is achieved in tuberculosis (TB) hospitals and comparable locations. Such medical facilities use a mixture of masks, depending upon the threat assessed for each person and the personal characteristics of the individual.[2] These discussions dis-

[2] See, for example, the CDC/NIOSH recommendations for TB hospitals at http://www.cdc.gov/niosh/99-143.html, or against Severe Acute Respiratory

count the value of normal surgical masks, but identify the National Institute for Occupational Safety and Health (NIOSH) approved N-95 and better respirators as viable means for preventing the spread of disease.

Our group had considerable discussion on the use of N-95 or similar respirators and their associated protection factor (PF). Supporters of these respirators found them attractive because they could be worn for protracted periods with minimal operational degradation to personnel, because the respirators were inexpensive, and because they gave a reasonable level of protection (a PF of 10 or greater[3]). Opponents of the respirators argued against their use because they believed the masks provided a lower PF (maybe only 4 or 5) and because the threat dosages from a primary release of BW would normally be much higher (requiring a PF more like 100) than the secondary dosages found in a medical setting. No consensus was achieved on this issue, except an agreement that more testing and evaluation of these respirators was needed.

The group concluded that full collective protection is far too expensive for most buildings and applications. Collective protection should be provided only for key facilities and operations. Deployable collective protection is necessary for critical activities such as Command and Control and medical treatment. In normal buildings, some level of collective protection can be achieved simply by using improved filters. Nomal buildings use filters with a Minimum Efficiency Reporting Value (MERV) of 6 to 8, but filters with a MERV of 11 can usually be substituted without changing the heating, ventilation, and air conditioning (HVAC) system capabilities, making a big difference in removal of many BW agents. DoD should acquire a supply of improved filters for its buildings in threat areas, and have rules for when to switch to their use.

If the value of respirators can be established, they offer an option that clearly ought to be employed based upon a cue from imperfect threat information. For example, if there is a threat of BW use in a theater and the theater determines that there is warning of war, that would be an appropriate time for respirators use because adversaries are likely to consider BW use before the traditionally defined D-Day (when personnel are not warned and insertion of attackers is easier). Similarly, such cues could be used to determine when to upgrade filters in normal buildings, or turn on collective protection in fully protected buildings.

Other Protective Efforts

For many years now the military has debated how to handle the remains of BW victims. DoD currently has no

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Syndrome (SARS) at http://www.cdc.gov/niosh/npptl/topics/respirators/factsheets/respsars.html.

[3] See, for example, "Protection Factor (PF) and Saturation Testing of Commercial Negative Pressure Half-Mask Respirators," ECBC Interim Technical Memorandum, November 9, 2001. The N-95 disposable respirators in these tests achieved a PF of 9 in up to 92% of personnel/activity combinations, while N-100 disposable respirators achieved a PF of 49 in 100% of tests and a PF of 999 in 92% of tests.

remains bag that will maintain a seal when transported by air (in a pressurized cabin), and thus removal of remains is dangerous. There appears to be an interim conclusion at TRANSCOM that remains will be interred locally during a conflict until the contamination can be addressed post-conflict.

A part of the issue here is determining the requirements for a remains bag and the means of evacuating remains. If remains can be evacuated by ship, the current bags may be adequate, though they potentially raise a longer-term contamination risk wherever interred. More generally, the issue of whether to cremate such remains needs to be addressed as do other options for handling remains. If current or modified remains bags are determined to be an appropriate answer, a quantitative requirement must also be established.

Some BW like anthrax pose a persistent contamination threat. Therefore, aircraft, ships, cargo, and personnel could spread BW. Current field decontaminants and techniques are resource intensive, not always effective, corrosive to most surfaces, and sometimes produce toxic by-products. DoD needs to establish criteria for BW decontamination and coordinate those criteria in the interagency environment and with WHO and U.S. coalition partners. It needs to improve its ability to achieve these standards.[4]

[4] Pulse corona discharge was mentioned as a possible technology to sterilize BW contaminated objects; however, a group member pointed out that this technology had been around for decades and has not yet been proven effective for operational use.

Handling Mass Casualties

The military medical community needs to determine how it would handle the mass casualties that would likely occur with BW use. Subjects that need to be addressed include:

- To what extent will BW and other casualty care need to be performed in the theater, as opposed to the normal DoD medical assumption of stabilizing personnel in the theater and then evacuating them to the U.S. for specialty medical care? If BW casualties must be kept in the theater (the developing TRANSCOM perspective), how must the force flow into a theater changed to provide the needed medical care up front to handle BW and other medical cases?
- How will DoD hospitals and clinics deal with medical overload? What other facilities might they use and how would they organize care?
- Who must the military hospitals handle? Must they provide care relative to BW exposure for all U.S. citizens? For host nation citizens (at least the ruling personnel)?
- Severe Acute Respiratory Syndrome (SARS) spread considerably in hospitals, reducing medical capacity. How will such disease spread be prevented in hospitals, especially if the first attacks may be associated with no warning?[5]

[5] For example, the triage function in front of the hospital entrance may need to send all potential

One tool to use against BW is quarantine and the isolation of BW casualties. Commanders must have the capability to quickly quarantine all or part of a base/facility, even if they must make decisions on very limited information; movement to and from quarantined areas must be curtailed. Until a full assessment of disease at a facility can be completed (days to a week?), it will not be known whether only a single biological agent was used or whether a cocktail was used that might include contagious disease. Police and security personnel must be trained and equipped to handle quarantine operations and available when needed. Logistics forces may not be able to bring in supplies because of the quarantine or contamination. All facilities must have plans and procedures developed in advance, and should have sufficient stocks of food and other necessities to endure quarantine (3 weeks or so).

Operations

Operational concepts must be developed for the gamut of military operations in a BW threat or contaminated environment. For example, would operations continue from an airfield that has been hit with BW, whether the operations are for combat or force deployment? The airlines supporting CRAF have been told that their aircraft will not be required to fly into hazardous circumstances (e.g., none are flying into Iraq today), so presumably they would have to be flown to a trans-load airfield and their passengers and cargo switched to military airlift for delivery to the theater. But where would transload be done and when do such procedures begin? Are they based upon a BW threat, or do they require BW use before implementation? Biological defense is not a separate entity to be addressed in isolation by medical/disaster preparedness staff; it must be an integral part of battlespace plans, operations, and training.

One example of improved operations to deal with BW threats would be to package U.S. Army pre-positioned material on ships in unit sets, much as the U.S. Marines do. That would reduce the time required to move units through the port bottleneck where BW targeting is more likely.

All key Aerial Ports of Debarkation (APODs) and Sea Ports of Debarkation (SPODs) in a theater with a BW threat should have an airfield/port BW defense opening package deployed to them. This package would include BW detection, defense, security, medical, and support personnel, establishing a basic level of BW protection. This package should be deployed to the airfield/port before significant force flow begins, seeking to protect that flow.

The most difficult of operations will be retrograde. Because we do not have reliable BW detectors, we will not know which populations or equipment have been exposed to BW. Anyone being moved could be infected. If these personnel become sick en-route or on return to the United States, they

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patients with flu-like symptoms to a different facility to prevent or reduce the contamination in the hospital.

could spread disease and also cause a loss of access for military movement. While this condition might prompt us not to move NEO or other non-essential personnel, even the pilots and crews of airlift aircraft could carry disease with them back to coalition countries or the United States. DoD needs to establish a containment program that will take non-essential personnel through a staged quarantine, and monitor essential personnel so that they are quarantined as soon as any potential symptoms develop.

Deterrence and Dissuasion

DoD has a strong preference to deter BW use, and even better to dissuade the development of BW threats. In general, deterrence is strengthened by a capability to deny the adversary effective use of BW. Thus, building BW defenses both protects U.S. forces and helps deter adversary use of BW in the first place. If the U.S. capability is developed promptly enough, the adversary may conclude that he has little to gain from even developing a BW threat in the first place (he has been dissuaded). But this leverage is most effectively achieved when the adversary is aware of U.S. defensive capabilities, but perhaps not aware of the details of (limitations in) these capabilities. Thus, DoD needs to develop a significant information operation against adversaries who pose BW threats, seeking to deter and dissuade them. This operation needs to be carefully crafted not to reveal details of U.S. vulnerabilities.

Group 1 Workshop Slides

Group 1

Facilitator: Dr. Bruce Bennett
Recorder: Mr. Walt Studdard
Members: Dr. Salvatore Bosco
Col John Bowley
Gen (ret) Walt Busbee
Mr. Phil Gardner
Mr. Jerry Jensen
Dr. Kent Lohman
Mr. Paul Mundt
Mr. Curt Wilhide

Group 1: Initial Comments

- Assumption: No major new material solutions on horizon for FY 2006
  - Still, emphasize joint experimentation (ACTDs) for new technology, more Limited User Tests
    - Also good for education, nonmaterial solutions
- Need to improve process for assimilating BW defense technologies

Group 1 Recommendations (1)

- Education
  - At all levels; information on BW threat and responses
  - Awareness, preparation to respond
  - Will help reduce negative psychological reactions
- Situational Awareness
  - Improve military/civilian interfaces around facilities
  - Recognize limitations in detectors; improve assays
- Work threat indications
  - Strategic warning, think theater responses (not just individual bases)
  - Take a systems approach to combine information
  - Cue actions on imperfect information
  - Don't expect very timely warning (expect hours+)

Group 1 Recommendations (2)

- Protection means
  - Strong preference for vaccination where possible
  - Cue: More complete vaccination, vaccination of HN
    - Need more vaccine supplies forward
  - Cue: Antibiotic prophylaxis
  - Use masks as opposed to full MOPP on specific warning
  - Use expedient masks for longer-term , uncertain threat
    - Example: Another base has been hit
  - Deployable collective protection
  - Improved filters (MERV 7 to 11) in standard buildings
- Involve WHO, CDC, and regional/coalition partners in prophylaxis/vaccination policy

Group 1 Recommendations (3)

- Restriction of movement
  - Movement from, to affected bases
  - Retrograde (personnel and equipment)
- Prepare to manage mass casualties
- Need to establish requirements
  - Human remains bags (also a policy issue)
  - Decontamination

Group 1 Recommendations (4)

- Operational Concepts
  - Using CRAF, VISA
  - When, where to deploy forces
  - Package Army prepositioned material as unit sets
  - Port/airfield/base opening packages
- Other effects of these efforts
  - Deterrence: Adversary thinks his leverage is lost
  - Dissuasion: Adversary decides a threat not worth developing

Appendix E2: Group 2 Workshop Notes and Slides

GROUP 2 NOTES

Facilitator: Mr. Jim Miller
Recorder: Col Michael Ainscough

ASSUMPTIONS

Group 2 bounded their discussion and recommendations according to the following criteria. Solutions needed to be currently possible or available within two years (by 2006). The technology must be immediately available. The primary focus was defensive protection of DoD and coalition personnel.

The primary means of attack was considered to be aerosol distribution, however, food, water, and vector distribution were also considered. Attacks on military facilities and troop concentrations at deployed (in-theater) locations and also at continental U.S. (CONUS) locations were both considered to be at-risk in this assessment.

Although biological weapons are often considered "strategic" in their effect, for the purposes of this discussion they were evaluated based upon attacks at the operational and tactical levels (individual military bases or troop concentrations). Interagency considerations were considered essential because solution sets are multi-factorial and may require Department of State, Department of Homeland Security, and other coordination. It was assumed that technology and equipment could be acquired by nonstandard acquisition means. Biological weapons (BW) defense is a complicated problem optimally approached with system(atic) analysis.

"FOUR S" CONCEPT

Group 2 decided to use the "Four S" construct to organize recommended solutions. The Joint Requirements Oversight Council (JROC) has approved the "Four S" concept for CBRN defense. "Four S" terms and general definitions are:

- Sense–standoff detection, point detection, and reconnaissance and surveillance
- Shape–hazard prediction, integrated sensors, and decision support systems
- Shield–individual protection (medical and non-medical) and collective protection systems
- Sustain–decontamination and long-term medical treatment

Sense

In this category, there were two primary recommendations. First, a system of near real-time high-fidelity medical surveillance system (for both

military *and* local civilian populations) should be implemented. The newly published DoD Instruction on Medical Surveillance should be universally implemented as soon as possible. Epidemiologic principles and techniques need to be emphasized to use continuous population-based disease monitoring. The ideal is to diagnose biological exposures at the pre-symptomatic stage of infection. Rapid assay technology (e.g. polymerase chain reaction (PCR)) can determine exposure of personnel and contamination of environmental samples and inanimate objects. The technology currently exists to rapidly sequence bacteria and viruses from throat swabs.

The second important recommendation was to deemphasize acquisition of new bio-detectors for the near term. Recently fielded bio-detection equipment has not performed as advertised. It has been larger, heavier, or required more maintenance than initially thought. Research and development of new bio-detectors should definitely continue, but we should not be in such a hurry to purchase every new model until reliability and value are adequately proven.

Shape

There were four main Shape recommendations. First, Commanders need Decision Tools to deal with biological attacks. Basic decision tools would include 1) recommendations for baseline posture, 2) indicators of biological attack, 3) questions that need to be asked about the extent and implications of an attack, and 4) appropriate actions. A basic set of decision tools could be further tailored to several force/base sizes and missions. Eventually, individual units/bases would have specific decision tools (possibly in decision-tree or checklist formats). A separate Bio-CON (Biological Threat Condition) assessment or a Bio-CON contribution to current FPCON (Force Protection Condition) should be considered in this context.

The group made the assumption that demonstration of a capability has deterrent effect. If we can demonstrate that we have the capability to survive and operate after a biological attack, an adversary may assess that such an attack would not be useful or worth the risk. Therefore, a second recommendation was that biological incidents should be included and integrated in war games and exercises. Mission Essential Task Lists (METLs) and standards of performance should be established. Response to biological incidents should routinely be assessed in inspections.

The 922 Concept should be evaluated for military application. The 922 Concept is a civilian effort currently pending U.S. government funding. It would establish a national computer center and telephone triage system that collects real-time self-reported symptoms from civilians in a biological exposure area. Information could be requested and distributed on television stations. This epidemiologic data would then be used to make decisions about treatment and quarantine.

The fourth “Shape” recommendation was to develop strategies for distri-

bution of information to the public (risk communication). Such communication plans should be tested before actual events. The strategy should include both general pre-incident information and also plans for incident management and how to communicate actions to the public in an incident area (both military and civilian).

Shield

There were five recommendations for individual and group protection (Shield). First, all active duty, guard and reserve members (Total Force) and critical other than U.S. forces (OTUSF) personnel should receive vaccination for anthrax and smallpox. This would include mission essential contractors and host nation support personnel.

Second, Collective Protection Standards should be developed and implemented in three levels. Full Collective Protection should be required for Command and Control (C2) and other critical nodes. Expedient Collective Protection (hardening) should be used for important (but not critical) facilities. The remaining general population should "Shelter-in-Place;" use best available procedures and equipment such as duct tape, masks, and other commonly accessible means.

Third, Individual Protection Guidance should be used as an incremental solution to reduce secondary exposures and the impact of behavioral casualties. An example would be the use of surgical or N-95 masks post-exposure. (Note: The use of N-95 masks was controversial within the group. A compromise proposal was not to use them for general pre-exposure use, but for protection after an exposure at the affected site as well as other sites.) Use of such masks is not intended to be a universal solution, only an option. Concepts for the use of such masks – under what conditions to mask and unmask – would have to be worked out over time. There are "re-sourcing implications" to almost all of the other recommendations. At $2-$3 per mask, the resource implications of this approach would be relatively small.

Fourth, food and water vulnerability assessments are vital and should be conducted according to current DoD guidance.

Finally, every key installation and unit should develop a Disease Containment Plan. DoD should develop a core outline of requirements. Plans should include details to implement quarantines (both voluntary and enforced) and how to conduct temperature monitoring (thermal scanning) of personnel.

Sustain

There were two recommendations in this category. Antibiotic prophylaxis is a high priority after select bacterial exposures. Stockpiles of antibiotics must be strategically pre-positioned, and the location of these supplies must be closely held information (classified?). Mission-essential and critical personnel should be ground-tested to rule out any anaphylactic reactions to these medications.

Interim standards for operational decontamination should be developed. We need a quantitative (not qualitative) answer for the question "How clean is

clean?" Because of the differences in effective doses of different biological agents, these standards need to be agent specific.

THINKING "OUT-OF-THE-BOX" FOR AN 85% SOLUTION

As a separate topic of discussion, Group 2 considered "out-of-the-box" solutions. These were possible solutions that either did not fit well in the previous four categories, would provide significant value if achieved or implemented, or may be outside the two-year window of availability.

First, a breakthrough in non-specific immune modulation would greatly enhance personal protection against a spectrum of biological agents. Dr. Ken Alibek has been researching possible ways to broadly boost the human immune system. There is some preliminary evidence that some vitamins and dietary supplements may mildly increase immunity. More research obviously needs to be done.

Second, there needs to be a more rapid process to develop and obtain FDA approval for new vaccines. The current FDA process takes 5-15 years for new vaccine approval. Another issue is tort reform. Many U.S. pharmaceutical companies have stopped making vaccines because liability outweighed the profit margin. U.K. and Canadian laws prohibit frivolous lawsuits. Possible "Outside-the-box" solutions (all bureaucratic, not technological limitations) were offered. The DoD could guarantee purchase of selected vaccine production. The DoD could build a laboratory to produce needed "orphan" vaccines. The FDA could "fast-track" specific vaccines for military use (this "military specific approval" may imply "experimental" to military members). Congress could pass national tort reform to reduce vaccine liability.

Finally, population-based non-invasive monitoring for biological exposures could be instituted. Two examples are thermal scanning (temperature monitoring of asymptomatic personnel) and badge-based biometrics.

CLOSING THOUGHTS

Many of the barriers to improving biological warfare defense are bureaucratic, not technological or economic. But we may have more ability to change bureaucratic limitations (policy, processes, education, and training) than technological solutions.

An 85% solution for a biological warfare event at a forward deployed operational military base may be different from an 85% solution at a CONUS base and both of these are probably different than the 85% solution for a bioterrorism event on a civilian population.

The 2001 anthrax letters did not result in a true mass casualty event. Senior leaders "still don't get it." They have not implemented procedures to deal with an actual mass casualty. How do we convince leadership that now is the time to act and to institutionalize biological preparedness and defense measures?

Group 2 Workshop Slides

Group 2

Facilitator: Mr. Jim Miller
Recorder: Col Michael Ainscough
Members: Dr. Steve Channel
Col Glenn Goddard
Mr. Randall Larsen
Mr. Russ Lewey
Mr. Al Mauroni
Mr. Dutch Miller
Col Donald Thompson
Mr. Andrew Wilson

85% Solution – WG Assumptions

- Near term (2006)
- Immediately available technology
- DoD/coalition personnel focus
- Aerosol, food/water, vectors
- In Theater or CONUS
  - Operational/tactical (individual military bases)
- Interagency considerations essential
- Nonstandard acquisition
- System(atic) analysis

"Four S" Concept

- JROC has approved the "four S" concept for CBRN defense
  - Sense – standoff detection, point detection, and reconnaissance and surveillance
  - Shape – hazard prediction, integrated sensors, and decision support systems
  - Shield – individual protection (medical and nonmedical) and collective protection systems
  - Sustain – decontamination and long-term medical treatment

Sense

- Near real-time high fidelity medical surveillance system (military *and* local civ population)
  - Implementation of DoDI on Med Surveillance
  - Pre-symptomatic diagnosis
  - Rapid assay technology (eg. PCR) to determine exposure/contamination
  - Continuous population-based disease monitoring
- Deemphasize acquisition of bio-detectors for the near term (but continue R&D)

Shape

- Decision Tools for Commanders
  - Baseline posture, indicators, questions to ask, actions
  - Tailored to several force/base sizes and missions (eventually to individual units/bases)
  - Consider FPCON/Bio-CON in this context
- Wargames and Exercises
  - Establish standards of performance
  - Demonstration of capability has deterrent effect
  - Inspections
- 922 Concept
- Public information strategies; pre-tested communication plans
  - Pre-incident
  - Incident management

Shield

- Vaccination for anthrax and smallpox for Total Force and critical OTUSF
- Collective Protection Standards (3 levels)
  - Full Collective Protection
    - C2 and critical nodes
  - Expedient Collective Protection (hardening)
    - Important (but not critical) facilities
  - Shelter In Place
    - For general population

Shield (cont'd)

- Individual Protection Guidance (surgical/ N-95 masks post-exposure)
  - Incremental solution to reduce secondary exposures and the impact of behavioral casualties?
- Food and water vulnerability assessment
- Develop Disease Containment Plan for key installations/units (includes voluntary quarantine, personnel temperature monitoring

Sustain

- Preparation for antibiotic prophylaxis
  - Preposition supplies
  - Ground-tests for critical personnel
- Develop interim operational decon standards ("How clean is clean?")
  - Quantitative (not qualitative)
  - Agent specific

85% Solution – "Out-of–the-Box"

- Non-specific immune modulation (broadly boost immune system)
- More rapid development/approval process of new vaccines
  - DoD lab to develop vaccines
  - Military specific approval - current FDA process takes 5-15 years
- Population-based non-invasive monitoring for exposures (i.e., thermal scanning, badge-based biometrics)

Appendix E3: Group 3 Workshop Notes and Slides

GROUP 3 NOTES

Facilitator: Mr. Leo Cropper
Recorder: Mr. Dick Estes

THOUGHTS FROM DR. LEO CROPPER

As we pursue the immediate problem of countering biological weapons, we must have a sense of urgency. The Secretary of Defense has said that it is not a question of "if" but rather "when" these weapons will be used against us. Our hope is that any such use will occur on foreign soil, but that may be false optimism.

When seeking solutions, we must be ever mindful that *the perfect is the enemy of the good*, making this workshop particularly appropriate. What exists today that is good enough to be pressed into service *now*, without waiting for the silver bullet that will solve all of our problems? Furthermore, while we are concentrating on military solutions in this workshop, the weapon we must counter may not come in the form of an artillery shell. The adversary may be seeking out an easier point of entry such as schools, child care centers, churches, ventilation systems of major buildings, or the food and water supply. An asymmetric attack against our overwhelming capabilities has already been accomplished, and we can expect more. After all, George Washington expected smallpox to be delivered on a contaminated blanket.

DOTMLPF

One of the guides for exploring the problem is the widely used "DOTMLPF" formula. Let's briefly look at each element of **D**octrine, **O**rganization, **T**raining, **M**aterial, **L**eadership, **P**ersonnel, and **F**acilities before we mention some specific recommendations and ideas.

Nuclear, biological, and chemical (NBC) is not necessarily a good way to approach doctrine nor is chemical, biological, radiological, and high-yield explosives (CBRNE). Each of the specific threats – nuclear, nuclear, biological, radiological, explosive, and chemical – present quite different challenges. The methods of countering them differ significantly, and the effects of each type of weapon are radically dissimilar. For those reasons, the **doctrine** for countering biological warfare should be de-linked from that of the others. [Although, it should be borne in mind that an adversary might use BW, CW, and RW agents in combination, requiring us to develop a doctrine that responds to combinations of such topic agents.]

The most advanced doctrine that we have, along with the most developed concepts of operations, belong to

chemical warfare. In addition, the services – particularly the Army – have many people trained in the field. But since currently we group weapons of mass destruction together, we tend to rely on those trained in chemical warfare to handle the others, particularly biowarfare – apparently because there seems to be some similarities. However, while some checklist procedures could apply coincidentally, the skills required to counter each threat couldn't be more distinct. We may not have the proper **organization** to counter biowarfare.

Similarly, the USAF tends to rely on civil engineer readiness people at the unit level to handle mass disasters, when their **training** may not be suited to the task. Frequently it takes a medical doctor, a biologist, or a bioenvironmental engineer to understand and cope with the nuances of a biological attack. These people are highly educated, are in short supply, and cannot be effectively turned-out in a few months at a tech school.

Furthermore, a biological weapons (BW) attack requires reverse engineering of our protective public health measures – and understanding disease transmission routes is no small undertaking. To understand pathogenic BW agents requires a mix of scientific skills in virology, bacteriology, entomology, epidemiology, infection control, laboratory sciences, public health, and medicine at the college through post-doctorate levels. And to be able to differentiate an emerging novel biological agent like West Nile or Severe Acute Respiratory Syndrome (SARS) from an intentional covert attack requires sophistication. Academic knowledge is key to defending against BW agents; in biological warfare, the warriors are often the medical team and scientists.

We should be looking for **material** solutions that can be applied right now. Some new technological fix may be on the shelf or being developed by an enterprising company that we can place in service in the near term to some appreciable gain. But as we look for these, we must remember that the same solutions may be available to our adversaries.

Whatever the technological advances, whatever the developments in doctrine, tactics, techniques, and procedures, if the **leadership** and the **personnel** who must face these threats are not fully informed and prepared, we are lost. The people in the field, and even at home, must understand what a biological attack can mean, and must be fully versed in countering such an attack, to include comprehending the element of panic among the military, dependents, and citizenry.

Finally, we should fully explore easy and quick fixes that can be applied to existing **facilities** that would be of some incremental gain against a biological attack. These may be something as simple as a new kind of air filter or ways of making windows more airtight. And in the field, we may wish to single out some specific buildings to make more robust against an attack, similar to a bomb shelter. These "immune buildings" would receive the latest in ventilation systems,

protective technology, and sensors, along with semi-annual vulnerability assessments by public health experts in conjunction with security forces and OSI.

BOUNDING THE PROBLEM

As the group tried to find the boundaries of the problem, there was a significant discussion of the goals of this exercise. The group quickly coalesced around the idea that in seeking short-term and "good" solutions, attempting to address all threats at all levels would not be productive. Theaters differ from one another, and overseas locations differ from the continental U.S. We don't know all of the agents that are out there, or even who the adversary may be in some cases. We should therefore plan against a range of capabilities, while singling out the most likely diseases that we could face.

There are dangers in such an approach. Novel agents from molecular engineering of microbes could be a future threat, and other agents that are not now on the classic BW charts could and will emerge. If the United States focuses on anthrax, smallpox, and plague, the lethal agents most easily weaponizable, we could be missing the next big threat. On the other hand, if we sincerely seek the 85% solution, we should make every effort to be capable against known agents, at a minimum, as quickly as possible.

This project was developed concurrently with the Air Force's Biological Defense Task Force – which itself offers a perspective on getting something in the field *now* instead of waiting for the perfect solution. The Air Force has inbeing a well-developed, albeit controversial, Counter-Chemical Warfare CONOPS (C-CW CONOPS). In 2002, leadership in the Air Force directed that that experts use the C-CW CONOPS. Through spiral development, the Air Force was to create guidelines to the field for commanders to use in a BW scenario; and to do so quickly. An invasion of Iraq was imminent at that time. We should take the existing C-CW CONOPS, see what applies to BW, brainstorm the rest and get a plan to the field, even if only partially developed. The point was then, and should be now, waiting until the next countermeasure is developed, or waiting until we know all of the possible agents and delivery means, will leave our forces with nothing as we seek the perfect solution. We can do better than that.

SENSORS

The group had a long and healthy discussion of BW sensors. While there are some available, and others that show promise, *today* there is no single sensor upon which we can rely to give us real-time warning of an attack.[1] To be sure, these sensors are part of the

[1] BIDS can give confirmation of attack within 30 minutes for up to ten BW agents, but this is a point detector and can give warning only if turned on, and the BW agent is present at the exact location of one of the relatively few deployed BIDS units.

85% solution because we have them now, and they can be quite helpful – but almost always as confirmation that a disease is present rather than for initial detection.

Key finding: Today's 85% solution must not rely on the hope that the magic BW sensor is just around the corner. We absolutely must develop doctrine and procedures to deal with BW attacks using technology as we find it today. And the initial detection sensor most effective today is the HUMAN.

The most likely sign of a covert BW attack is the an increased body temperature of those that have been infected, and those people will not present themselves to medical personnel until several days after the attack, since they may not know themselves that they have an elevated temperature early on.

The triage at that point involves critical knowledge and expertise to distinguish the presence of an agent from an influenza outbreak, which most diseases resulting from a BW attack resemble in the initial stages.

The next step is to determine if those infected have any commonality: same dorm, dining hall, building, or region of the area, for instance.

And finally – a critical step – this information, which is essentially medical, must find its way into the operational chain of command so that commanders can make critical decisions.

Therefore, the earlier BW warriors can discover a population with elevated temperatures or other indications, the better the chance of isolating those affected, containing the attack, and continuing to operate.

Three courses of action may be available immediately. First, military populations can be vaccinated against the most likely diseases to lessen the likelihood of infection. Of course there are associated problems: Which diseases? What about emerging diseases? Do we have sufficient vaccine? Is the risk from the vaccine worth the gain? Do we require foreign nationals on a base to be vaccinated? If not, are we wasting our time vaccinating the military members? And what about other civilian populations that could spread a disease? Should we require them to be vaccinated – if it is even possible?

Second, with controlled populations such as those that exist on a military base, we can conduct regular well-patient health screening, which would include an examination for symptoms of incipient disease. Chief among those symptoms being screened for would be elevated temperature, catching a spike in temperatures before the general population starts to present. Obtaining DNA samples may be useful as well, and a means for breath analysis, useful in identifying disease, is nearing completion. A representative number of samples (i.e. blood, urine, throat swab) could be sent for polymerase chain reaction analysis against the standard panel of biowarfare agents each day.

Third, it may be possible to carefully place thermal sensors in high-traffic areas such as dorms, dining halls, command posts, or exchanges, to

assess body temperatures of the population that passes nearby – again giving an early warning of problems. False positives are likely from people that are engaged in strenuous activity such as manual labor or exercise, so there must be an accurate normal benchmark against which samplings are measured – to ensure a spike indeed has occurred.

Every moment of advanced knowledge of the presence of pathogenic agents allows commanders more time to develop options to, first, contain the attack and spread of disease, and, second, continue the mission. And since bio-attacks are almost certain to cross the "fence line" of the base, communication is critical with local hospitals and community health officials as well.

OPTIONS FOR THE COMMANDER

As commanders at different levels assess what has happened to their forces as a result of a BW attack, the two imperatives may diverge quickly. An attack contained at a local base may be catastrophic for that locale to the point that the local commander's only option is to try to contain the outbreak. At the same time, the task force or component commander may wish to remove that base from his operational plans and continue the fight without it.

In another scenario, an attack that is discovered too late to be contained at a specific locality may become the focus for the combatant commander, or the entire nation if such an attack were to happen in the United States. Stopping the spread of disease then becomes the primary focus, and such measures as quarantines (which may become international) and mass vaccinations take on primacy over immediate combat.

Immediate improvement may be possible in either scenario by engaging commanders and political leaders in rigorous table-top exercises, causing them to think through actions ahead of time in the luxurious environment of peacetime. Part of these exercises should include the element of panic almost certainly to be present as the worried well present themselves to medical personnel in an actual attack, or only slightly better – in an unsubstantiated attack that may be only a flu outbreak. Commanders need extensive training on options for controlling populations, gaining maximum efforts from forces that are predisposed to panic because of the developing situation, and assessing combat capability in the face of a BW attack. The commander may even need to know if he is authorized to use deadly force against friendlies or allies to enforce quarantine. *A suggestion: exercise, exercise, exercise.*

Finally, the group re-emphasized the importance of ensuring the commander gets the information in the first place. It need not be a 100% confirmation of a BW attack; the information that *something* has happened may be sufficient for a commander to take some appropriate action.

INFORMATION OPERATIONS

If we put defensive plans and measures in place, or conduct large-

scale exercises, we should publicize those preparations. Preparation for a BW attack is good deterrence in the first place, and even better if publicized widely. That is not to say that vulnerabilities should be made public.

On the other hand, information regarding forces impaired from a disease outbreak – whether food borne, influenza, or actual BW attack – could be used by adversaries. In releasing information on such degradation, commanders and public affairs experts must weigh the requirement for public need-to-know against any advantage an adversary could gain from such a release. Ethics are involved in this decision: Depending on the circumstances, not informing the public of a serious health threat carries grave consequences.

OTHER INPUTS FROM GROUP MEMBERS

One group member suggested four improvements that could be useful in countering BW:

1. **An improved acquisition process for getting new equipment to the warfighter.**

Identify emerging requirements through analysis of operations plans and concept plans. Focus should be on quick and inexpensive solutions to fill the requirements – the 85% solution. We should look for technologies that have already been tested with third-party validation. The Joint Science and Technology Office (JSTO) funds Military Utility Assessment and operational testing while industry seeks GSA approval in parallel. Finally, it is suggested that the JSTO assists COCOMs in entering items into the Joint Capabilities Integration and Development System (JCIDS) and developing Urgent Needs Statements.

2. **Use Force Protection Conditions (FPCONs) as operational drivers for expedient solutions.**

AF/XOS and USPACOM have advanced this concept through the Kunsan Focused Effort (KFE) trials. The KFE is now ready for additional Red Teaming.

3. **Use perception management to mitigate risk.**

This is a STRATCOM responsibility. It requires more national-level guidance (NSC level) and should be effects-based. The COCOMs should add theater flavor to STRATCOM planning.

4. **Develop quicker confirmatory analysis for COCOMs.**

This requires in-theater assets and labs to reduce the turn-around time on biological samples.

Another group member suggested using Methyl Bromide (MB) to decontaminate items contaminated with anthrax spores. Methyl Bromide is relatively inexpensive and leaves no after-effects. Buildings can be enclosed in a tent, infused with MB gas, and inhabited after 48 hours. The M1A1 Abrams tank can be decontaminated inside and out for a total cost of $2,500 and no damage to the tank. In both

cases, a relatively high ambient temperature is required: around 37 degrees Centigrade. This is a technology that is available now.

A third group member mentioned a simple system they implemented in Sigonella, Sicily, and in Naples for giving warnings of BW incidents. The Navy used physical training flags in various colors to indicate different conditions during a BW incident, and all personnel were trained on the meaning of each.

A final group member offered inputs from the research and development community that involves cooperation between the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) and the Marine Chemical-Biological Incident Response Force (CBIRF). He said that defining medical counter-measures to support an 85% solution is dependent on the threat scenario that is to be protected against. If the threat posed is open-air aerosol delivery with the intent of mass casualties, immunization of at-risk populations with available investigational new drug (IND) vaccines may be applicable.

Situations involving limited-aerosol delivery to buildings or other fixed facilities – or bioterrorism targets involving individuals or limited populations (e.g., direct delivery or food source) do not necessarily target entire populations.

Therefore, post-exposure countermeasures would play a more significant role in these scenarios. The means of execution of an attack and means to counter the threat differ in each scenario. The use of the IND botulinum toxin vaccine and antitoxin are examples of pre-, overt, and post- attack countermeasures/responses.

Group 3 Workshop Slides

Group 3

Facilitator: Mr. Leo Cropper
Recorder: Mr. Dick Estes
Members: CDR Daizo Kobayashi
Dr. Ross LeClaire
Col Donald Minner
Maj Jim Poel
Dr. Robert Sherwood
Mr. Eric Stephens
Dr. David Stockwell
CAPT Steven Temerlin

DOTMLPF

- Need to de-link doctrine
  - Bio should be considered alone
- Organization
  - People who work chem are not equipped to work bio
- Training
  - People at unit level tasked with working bio are the least educated

DOTMILPF

- Material
  - While there may a technological fix on the shelf, the same is available to adversary
- Leadership and Personnel
  - Are leaders prepared and do personnel understand what they are up against?
- Facilities
  - Need a quick fix

Narrowing the Problem

- Strategic, CONUS, Combatant Command, or base level?
  - All threats may be too broad
  - Look at capabilities-based planning
- Look at the most likely diseases
  - Anthrax, Smallpox, Plague
  - Need to set priorities among these

Narrowing the Problem

- There are no effective sensors available for all environment
  - Some can be helpful, but usually as confirmation rather than initial detection
- The HUMAN sensor is the best short term solution

Perfecting the Human Sensor

- Thermal sensors
- Daily health screening

Using the Data from the Human Sensor

- Human event vs. combat capability
  - Base level perspective may be different from task force/combatant commander
- Ensure useful data on infections makes it out of medical channels and to the decision makers

Information Operations

- Publicized preparation is good deterrence
- Should we publicize increased illness in an area?
  - Playing into adversary's hands

Stockwell inputs

1) Improved process to get material solutions out to warfighters
2) FPCONs/RAMs as operational drivers for expedient solutions
3) Mitigate risk through perception management
4) Quicker confirmatory analysis

Volume	3,072 ft3	Equipment needed (cost $2.5K):	
MeBr Required	16.3 lbs	40'x60' tarp	thermometer
Set-up Time*	2 hrs	80' snake	shooting hose
Exposure Time	48 hrs	50 clamps	2.8 amp fan
Aeration Time	24 hrs	Fumiscope	Kitagawa tubes
* 2 person taskforce		heat exchanger	tube pump

Replacement cost	$4.3M

Appendix E4: Group 4 Workshop Notes and Slides

GROUP 4 NOTES

Facilitator: Mr. Roy Williams
Recorder: MSgt Henry Mayfield

FOCUS

Mr. Roy Williams opened discussions about 85% BW Solutions by outlining the necessary framework for understanding the threat. First, Mr. Williams initiated discussions by highlighting our national strategy and JP 3-40, Joint Doctrine for Combating Weapons of Mass Destruction. Our workshop, Group 4, emphasized the need for greater "force information sharing and cross-functional approaches."

DEFINING THE THREAT

The group participated in a brain-storming session that generated ideas about reducing BW threats. One of the group's early findings was that opinions differed about ways and means of threat reduction. During the brain-storming process, the group realized that before we could achieve an 85% Solution, we needed first to develop a better understanding of the BW threats. The threat is more than understanding, growing, and weaponizing BW agents and more than the development of their delivery systems. We must look at the full spectrum of what constitutes a threat. This will range from the basic scientific research to sequence DNA, to the terrorist trying to buy capability for BW on the world market.

The group discussed the term "threat" and determined that they were not absolutely clear about what exactly constitutes a biological threat. The discussions revolved around whether "terrorists" constitute a biological threat or whether a threat might be defined as a scientist working on something that has dual-use. If you can prevent a BW's use by terminating the threat at the source, it would eliminate the need to react to the BW on the battlefield.

The group argued about the effectiveness of our country's efforts to reduce the level of BW threats. Some argued that responders are too focused on "BW agent threat lists" as opposed to what biotechnology can actually produce. The group agreed that we can better define the potential threat based on what science and technology will permit.

Who is most likely to attack us with biological weapons? It was suggested that terrorists were most likely to use biological weapons against the U.S., but all in the group did not agree that Al Qaeda was the greatest threat. Some were more concerned about the possibility of war with China emerging over a crisis in the Taiwan Straits. (The U.S.

National Security Strategy states that the gravest danger is the crossroads of radicalism and technology.)

The group pondered questions about the ways and means of reducing threats. For example, do we start looking at the BW problem from the ground up, or do we look at it from where we are currently? Can we separate BW facts from BW myths? How much confidence do we have in the basic knowledge about BW? Do we build from already proven information or waste time reinventing the wheel?

At a point where many countries are pursuing BW, the more attention we call to the "BW threat," internationally, the more other countries will invest in defense of BW. Unfortunately, this is also likely to increase the interest of adversaries in obtaining BW weapons. Anything they know we are afraid of, is something the bad guys will want. Nor should we think in terms of final solutions to the BW threat. Eventually, each offensive measure will have a defensive countermeasure, that will, in time, also be countered.

INFORMATION SHARING

We need to structure intelligence function at each level of war (strategic, operational, and tactical) to enable collection of information to counter BW threats. National efforts at the strategic level should include developing networks of health care information that can quickly spot abnormal incidents, including inputs from veterinarians, agriculture experts, as well as healthcare professionals. Operational level intelligence should include tying together the host nations and allies into a comprehensive detection network. Tactical intelligence should focus on agents and delivery vehicles to provide focused warning and de-warning of a BW threat to critical assets and infrastructure.

The group also further suggested ways to improve BW defenses:

- Work with the intelligence community to define and refine the BW threat spectrum;
- Use capability-based planning instead of threat-based planning;
- Define what experts believe is possible in creating new types of biological weapons; and
- Apply new BW information immediately, as it becomes available.

The struggle to get essential information readily from the CDC and other national agencies is presently very difficult. Full efforts should be made to develop a forum that allows for timely information sharing and reduces duplication of effort.

CROSS-FUNCTIONAL APPROACHES

The group discussed the importance of cross-functional approaches to BW defense. They concluded that the DoD simply must synchronize and integrate joint, national, and international efforts. At present, there are too many stovepipes. The group discussed incorporating trans-national efforts such as the Australia Group to control sensitive

technology and materials. To make the connection in BW defense, work within the DoD must blend with work in the foreign sector, civil authority, and public health arenas. In addition, we must expand cooperative defense initiatives to allies.

Many good things are being done in BW defense. We should explore present concepts of operations and ideas, not discard them without good reasons. We need to work on building risk assessment tools, risk communication procedures, and better health surveillance.

NON-PROLIFERATION…USING "DOTMLPF"

The group discussed supporting non-proliferation and counterproliferation programs to reduce the threat over time. The following organizes the group thoughts from the day into a DOTMLPF (Doctrine, Organization, Training, Materials, Leadership, Personnel and Facilities) format.

Doctrine (and the CONOPS)

The group seemed to agree that those currently working toward a C-BW CONOPS have so much information that needs to be better organized and prioritized. It was suggested that we look at BW threats and solutions at all levels (strategic, operational, and tactical) and by mission area. For example, one suggestion was someone needs to develop a commander's decision guide and staff estimation procedure to prepare personnel to do a better job in a BW environment. Some in the group also stated that "we must have a complete C-CBRNE CONOPS since we need to prepare for all of it!"

Some suggestions regarding the development of the CONOPS included exploiting the successes of the C-BW concepts and refining procedures presented in JP 3-11, Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense. The group discussed "Spiral development" and the positive value this approach would bring to developing a C-BW CONOPS. It was suggested that we define our best guess regarding a C-BW CONOPS, let the community try it, tell us what to change, and then, keep working the issue. A satisfactory solution to the BW threat may take some time to implement, involving trying out several iterations. The BW threats didn't evolve overnight, and the question of how to counter them won't be solved overnight.

We must look at a range of agents and look at doctrine to figure out how to change. Given real-time detection we may be able to opt for a "mask only MOPP" vice MOPP 4 when reacting to weaponized BW agents since most are only respiratory threats. Understanding how an agent gets into the body may preclude the necessity of adopting a MOPP 4 posture.

To be effective, we need a clear separation of BW research and analysis from other possible weapons use. C-BW is so important that it should be treated first as a "stand alone" problem, rather than being grouped with chemical, biological, radiological, nuclear,

and high-yield explosive threats and countermeasures. When we discuss, teach, or develop employment profiles against weapons (a weapons centric approach), initially it would be wise to analyze each one separately. C is not B is not R is not N. However, when we then turn to telling people what to do, and how to react, clustering defense concepts is to be encouraged. For example, it is suggested that when encountering a substance that attacks through the respiratory track, the appropriate first reaction should be masking. If it proves, in fact, to be a material against which the mask does not work, then the only effective response would be to hold one's breath and rapidly leave the area. The point is that there will be many possible cues that should trigger just a few simple actions. Clearly, if we want someone to respond effectively to a BW attack, we must provide the best real-time information that tells them what they should do.

Organization

The group discussed the importance of aligning military organizations to fit National Response Plan (NRP) requirements. In addition, they suggested building integrated base defense structure with cross-functional teams.

Training

The group examined ways to reduce BW threats between now and 2006. ***The group concluded that the number one thing we can do to take care of BW threats is to accelerate the training and education of the general military and civilian populations, and emergency responders.***

The need for more BW expertise in first responders was highlighted. The consensus of the group was that most personnel have not read CBRN doctrine that focuses on training and development. The group concluded that the current information on BW threats and defenses is not well understood. In addition, if we have validation that any CBRN solutions work, we should take what works and build on them.

Education and training should be emphasized at all levels: commander's decision-making, staff developing estimates, operators doing their jobs while coping, etc. One question that came up in the group was "what is the objective of the BW defense?" Is it to simply protect personnel or to sustain operations? We concluded that this is not an issue. Military forces must accomplish the assigned missions. This is paramount in wartime. Therefore, training should be based on this assumption.

There has been considerable discussion about what the military can and should respond to outside the gates of U.S. military bases. It was concluded that we need to bring together military and civilian training and education because of the military's heavy reliance on civilian response and treatment facilities. Further, it is anticipated that some large BW crises will eventually require DoD assistance even if it is not the lead agency responsible. There needs to be much greater civil-military coordination. We need to get away from our silver bullet mentality. There is no single sil-

ver bullet that will solve the BW threats and there is no means of removing the threat entirely.

The group also discussed "Strategic Education:"

- Education and training about BW needs to be simplified. Commanders, responders and other personnel do not need 100 pages of material but, rather, guidance should be printed on handouts of two or three pages.
- Joint Professional Military Education (JPME) needs to incorporate more CBRN threat/defense education.
- BW awareness needs to get up to the DoD level.
- Additional Counter-BW products need to be made for commanders and those at other levels.

In addition, the group discussed the elimination of the wartime and peacetime dichotomy regarding education, training, and exercising. And finally, the group concluded that the established and refined training requirements should use the Universal Joint Task List (UJTL).

Materials

The group sought ideas about short term fixes that could enhance early detection of BW agents. It is believed that the current BW detector is too expensive. They argued that we can achieve an 85% BW solution by innovations such as personnel screening and implementation of retina scans in airports and areas where large groups of people gather. It is suggested that infrared (IR) detectors could be employed for temperature monitoring. This approach may allow the detection of illnesses caused by BW exposure before individuals realize they are affected.

Dual-use bio-defense materials/items for military and civilian use was also suggested.

The group also discussed the meaning of "Detection." There are different interpretations about the meaning of detection. Does detection mean identification of a BW-agent by a monitor or is it informational, such as provided by defectors or other human intelligence? The group defined detection as providing cues against which to react. The better and more informative the cue, the better we react. The need for better detection and monitoring of BW agents is crucial, whether reacting to an attack on a military base or when responding to support the local community.

The group suggested that available technology can be expanded. The group discussed the need for bio-indicators or bio-metrics for identifying who is on installations. Installing biometric sensors at each gate per installation was believed to hold promise for reducing threats.

Also, a standardized list of C-BW response equipment and supplies needs to be determined and provided at each base.

Leadership

How can we reduce uncertainties and help commanders make informed decisions? Because of present uncer-

tainties in our sensors and knowledge of BW, and because we need to both survive and fight, a commander must take a risk-based approach.

The group suggested developing user friendly decision tools. In addition, the group discussed risk communications for BW attack. The focus should be on minimizing panic and maximizing cooperative steps that help avoid problems.

Personnel

The group agreed that the DoD needs more BW expertise. Group discussion also explored the possibility of more specialized career fields in the armed services to specifically deal with BW threat issues.

Facilities

The group agreed that facilities at bases and installations need to be better prepared to provide air-tight shelter in times of BW attack. Filtration systems need to accompany air conditioning systems and doors, windows, and other openings need to be sealed to prevent exposure to outside contaminants during times of peak danger.

THREAT REDUCTION

The group suggested that security perimeters around the U.S. bases need to be expanded so that no residence is within a 3 mile radius of base, as is economically feasible. For overseas bases, the group stated a need for more readiness exercises and dialogue with host nations on how to reduce and mitigate BW threats and perform better consequence management of BW events. It is suggested that agreements with host nations should be expanded to clear-up what responses to take in BW crises, what the process should be, and what training and equipping needs to be done. This likely will require changes in the present support agreements.

DISPOSITION OF CONTAMINATED REMAINS AND EQUIPMENT

The group was unclear about BW contamination disposal. They stated that greater research of the actual threat and the impact on our environment is needed. In handling contaminated bodies of those killed in a BW attack, the means of proper disposal was confusing to the group. Some work group members thought placement and burial in plastic bags with a slit in the bag bottom would be acceptable. The belief is that the slit would help accelerate decomposition. Others believed that bodies should be cremated in place. There was uncertainty about the existence of guidelines and rules regarding exhuming bones and repatriation of contaminated remains.

Another option for dealing with contaminated remains was Kappler's human remains pouch tested during the recent Restoration of Operations (RESTOPS) ACTD at Osan AB, ROK.

CONCLUSIONS

Group 4 came to the consensus that the provision of rapid detectors, and

biometric monitors could improve the means of detecting the presence of BW contamination. Most importantly, education and training of both the military and civilian populations about BW threats and counter-measures would do the most to help cope with BW attacks and threats and would reduce panic levels, which would enable everyone to cope better with this kind of situation. It was also agreed across the board that the gaps need to be closed between military and civilian functions, especially in medical treatment. Closer civil/ military medical coordination was seen as very important.

Group 4 Workshop Slides

Group 4

Facilitator: Mr. Roy Williams
Recorder: MSgt Henry Mayfield
Members: Mr. Paul Clark
Ms. Renae Ditmer
Ms. Anne Dixon
Dr. Richard Gullickson
LtCol Donna Hudson
Dr. Peter Lavoy
Ms. Kathryn Szeliga

Nonproliferation Framework

- Detect and monitor acquisition and development
- Conduct NP operations
- Security cooperation

Counterproliferation Framework

- Detect and Monitor
- Prepare to Conduct CP Operations
- Conduct Offensive Operations
- WMD Active Defense
- WMD Passive Defense

Consequence Management Framework

- Assess
- Coordinate operations
- Conduct logistics
- Health service support
- Decontaminate

Framework

- Doctrine
- Organization
- Training
- Material
- Leader Development
- Personnel
- Facilities

Appendix F: List of 56 Ideas Generated at the 85% Workshop with Description

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			C-BW CONOPS †	Develop a C-BW CONOPS; Doctrine for BW should be de-linked from other CBRNE doctrine since it is significantly different; develop operational concepts for all military operations in BW contaminated environment for individual, Joint and Coalition operations (ex., airfield operations, deployment and redeployment of forces, use of CRAF and VISA, re-supply, etc.).
			Determine BW Agents Possible	Define BW threat based on what biological agents can realistically be created with today's science and technology; threat determination should also include an adversary's capability to use biological weapons, an adversary's intent to use biological weapons, and our own vulnerability to these weapons.
			Re-Prioritize BW Threat Agents †, ‡	Set priorities on most likely BW/disease threats to guide R&D concerning detection, treatment, and defense (i.e., are anthrax, smallpox, and plague the top three?).
			Decision Tools for Commanders	Develop Decision Tools for Commanders for BW attacks; include recommendations for baseline posture, indicators of biological attack, questions that need to be asked about the extent and implications of an attack, and appropriate actions.
			BW FPCON/RAM Measures †	Develop BW-specific counter-measures in FPCONs/RAMs for commands with elevated threats.

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			Develop Installation Medical Surveillance Information †, ‡	Develop and implement an installation system of near real-time, high-fidelity medical surveillance information for both military and local civilian populations. This integrated medical surveillance program will collect data from multiple sources, for example medical surveillance of clinic appointments, illness observed by co-workers, school absenteeism, veterinarians, over-the-counter drug sales, etc.
			Develop DoD Integrated Information Collection	Adopt a DoD systems approach to combine information from all sources (ex., adversary capabilities and intent, friendly vulnerability, detectors, local nationals, installation medical surveillance information, regional medical surveillance). Intelligence collection at the strategic, operational, and tactical levels of war.
			Daily Health Screening	Conduct/record daily health screening;daily random blood, urine, and/or throat swab for PCR.
			922 Concept	Evaluate 922 Concept for military application (reference attached cell comment).
			Weekly Commander's Stand-Up Briefings	Provide uniform, frequent briefings to installation commanders regarding illness trends (ex., occurrences of infectious diseases such as flu).
			Enhance Research Community and Operator Interaction	Develop streamlined procedures for effective information exchange between biomedical research community and operators.
			Badge-Based Biometrics	Develop/employ badge-based biometrics, like radiation dosimitry badges, to use humans as sensors.
			Thermal Sensors	Employ personnel thermal, or infrared, sensors (ex., barracks, chow halls, base/post exchange).
			R&D of Novel Agents	Increase R&D of defense and treatment of novel agents (ex., genetically engineered BW).
			R&D Versus Acquisition of Current Bio-detectors †, ‡	De-emphasize acquisition of bio-detectors (ex., Portal Shield) for the short-term but continue R&D on alternatives.

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			Improve Solutions/ Technology Implementation Process	Improve the process to get materiel solutions and technology more quickly; look for and employ technologies that have been tested with third-party validation; identify emerging requirements through analysis of operations plans and concept plans.
			Expand Joint BW ACTD Funding	Expand funding for joint experimentation ACTD for BW defense; more Limited User Tests to bring new technologies to field; ensure funding for BW ACTDs is provided.
			Public Information Packages and Media Relations †, ‡	Prepare standardized public information packages and policies/procedures for public release concerning BW agents; educate, train, and exercise media relations procedures and capabilities for a post-BW event to control panic.
			Ventilation Systems †	Install protective ventilation system, filters (ex. HEPA filters or MERV 7 to 11), room air purifiers, ultraviolet lights, or airtight window technologies, as economically feasible.
			New Detection Methods †, ‡	Identify and deploy current cutting-edge technologies to enhance identification of BW agents (ex., 454 DNA Sequencing system to rapidly sequence DNA of biologic agents).
			New Decontamination Methods †, ‡	Investigate novel methods for decontamination, for example pulse corona discharge or methyl bromide to decontaminate anthrax spores from large vehicles (ex., M1A1 Abrams tank) or buildings.
			New Individual Protective Equipment (IPE) †	Research and develop alternatives to MOPP or JSLIST protective equipment. For instance, investigate alternative fabrics or microporous film technologies specific for biological challenges.

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			Develop Individual Protection Guidance †, ‡	Develop Individual Protection Guidance to reduce secondary exposures (ex. Use N-95 masks post-exposure); investigate the use of items such as expedient masks with lower protection factors, especially concerning longer-term uncertain threats; consider development of a "mask only MOPP" versus MOPP 4 when reacting to biological agents with respiratory effect only.
			New Prophylaxis and Vaccines †	Investigate alternate and improved prophylaxis and vaccines; conduct R&D on non-specific immune modulation, for example, use of vitamins and dietary supplements to enhance immunity.
			New Treatments	Investigate alternate and improved treatment options.
			Rapid Vaccine Approval	Investigate a more rapid process to obtain FDA approval for new vaccines, including "fast-track," for military use vaccines.
			Vaccinate All Military †	Vaccinate all military populations against most likely BW diseases (smallpox and anthrax) to lessen likelihood of infection.
			Increase DoD Vaccine Funding	Increase DoD funding for vaccination programs (ex., R&D, administration).
			External Inputs for Prophylaxis and Vaccination Policies	Involve WHO and CDC/ATSDR and regional/coalition partners in establishing policies for prophylaxis/vaccination of U.S. military, U.S. contractors and host nation personnel.
			Disposition of BW contaminated personnel, remains, equipment †, ‡	Develop policy for when, where, and how to move biological contaminated personnel, remains, and equipment back to the CONUS; develop aeromedical evacuation policies for BW contaminated patients; investigate COTS technology/products such as Kappler's human remains pouch (tested in RESTOPS).

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			"How Clean is Clean" Policy †	Develop DoD policy to establish "how clean is clean" or the level decontamination at which assets are considered safe for use without individual protective equipment.
			Fast In-Theater Confirmatory Analysis	Develop methods for quicker confirmatory analysis (more and higher quality in-theater laboratories and assets).
			Pre-positioned Material and Supplies †	Package pre-positioned material, including BW protection/defense assets; generate stockpiles of strategically pre-positioned antibiotic prophylaxis for post-exposure treatment.
			Initial Deployment Packages	Develop port/airfield/base initial deployment (bare-base) packages specific for the BW threat.
			Develop Specialized BW Teams	Align military organizations to fit NRP requirements; build integrated base defense structure with cross-functional teams; construct specialized teams with expertise in BW to respond to BW local events.
			Hire BW-educated Health Care Workers and First Responders	Hire physicians, nurses, public health officers, bioenvironmental engineers, and laboratory officers with specific academic preparation to respond to BW agent use.
			Train Health Care Workers and First Responders	Provide existing physicians, nurses, public health officers, bioenvironmental engineers, and laboratory officers specific academic preparation to respond to BW agent attack; bring together military and civilian care providers in training scenarios… military will continue a heavy reliance on commercial treatment facilities.
			Quick-Reference Education Handouts	Develop a brief, simplified Strategic Education specific for each rank. Each rank-specific education document 2 to 3 pages. Education should be of a rank specific detail and level of knowledge.

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equivalent) †	Educate senior level military and civilian personnel in the DoD on the basics of BW agent effects, characteristics, treatment, the BW threat, passive defense measures, and operational considerations.
			Educate All Other DoD Personnel †	Educate all personnel in the DoD on the basics of BW agent effects, characteristics, treatment, the BW threat, passive defense measures, and operational considerations (ex. include in all levels of PME). All Airmen are Sensors! Education should be of a specific detail and level of knowledge appropriate for the rank.
			Train and Exercise DoD Personnel †	Train and Exercise all DoD personnel more specifically and thoroughly on BW agents. Training expectations should be of a specific detail and level of knowledge appropriate for the rank.
			Educate Non-DoD Personnel †	Educate non-DoD personnel (dependents, contractors, etc.) on an installation regarding the threat, hazards, and treatment of BW.
			Train Non-DoD Personnel †	Train all non-DoD personnel (dependents, contractors, etc.) on an installation on how to respond in a BW attack.
			Mission Essential Task Lists	Develop Mission Essential Task Lists (METLs) specific for accomplishing a unit's combat mission and standards of performance for BW incident response.
			Subject Matter Experts in Exercise Planning and Execution	Include BW subject matter experts from USACHPPM, NEHC, AFIOH, USAMRIID, CDC/ATSDR, etc. in all Command or OSD level tabletop exercise planning and execution.
			Educate COCOMs (ETE)	Educate, train, exercise combatant commanders regarding impacts of BW attacks on combat operations.
			Publicize BW Preparedness	Publicize BW preparedness (deterrent measure), including defensive measures and large-scale exercises.

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			Establish Collective Protection Standards †, ‡	Develop and implement Collective Protection Standards at three levels: Full Collective Protection for Command and Control and other critical nodes, Expedient Collective Protection (hardening) for important facilities, "Shelter-in-Place" for remaining population using best available procedures (ex. duct tape, masks).
			Vulnerability Assessments	Conduct semi-annual "food and water supplies and places of assembly" vulnerability assessments by public health, OSI, bioenvironmental engineering, and civil engineering.
			Disease Containment Plan †, ‡	Develop Disease Containment Plan for key installation/units to include voluntary and mandatory quarantine and personnel temperature monitoring.
			Installation Quarantine (ETE)	Educate, train and exercise all commanders and installation personnel (especially medical and police/security personnel) regarding local quarantine operations, plans, and procedures.
			International Quarantine (ETE)	Educate, train, and exercise commanders and installation personnel on international quarantine and allied notification procedures.
			Information Management/Risk Communication for Installations (ETE) †	Educate, train, and exercise theater commanders on information management/risk communication regarding identification of agent, means of transmission, treatment and infection control measures essential for installation population.
			Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	Educate, train, and exercise commanders, Public Affairs, and medical personnel regarding information management/risk communication regarding identification of agent, means of transmission, treatment and infection control measures essential for public health authorities in adjoining civilian community.

Implemented Quickest	*Greatest Benefit*	*Implemented Quickest & Greatest Benefit*	**Idea from 85% Workshop**	**Brief Description**
			Information Management/Risk Communication for Public Release (ETE)	Educate, train, and exercise commanders, Public Affairs, and medical personnel regarding information management/risk communication regarding identification of agent, means of transmission, treatment and infection control measures essential for public release to ease anxiety and quell fear.
			Joint and Coalition Decision Tools	Synchronize and integrate joint, coalition, and international efforts, avoid stovepipes that may limit how Commanders respond to BW event.

† Similar to or related to one of the 59 action items identified in Biological Defense Task Force Action Plan, 28 May 2003, available at https://www.xo.hq.af.mil/xos/xosf/xosfc/CCBRNE_resource/biological/bdtf/bdtf.shtml, last accessed 14 December 2004.

‡ Similar to or related to one of the action items of the PACOM Biological Warfare Countermeasure Initiative (BWCI). Hudson, Donna (LtCol), XOS-FC, "Counter-Biological Warfare (C-BW) Program," slide presentation, 22 September 2004.

Appendix G: Data

The following is a description of the data found in Appendices G1 through G4.

Respondents rank ordered the ideas listed in Appendix F with "1" denoting highest priority through "15" denoting the lowest priority in each of three categories: *Implemented Quickest*, *Greatest Benefit*, and *Best Overall*. *Implemented Quickest* was described as "the solution that can be the most quickly implemented regardless of the amount of benefit to the warfighter." *Greatest Benefit* was described as "the solution that offers the greatest benefit to our biological weapons defense without regard to cost, time, or other considerations which may inhibit implementation." Finally, *Best Overall* was described as "the solution that offers the 'most bang for the buck,' or the best solution when you consider both the cost, speed of implementation, and value to the warfighter."

Three methods of analysis were used to analyze the data. First, the idea that generated the most number one votes in each of the three categories was identified (Appendix G1). Second, a top ten for each of the three categories was determined by using a frequency distribution of total votes (regardless of the value of the vote). This provided a set of data titled "Priority Ranking by Number of Total Votes" (Appendix G2). Third, a top ten for each of the three categories was determined by adding all the votes of one through five (each vote of one through five given equal value). This provided a set of data titled "Priority Ranking by Number of Votes 1-5" (Appendix G3).

In the tables of Appendix G4, the "Number of Raw Votes" column indicates the total number of times the idea was selected by the workshop attendees. The "% of Respondents" column is the number of raw votes received divided by the total number of respondents who provided inputs for that category, multiplied by 100%. This raw data is organized into the top ten for each category in Appendix G2 (Total Voted 1-15) and Appendix G3 (Total Voted 1-5).

Appendix G1: Highest Frequency of #1 Votes

Category	Idea from 85% Solution Workshop	Number 1 Votes
Best Overall	C-BW CONOPS	8
Implemented Quickest	Weekly Commander's Stand-Up Briefings	6
Greatest Benefit	C-BW CONOPS	9

This table presents the solutions that received the highest frequency of "1" votes for each category.

Appendix G2: Priority Ranking by Number of Total Votes

Table G2.1. Priority Ranking by Number of Total Votes for the Best Overall Category

Idea from 85% Solution Workshop	Votes	% of 36 Respondents
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equiv.)	25	69 %
C-BW CONOPS	23	64 %
Decision Tools for Commanders	23	64 %
Train and Exercise DoD Personnel	20	56 %
Develop Installation Medical Surveillance Information	18	50 %
BW FPCON/RAM Measures	17	47 %
Public Information Packages and Media Relations	16	44 %
Vaccinate All Military	15	42 %
Educate All Other DoD Personnel	14	39 %
Educate COCOMs (ETE)	14	39 %

Table G2.1 presents the ideas ranked in the top 10 for the *Best Overall* category. Total votes were determined by summing the number of times an idea was voted on (1–15) with equal weight given to each vote. Total number of workshop participants who submitted votes for this category was 36.

Table G2.2. Priority Ranking by Number of Total Votes for the Implemented Quickest Category

Idea from 85% Solution Workshop	Votes	% of 34 Respondents
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equiv.)	22	65 %
Decision Tools for Commanders	22	65 %
Public Information Packages and Media Relations	19	56 %
Quick-Reference Handouts	17	50 %
C-BW CONOPS	16	47 %
922 Concept	13	38 %
Weekly Commander's Stand-Up Briefings	13	38 %
Educate All Other DoD Personnel	13	38 %
Train and Exercise DoD Personnel	13	38 %
Train Health Care Workers and First Responders	13	38 %

Table G2.2 presents the ideas ranked in the top 10 for the *Implemented Quickest* category. Total votes were determined by summing the number of times an idea was voted on (1–15) with equal weight given to each vote. Total number of workshop participants who submitted votes for this category was 34.

Table G2.3. Priority Ranking by Number of Total Votes for the Greatest Benefit Category

Idea from 85% Solution Workshop	Votes	% of 35 Respondents
C-BW CONOPS	22	63 %
Develop Installation Medical Surveillance Information	20	57 %
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equiv.)	19	54 %
Decision Tools for Commanders	18	51 %
New Prophylaxis and Vaccines	17	49 %
Develop DoD Integrated Information Collection	16	46 %
New Detection Methods	16	46 %
Fast In-Theater Confirmatory Analysis	14	40 %
Train and Exercise DoD Personnel	14	40 %
Educate COCOMs (ETE)	13	37 %

Table G2.3 presents the ideas ranked in the top 10 for the *Best Overall* category. Total votes were determined by summing the number of times an idea was voted on (1–15) with equal weight given to each vote. Total number of workshop participants who submitted votes for this category was 35.

Appendix G3: Priority Ranking by Number of Votes 1-5

Table G3.1. Priority Ranking by Number of Votes 1-5 for the Best Overall Category

Idea from 85% Solution Workshop	Votes	% of 36 Respondents
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equiv.)	17	47 %
Decision Tools for Commanders	14	39 %
C-BW CONOPS	13	36 %
BW FPCON/RAM Measures	9	25 %
Vaccinate All Military	8	22 %
Educate COCOMs (ETE)	7	19 %
Ventilation Systems	6	17 %
Educate All Other DoD Personnel	6	17 %
Develop Installation Medical Surveillance Information	6	17 %
Re-Prioritize BW Threat Agents	5	14 %
Expand Joint BW ACTD Funding	5	14 %
Train and Exercise DoD Personnel	5	14 %
Disease Containment Plan	5	14 %

Table G3.1 presents the ideas ranked in the top 10 for the *Best Overall* category. Votes were determined by summing the number of times an idea with a value of 1 to 5. To clarify, any vote of 1 to 5 was given a value of "1" and the total number of those votes summed. Total number of workshop participants who submitted votes for this category was 36. The reason for more than ten ideas indicates a tie of the tenth position.

Table G3.2. Priority Ranking by Number of Votes 1-5 for the Implemented Quickest Category

Idea from 85% Solution Workshop	Votes	% of 34 Respondents
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equiv.)	15	44 %
Weekly Commander's Stand-Up Briefings	11	32 %
Public Information Packages and Media Relations	10	29 %
Quick-Reference Handouts	9	26 %
C-BW CONOPS	7	21 %
Educate COCOMs (ETE)	7	21 %
Decision Tools for Commanders	7	21 %
Re-Prioritize BW Threat Agents	6	18 %
Daily Health Screening	6	18 %
922 Concept	6	18 %
Educate All Other DoD Personnel	6	18 %

Table G3.2 presents the ideas ranked in the top 10 for the *Implemented Quickest* category. Votes were determined by summing the number of times an idea with a value of 1 to 5. To clarify, any vote of 1 to 5 was given a value of "1" and the total number of those votes summed. Total number of workshop participants who submitted votes for this category was 34. The reason for more than ten ideas indicates a tie of the tenth position.

Table G3.3. Priority Ranking by Number of Votes 1-5 for the Greatest Benefit Category

Idea from 85% Solution Workshop	Votes	% of 35 Respondents
C-BW CONOPS	16	46 %
Decision Tools for Commanders	13	37 %
New Prophylaxis and Vaccines	10	29 %
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equiv.)	9	26 %
New Detection Methods	8	23 %
BW FPCON/RAM Measures	6	17 %
Ventilation Systems	6	17 %
Vaccinate All Military	6	17 %
Educate COCOMs (ETE)	6	17 %
Develop Installation Medical Surveillance Information	5	14 %
Develop DoD Integrated Information Collection	5	14 %
Public Information Packages and Media Relations	5	14 %
Expand Joint BW ACTD Funding	5	14 %
Rapid Vaccine Approval	5	14 %

Table G3.3 presents the ideas ranked in the top 10 for the *Best Overall* category. Votes were determined by summing the number of times an idea with a value of 1 to 5. To clarify, any vote of 1 to 5 was given a value of "1" and the total number of those votes summed. Total number of workshop participants who submitted votes for this category was 35. The reason for more than ten ideas indicates a tie of the tenth position.

Appendix G4: Raw Data for All Categories

Category: Best Overall, Total Voted 1-15

Idea from 85% Solution Workshop	Raw Votes	% of Total
C-BW CONOPS	23	64
Determine BW Agents Possible	9	25
Re-Prioritize BW Threat Agents	10	28
Decision Tools for Commanders	23	64
BW FPCON/RAM Measures	17	47
Develop Installation Medical Surveillance Information	18	50
Develop DoD Integrated Information Collection	12	33
Daily Health Screening	7	19
922 Concept	10	28
Weekly Commander's Stand-Up Briefings	7	19
Enhance Research Community and Operator Interaction	5	14
Badge-Based Biometrics	4	11
Thermal Sensors	6	17
R&D of Novel Agents	2	6
R&D Versus Acquisition of Current Bio-detectors	11	31
Improve Solutions/Technology Implementation Process	7	19
Expand Joint BW ACTD Funding	10	28
Public Information Packages and Media Relations	16	44
Ventilation Systems	12	33
New Detection Methods	8	22
New Decontamination Methods	5	14
New Individual Protective Equipment (IPE)	7	19
Develop Individual Protection Guidance	12	33
New Prophylaxis and Vaccines	6	17
New Treatments	2	6
Rapid Vaccine Approval	5	14
Vaccinate All Military	15	42
Increase DoD Vaccine Funding	6	17
External Inputs for Prophylaxis and Vaccination Policies	5	14
Disposition of BW contaminated personnel, remains, equipment	7	19
"How Clean is Clean" Policy	7	19
Fast In-Theater Confirmatory Analysis	10	28
Pre-positioned Material and Supplies	8	22
Initial Deployment Packages	4	11
Develop Specialized BW Teams	4	11
Hire BW-educated Health Care Workers and First Responders	2	6
Train Health Care Workers and First Responders	12	33
Quick-Reference Education Handouts	11	31
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equivalent)	25	69
Educate All Other DoD Personnel	14	39
Train and Exercise DoD Personnel	20	56
Educate Non-DoD Personnel	7	19
Train Non-DoD Personnel	6	17
Mission Essential Task Lists	11	31

Idea from 85% Solution Workshop (cont.)	Raw Votes	% of Total
Subject Matter Experts in Exercise Planning and Execution	9	25
Educate COCOMs (ETE)	14	39
Publicize BW Preparedness	5	14
Establish Collective Protection Standards	3	8
Vulnerability Assessments	10	28
Disease Containment Plan	12	33
Installation Quarantine (ETE)	7	19
International Quarantine (ETE)	3	8
Information Management/Risk Communication for Installations (ETE)	13	36
Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	6	17
Information Management/Risk Communication for Public Release (ETE)	10	28
Joint and Coalition Decision Tools	6	17

Category: Best Overall, Total Voted 1-5

Idea from 85% Solution Workshop	Raw Votes	% of Total
C-BW CONOPS	13	36
Determine BW Agents Possible	4	11
Re-Prioritize BW Threat Agents	5	14
Decision Tools for Commanders	14	39
BW FPCON/RAM Measures	9	25
Develop Installation Medical Surveillance Information	6	17
Develop DoD Integrated Information Collection	2	5.6
Daily Health Screening	1	3
922 Concept	2	6
Weekly Commander's Stand-Up Briefings	2	6
Enhance Research Community and Operator Interaction	0	0
Badge-Based Biometrics	0	0
Thermal Sensors	1	3
R&D of Novel Agents	0	0
R&D Versus Acquisition of Current Bio-detectors	1	3
Improve Solutions/Technology Implementation Process	2	6
Expand Joint BW ACTD Funding	5	14
Public Information Packages and Media Relations	3	8
Ventilation Systems	6	17
New Detection Methods	4	11
New Decontamination Methods	0	0
New Individual Protective Equipment (IPE)	0	0
Develop Individual Protection Guidance	3	8
New Prophylaxis and Vaccines	0	0
New Treatments	0	0
Rapid Vaccine Approval	1	3
Vaccinate All Military	8	22
Increase DoD Vaccine Funding	1	3
External Inputs for Prophylaxis and Vaccination Policies	0	0
Disposition of BW contaminated personnel, remains, equipment	1	3
"How Clean is Clean" Policy	3	8
Fast In-Theater Confirmatory Analysis	2	6

Idea from 85% Solution Workshop (cont.)	Raw Votes	% of Total
Pre-positioned Material and Supplies	0	0
Initial Deployment Packages	2	6
Develop Specialized BW Teams	1	3
Hire BW-educated Health Care Workers and First Responders	1	3
Train Health Care Workers and First Responders	2	6
Quick-Reference Education Handouts	4	11
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equivalent)	17	47
Educate All Other DoD Personnel	6	17
Train and Exercise DoD Personnel	5	14
Educate Non-DoD Personnel	2	6
Train Non-DoD Personnel	1	3
Mission Essential Task Lists	4	11
Subject Matter Experts in Exercise Planning and Execution	2	6
Educate COCOMs (ETE)	7	19
Publicize BW Preparedness	1	3
Establish Collective Protection Standards	1	3
Vulnerability Assessments	4	11
Disease Containment Plan	5	14
Installation Quarantine (ETE)	1	3
International Quarantine (ETE)	0	0
Information Management/Risk Communication for Installations (ETE)	0	0
Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	0	0
Information Management/Risk Communication for Public Release (ETE)	4	11
Joint and Coalition Decision Tools	2	6

Category: Implemented Quickest, Total Voted 1-15

Idea from 85% Solution Workshop	Raw Votes	% of Total
C-BW CONOPS	16	47
Determine BW Agents Possible	8	24
Re-Prioritize BW Threat Agents	11	32
Decision Tools for Commanders	22	65
BW FPCON/RAM Measures	15	44
Develop Installation Medical Surveillance Information	12	35
Develop DoD Integrated Information Collection	8	24
Daily Health Screening	12	35
922 Concept	13	38
Weekly Commander's Stand-Up Briefings	13	38
Enhance Research Community and Operator Interaction	4	12
Badge-Based Biometrics	3	9
Thermal Sensors	10	29
R&D of Novel Agents	1	3
R&D Versus Acquisition of Current Bio-detectors	5	15
Improve Solutions/Technology Implementation Process	3	9
Expand Joint BW ACTD Funding	9	26
Public Information Packages and Media Relations	19	56
Ventilation Systems	9	26

Idea from 85% Solution Workshop (cont.)	Raw Votes	% of Total
New Detection Methods	2	6
New Decontamination Methods	1	3
New Individual Protective Equipment (IPE)	4	12
Develop Individual Protection Guidance	15	44
New Prophylaxis and Vaccines	4	12
New Treatments	1	3
Rapid Vaccine Approval	2	6
Vaccinate All Military	11	32
Increase DoD Vaccine Funding	5	15
External Inputs for Prophylaxis and Vaccination Policies	1	3
Disposition of BW contaminated personnel, remains, equipment	9	26
"How Clean is Clean" Policy	10	29
Fast In-Theater Confirmatory Analysis	6	18
Pre-positioned Material and Supplies	6	18
Initial Deployment Packages	8	24
Develop Specialized BW Teams	6	18
Hire BW-educated Health Care Workers and First Responders	5	15
Train Health Care Workers and First Responders	13	38
Quick-Reference Education Handouts	17	50
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equivalent)	22	65
Educate All Other DoD Personnel	13	38
Train and Exercise DoD Personnel	13	38
Educate Non-DoD Personnel	5	15
Train Non-DoD Personnel	5	15
Mission Essential Task Lists	11	32
Subject Matter Experts in Exercise Planning and Execution	10	29
Educate COCOMs (ETE)	12	35
Publicize BW Preparedness	9	26
Establish Collective Protection Standards	5	15
Vulnerability Assessments	10	29
Disease Containment Plan	12	35
Installation Quarantine (ETE)	8	24
International Quarantine (ETE)	4	12
Information Management/Risk Communication for Installations (ETE)	11	32
Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	9	26
Information Management/Risk Communication for Public Release (ETE)	11	32
Joint and Coalition Decision Tools	7	21

Category: Implemented Quickest, Total Voted 1-5

Idea from 85% Solution Workshop	Raw Votes	% of Total
C-BW CONOPS	7	21
Determine BW Agents Possible	5	15
Re-Prioritize BW Threat Agents	6	18
Decision Tools for Commanders	7	21
BW FPCON/RAM Measures	5	15
Develop Installation Medical Surveillance Information	3	9
Develop DoD Integrated Information Collection	0	0

Idea from 85% Solution Workshop (cont.)	Raw Votes	% of Total
Daily Health Screening	6	18
922 Concept	6	18
Weekly Commander's Stand-Up Briefings	11	32
Enhance Research Community and Operator Interaction	1	3
Badge-Based Biometrics	1	3
Thermal Sensors	3	9
R&D of Novel Agents	0	0
R&D Versus Acquisition of Current Bio-detectors	1	3
Improve Solutions/Technology Implementation Process	0	0
Expand Joint BW ACTD Funding	3	9
Public Information Packages and Media Relations	10	29
Ventilation Systems	3	9
New Detection Methods	2	6
New Decontamination Methods	0	0
New Individual Protective Equipment (IPE)	1	3
Develop Individual Protection Guidance	3	9
New Prophylaxis and Vaccines	0	0
New Treatments	0	0
Rapid Vaccine Approval	0	0
Vaccinate All Military	3	9
Increase DoD Vaccine Funding	2	6
External Inputs for Prophylaxis and Vaccination Policies	0	0
Disposition of BW contaminated personnel, remains, equipment	0	0
"How Clean is Clean" Policy	4	12
Fast In-Theater Confirmatory Analysis	3	9
Pre-positioned Material and Supplies	0	0
Initial Deployment Packages	1	3
Develop Specialized BW Teams	1	3
Hire BW-educated Health Care Workers and First Responders	1	3
Train Health Care Workers and First Responders	2	6
Quick-Reference Education Handouts	9	26
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equivalent)	15	44
Educate All Other DoD Personnel	6	18
Train and Exercise DoD Personnel	5	15
Educate Non-DoD Personnel	1	3
Train Non-DoD Personnel	0	0
Mission Essential Task Lists	2	6
Subject Matter Experts in Exercise Planning and Execution	5	15
Educate COCOMs (ETE)	7	21
Publicize BW Preparedness	1	3
Establish Collective Protection Standards	0	0
Vulnerability Assessments	2	6
Disease Containment Plan	5	15
Installation Quarantine (ETE)	2	6
International Quarantine (ETE)	0	0
Information Management/Risk Communication for Installations (ETE)	3	9
Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	1	3
Information Management/Risk Communication for Public Release (ETE)	2	6
Joint and Coalition Decision Tools	2	6

Category: Greatest Benefit, Total Voted 1-15

Idea from 85% Solution Workshop	Raw Votes	% of Total
C-BW CONOPS	22	63
Determine BW Agents Possible	8	23
Re-Prioritize BW Threat Agents	6	17
Decision Tools for Commanders	18	51
BW FPCON/RAM Measures	10	29
Develop Installation Medical Surveillance Information	20	57
Develop DoD Integrated Information Collection	16	46
Daily Health Screening	4	11
922 Concept	8	23
Weekly Commander's Stand-Up Briefings	2	6
Enhance Research Community and Operator Interaction	6	17
Badge-Based Biometrics	9	26
Thermal Sensors	6	17
R&D of Novel Agents	9	26
R&D Versus Acquisition of Current Bio-detectors	8	23
Improve Solutions/Technology Implementation Process	10	29
Expand Joint BW ACTD Funding	11	31
Public Information Packages and Media Relations	8	23
Ventilation Systems	10	29
New Detection Methods	16	46
New Decontamination Methods	10	29
New Individual Protective Equipment (IPE)	11	31
Develop Individual Protection Guidance	6	17
New Prophylaxis and Vaccines	17	49
New Treatments	11	31
Rapid Vaccine Approval	11	31
Vaccinate All Military	12	34
Increase DoD Vaccine Funding	7	20
External Inputs for Prophylaxis and Vaccination Policies	4	11
Disposition of BW contaminated personnel, remains, equipment	3	9
"How Clean is Clean" Policy	8	23
Fast In-Theater Confirmatory Analysis	14	40
Pre-positioned Material and Supplies	10	29
Initial Deployment Packages	3	9
Develop Specialized BW Teams	9	26
Hire BW-educated Health Care Workers and First Responders	4	11
Train Health Care Workers and First Responders	8	23
Quick-Reference Education Handouts	5	14
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equivalent)	19	54
Educate All Other DoD Personnel	12	34
Train and Exercise DoD Personnel	14	40
Educate Non-DoD Personnel	5	14
Train Non-DoD Personnel	4	11
Mission Essential Task Lists	6	17
Subject Matter Experts in Exercise Planning and Execution	9	26
Educate COCOMs (ETE)	13	37
Publicize BW Preparedness	2	6

Idea from 85% Solution Workshop (cont.)	Raw Votes	% of Total
Establish Collective Protection Standards	4	11
Vulnerability Assessments	8	23
Disease Containment Plan	12	34
Installation Quarantine (ETE)	7	20
International Quarantine (ETE)	3	9
Information Management/Risk Communication for Installations (ETE)	8	23
Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	6	17
Information Management/Risk Communication for Public Release (ETE)	8	23
Joint and Coalition Decision Tools	5	14

Category: Greatest Benefit, Total Voted 1-5

Idea from 85% Solution Workshop	Raw Votes	% of Total
C-BW CONOPS	16	46
Determine BW Agents Possible	3	9
Re-Prioritize BW Threat Agents	1	3
Decision Tools for Commanders	13	37
BW FPCON/RAM Measures	6	17
Develop Installation Medical Surveillance Information	5	14
Develop DoD Integrated Information Collection	5	14
Daily Health Screening	1	3
922 Concept	1	3
Weekly Commander's Stand-Up Briefings	1	3
Enhance Research Community and Operator Interaction	1	3
Badge-Based Biometrics	2	6
Thermal Sensors	2	6
R&D of Novel Agents	2	6
R&D Versus Acquisition of Current Bio-detectors	3	9
Improve Solutions/Technology Implementation Process	4	11
Expand Joint BW ACTD Funding	5	14
Public Information Packages and Media Relations	5	14
Ventilation Systems	6	17
New Detection Methods	8	23
New Decontamination Methods	4	11
New Individual Protective Equipment (IPE)	1	3
Develop Individual Protection Guidance	2	6
New Prophylaxis and Vaccines	10	29
New Treatments	3	9
Rapid Vaccine Approval	5	14
Vaccinate All Military	6	17
Increase DoD Vaccine Funding	2	6
External Inputs for Prophylaxis and Vaccination Policies	0	0
Disposition of BW contaminated personnel, remains, equipment	0	0
"How Clean is Clean" Policy	2	6
Fast In-Theater Confirmatory Analysis	3	9
Pre-positioned Material and Supplies	1	3
Initial Deployment Packages	1	3

Idea from 85% Solution Workshop (cont.)	Raw Votes	% of Total
Develop Specialized BW Teams	3	9
Hire BW-educated Health Care Workers and First Responders	2	6
Train Health Care Workers and First Responders	1	3
Quick-Reference Education Handouts	0	0
Educate Senior-Level DoD Personnel (O-6 & Flag Officer, or Civilian Equivalent)	9	26
Educate All Other DoD Personnel	3	9
Train and Exercise DoD Personnel	2	6
Educate Non-DoD Personnel	0	0
Train Non-DoD Personnel	0	0
Mission Essential Task Lists	1	3
Subject Matter Experts in Exercise Planning and Execution	2	6
Educate COCOMs (ETE)	6	17
Publicize BW Preparedness	0	0
Establish Collective Protection Standards	0	0
Vulnerability Assessments	4	11
Disease Containment Plan	4	11
Installation Quarantine (ETE)	1	3
International Quarantine (ETE)	0	0
Information Management/Risk Communication for Installations (ETE)	1	3
Information Management/Risk Communication for Civilian Public Health Authorities (ETE)	0	0
Information Management/Risk Communication for Public Release (ETE)	2	6
Joint and Coalition Decision Tools	2	6

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