Chemical and Biological Defense
CBIAC Newsletter
Information Analysis Center

Volume 8 Number 1
2007

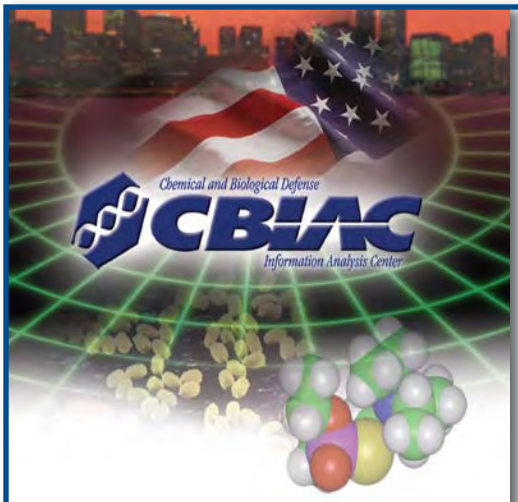
The Joint Strike Fighter Chemical and Biological Program

Chemical and Biological Detection in the New Millennium

Systems Engineering Approach to Chemical /Biological Design

A U.S. Department of Defense Information Analysis Center sponsored by the ***Defense Technical Information Center***

Approved for Public Release; Distribution Unlimited



The **Chemical and Biological Defense Information Analysis Center (CBIAC)** is a Department of Defense (DoD)-sponsored Information Analysis Center (IAC) operated by Battelle Memorial Institute and supported by Horne International, Innovative Emergency Management, Inc., MTS Technologies, Inc., QuickSilver Analytics, Inc., and SciTech, Inc., and administered by the Defense Technical Information Center (DTIC) under the DoD IAC Program Office (Contract No. SP0700-00-D-3180).

The CBIAC Contracting Officer's Technical Representative (COTR) may be contacted at the following address:

CDR USA RDECOM
Edgewood Chemical Biological Center
ATTN: AMSRD-ECB-RT (CBIAC COTR)
5183 Blackhawk Road
Aberdeen Proving Ground, MD 21010-5424

U.S. Government agencies and private industry under contract to the U.S. Government can contact the CBIAC for information products and services. CBIAC services also extend to all state and local governments and the first responder community, to include local emergency planners, firefighters, medics and law enforcement personnel.

The CBIAC is located in building E3330, Room 150, Aberdeen Proving Ground-Edgewood Area, Maryland 21010. For further information or assistance, visit or contact the CBIAC.

CBIAC
Aberdeen Proving Ground - Edgewood Area
P.O. Box 196 • Gunpowder, MD 21010-0196
410.676.9030 (phone) 410.676.9703 (fax)

General Information & Core Program:
cbiac@battelle.org

Technical Area Task Program:
cbiac-tat@battelle.org

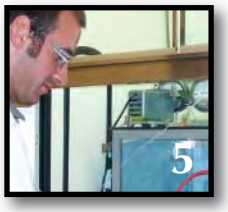
Knowledge Management & Development Program:
cbiac-kmd@battelle.org

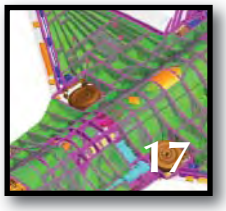
http://www.cbiac.apgea.army.mil/

Approved for Public Release; Distribution Unlimited

Table of Contents

Volume 8 Number 1 2007





3 The Joint Strike Fighter Chemical and Biological Program

4 Contract Awards

5 Chemical and Biological Detection in the New Millennium

6 In the News

7 Dr. Brennie E. Hackley, Jr.

9 New CBIAC Information Resources

11 CBIAC Information Products

17 Systems Engineering Approach to Chemical/Biological Design

19 Calendar of Events

20 DOD IACs: Reliability Information Analysis Center

23 CBIAC Ends 2006 with 20th Anniversary Celebrations and Cogswell Award Presentation

On the Cover: *The new F-35 Lightning II aircraft is revealed during an inauguration ceremony at Lockheed Martin's Fort Worth, Texas, facility July 7, 2006. (U.S. Marine Corps photo by Gunnery Sgt. Rusty Baker) (Released) (Released to Public) Image number 060707-M-6508B-083; Courtesy of www.defenselink.mil*

The ***CBIAC Newsletter***, a quarterly publication of the CBIAC, is a public release, unlimited distribution forum for chemical and biological defense information. It is distributed in hardcopy format and posted in Portable Document Format (PDF) on the CBIAC Homepage.

The CBIAC welcomes unsolicited articles on topics that fall within its mission scope. All articles submitted for publication consideration must be cleared for public release prior to submission. The CBIAC reserves the right to reject or edit submissions. For each issue, articles must be received by the following dates:

- First Quarter (Number 1) – October 15th
- Second Quarter (Number 2)– January 15th
- Third Quarter (Number 3) – April 15th
- Fourth Quarter (Number 4) – July 15th

All paid advertisements and articles are subject to the review and approval of the CBIAC COTR prior to publication. The appearance of an advertisement or article in the ***CBIAC Newsletter*** does not constitute endorsement by the DoD or the CBIAC.

The Joint Strike Fighter Chemical and Biological Program

By Lucy DiGhionno and Will Stewart

Since the fall of the Soviet Union, accelerated proliferation of the Chemical/Biological (CB) threat has increased the likelihood that U.S. military personnel and weapon systems will be exposed to CB contaminants on the battlefield. Combat air vehicles must be capable of withstanding exposure to CB threats. As a result, there has been an increased emphasis on aircrew, maintainer, and air-system survivability in a CB environment.

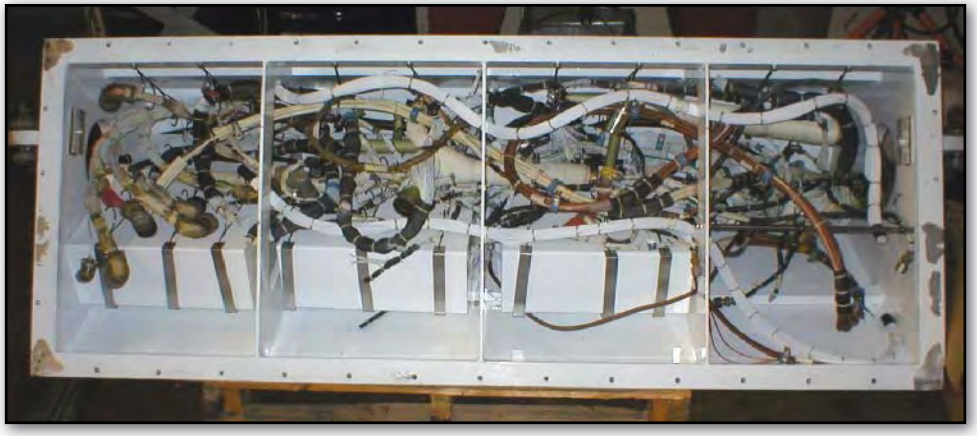


Figure 1- Cluttered Electronics Bay Mock-Up

A F-35 Lightning II Air Vehicle requirement was developed to retain mission capability without decontamination and with only routine servicing and inspection for a certain time period after exposure. This requirement defines CB hardness and covers the chemical threat-level concentration and duration and the biological threat minimum infective dose to ensure aircrew and maintainer survivability. The CB community uses the terms hardness and exposure in preference to vulnerable and susceptible. CB hardness is a measure of an air vehicle's ability to resist degradation by CB warfare agents. Materials selected in the design of an air vehicle must be capable of withstanding exposure to a contaminated environment without degradation of its critical properties for a specified period of time. Deployed units and commands must have the capacity to operate through and recover from a CB attack. This requirement addresses both air-system hardness and operational capability.

To ensure the Lightning II is fully compliant with CB decontamination requirements, a plan for incremental validation was established. This process progressed from material-property testing to subassembly testing to system-level testing. This testing process, coupled with modeling and simulation, confirms that requirements are being met at all stages of the design. Vigilant implementation of CB design requirements and proper selection of a sufficient decontamination process dramatically improves the ability of the system to be decontaminated.

Decontamination Methodology

The ideal decontamination methodology would quickly decontaminate a system, not degrade any of the system components, and have a negligible impact on the environment. Unfortunately, there is no such magic solution for CB decontamination, although significant improvements have been made in recent years. New decontamination methods are more effective and less damaging than former techniques but still require the asset to be removed from operational status during decontamination. The type and quantity of contamination will have a direct impact on the length of time required for decontamination.

The decontamination methods that are being verified for Lightning II are Hot Air Decontamination (HAD) for chemical threats and Vaporized Hydrogen Peroxide (VHP®) for biological threats. Vaporized Hydrogen Peroxide is registered by STERIS Corporation and will henceforth be called VHP.

Chemical threats naturally dissipate through natural weathering processes such as evaporation and chemical decomposition. Unfortunately, the natural weathering process is too time consuming to be beneficial to military assets that are essential to accomplishing mission objectives. HAD expedites the weathering process by introducing heated air with significant airflow in the vicinity of the contamination. The heated air facilitates chemical offgassing, while the airflow removes contaminant from the surface to prohibit the agent from being re-absorbed.

Figure 2- Chemical Decontamination Preparation

Biological threats and agents are living organisms that can be neutralized through a proven process such as VHP. Unlike chemical threats, biological contamination does not have to be physically removed from the asset once an organism is killed. VHP is also benign to the environment since it readily decomposes into water and oxygen.

Aircraft Material Property Testing

There are numerous concerns that can be addressed through material-level testing. Material testing produces results that indicate whether a material

Continued pg. 8

Contract Awards • *By Mary Frances Tracy*

Enhance Healthcare Information in an Effort to Improve the Detection and Response to Emerging Public Health Threats
New York City Department of Health and Hygiene
New York, NY
University of Utah
Salt Lake City, UT
Johns Hopkins University
Baltimore, MD
$3,700,000 January 8, 2007
By Centers for Disease Control and Prevention, Atlanta, GA

Family of Collective Protection Shelters
Production Products Manufacturing & Sales Co, Inc.
St. Louis, MO
$3,233,000 December 28, 2006
By U.S. Army Research, Development, & Engineering Command Acquisition Center - Natick, Natick Contracting Division, Natick, MA

Operate the National Biodefense Analysis and Countermeasures Center (NBACC), Ft. Detrick, Frederick, MD
Battelle Memorial Institute, Columbus, OH, will manage and operate the lab through a limited liability company called the Battelle National Biodefense Institute (BNBI).
$250,000,000 December 20, 2006
By U.S. Department of Homeland Security, Washington, DC

Joint Biological Point Detection Systems and Related Fielding Support Packages, System Testing, and User Training
General Dynamics Armament and Technical Products
Charlotte, NC
$32,138,255 December 15, 2006
By U.S. Army Research, Development, and Engineering Command, Aberdeen Proving Ground, MD

Development of Antisense Therapeutics to Treat the Effects of Ebola, Marburg and Junin Hemorrhagic Viruses
AVI BioPharma, Inc.
Corvallis, OR
$28,034,018 November 30, 2006
By Defense Threat Reduction Agency, Fort Belvoir, VA

Care, Maintenance, Security, Surveillance, and Safety of the Newport Chemical Depot
Mason & Hanger Corp.
Newport, IN
$8,037,407 (part of $25,964,411) November 30, 2006
By U.S. Army Research, Development, and Engineering Command, Aberdeen Proving Ground, MD

Grant for Biosecurity Research Institute
Kansas State University
Manhattan, KS
$2,294,255 November 20, 2006
By U.S. Army Research, Development, and Engineering Command Acquisition Center - Natick, Natick, MA

Preclinical Services for the Development of Drugs and Antibodies for Anti-Infective Therapeutics
SRI International
Menlo Park, CA
$56,900,000 November 7, 2006
By U.S. National Institute of Allergy and Infectious Diseases, Bethesda, MD

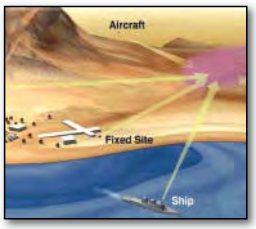
Develop Self-Decontaminating, Smart Textiles for Collective Protection Shelters
Lynntech, Inc.
College Station, TX
$70,000 November 7, 2006
By U.S. Army Research, Development, and Engineering Command Acquisition Center - Natick, Natick, MA

Creation of a Center of Excellence Focused on the Development of New and Improved Medical Countermeasures Against Chemical Threats
UMDNJ-Robert Wood Johnson Medical School and Rutgers
New Brunswick, NJ
$19,200,000 November 2, 2006
By U.S. National Institutes of Health, Bethesda, MD

Bioengineering a Human Protein to Attack Nerve-Gas Agents in a Victim's Bloodstream
Ohio State University
Columbus, OH
$4,500,000 October 12, 2006
By National Institutes of Health, Bethesda, MD

Chemical and Biological Detection in the New Millennium






The History of Chemical and Biological Detectors, Alarms, and Warning Systems series ended in our last 2006 ***CBIAC Newsletter*** (Volume 7, Number 4) with predictions for "The Future" as of the original document publication date, June 2000. Nowhere in the Millennium predictions was the devastation that occurred on September 11, 2001, or the Anthrax-contaminated letters that raised the requirement for detection capabilities that could be incorporated by the public sector as well as military communities. Emergency and First Responders now need to know how to handle emergencies that include Weapons of Mass Destruction.

The Internet has made it possible to access and share information resources in a publicly accessible forum. Some relevant online information resources presenting chemical and biological (CB) detection, alarms, sensors, and NBC reconnaissance equipment commercially available or fielded as well as some of the current technologies being developed since the year 2000 are shown below.

Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD)

http://www.jpeocbd.osd.mil

Programs and equipment information include Bio-Detection and Contamination Avoidance (which includes detectors, alarms, and reconnaissance systems).

Fact Sheets By JPM

http://www.jpeocbd.osd.mil/page_manager.asp?pg=5&sub=12

Biological Defense

Joint Biological Point Detection System (JBPDS)
Joint Biological Standoff Detection System (JBSDS)
Joint Portal Shield (JPS).

NBC Contamination Avoidance

Automatic Chemical Agent Alarm (ACADA) M22
ASCHA Detection System
Chemical Agent Monitor Simulator (CAM SIM)
Improved Chemical Agent Monitor (CAM ICAM)
Chemical Biological Mass Spectrometer II (CBMS II)
Family of Tactical Obscuration Devices (FOTOD)
Joint Chemical Agent Detector (JCAD)
Joint Chemical Surface Detector (JCSD)
Joint Services Light NBC Reconnaissance System (JSL NBCRS)
Joint Services Lightweight Standoff Chemical Agent Detector (JSLSCAD)
Light Vehicle Obscuration Smoke System (LVOSS)
M256A1 Chemical Agent Detection Kit
M8A1 Chemical Agent Alarm
M8 and M9 Chemical Agent Detector Paper
M93A1 Fox NBCRS
NBC RV Sensor Suite Stryker
Portable Area Warning and Surveillance System (PAWSS)
M21 Remote Sensing Chemical Agent Alarm (RSCAAL), and more.

Information Systems

JWARN Initial Capability (JIC)
JWARN Component Interface Device (JCID)
Joint Effects Model (JEM)
Joint Warning and Reporting Network (JWARN)

Joint Program Manager NBC Contamination Avoidance

http://www.jpeocbd.osd.mil/page_manager.asp?pg=7

Drop list provides fact sheets. Biological Integrated Detection System (BIDS) is included.

Chem-Bio Defense Quarterly Magazine

http://www.jpeocbd.osd.mil/page_manager.asp?pg=4&sub=0

Current issue and archives include articles on Contamination Avoidance and specific equipment development and technology applications.

Department of Homeland Security (DHS) Office of Grants & Training

http://www.ojp.usdoj.gov/odp/equipment.htm

Key programs available on the DHS Web site include:

Responder Knowledge Database (RKB)

http://www1.rkb.mipt.org/

Created to serve the needs of Emergency Responders, this database contains information on currently available products and related information on standards, training, and grants.

System Assessment and Validation for Emergency Responders (SAVER) Program

http://www.ojp.usdoj.gov/odp/equipment_saver.htm

Several resources, including reports on Detection Equipment and technologies are available through SAVER.

U.S. Army Research, Development and Engineering Command (RDECOM)

http://www.rdecom.army.mil/

RDECOM Magazine

http://www.rdecom.army.mil/rdemagazine/Current/index.html

Current issue and archives are available at this site.

Edgewood Chemical and Biological Center

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

Web site contains links to Homeland Defense Reports, Detection Information, and more.

Continued pg. 15

In the News • *By Mary Frances Tracy*

FDA Approves Drug to Treat Cyanide Poisoning
U.S. Food and Drug Administration Press Release
December 15, 2006
"The Food and Drug Administration (FDA) today approved Cyanokit (containing the drug hydroxocobalamin, intravenous tubing and a sterile spike for reconstituting the drug product with saline) for the treatment of known or suspected cyanide poisoning."
http://www.fda.gov/bbs/topics/NEWS/2006/NEW01531.html

Troops in Iraq to Get Fire-Resistant Uniforms
Tom Vanden Brook
USA TODAY
December 14, 2006
"Flame-resistant uniforms will be standard issue for U.S. troops in Iraq and Afghanistan by early 2007, Pentagon officials say."
http://www.usatoday.com/news/washington/2006-12-14-safer-uniforms_x.htm

Study Reveals Molecular Basis of Botulism Toxin's Deadly Activity
PhysOrg.com
December 14, 2006
"In the study, the scientists reveal the mysterious structural basis of the remarkably strong interaction that botulinum toxins form with nerve cells, a union so robust that a single toxin molecule can completely incapacitate a nerve cell."
http://www.physorg.com/news85331820.html

New Evaluation Brigade to Test Emerging Warfighter Technologies
Donna Miles
American Forces Press Service
December 12, 2006
"A new brigade here will test some of the most revolutionary concepts and systems being developed for future warfighters, report how they operate under field conditions, and ultimately speed their fielding to troops on the battlefield."
http://www.defenselink.mil/news/NewsArticle.aspx?ID=2389

New Agency Charged with Fighting Bioterror Threats
Daniel Friedman
Federal Times
December 11, 2006
"In its final days, the 109th Congress passed a bill creating a new $1 billion agency to fight bioterror threats. Called the Biomedical Advanced Research and Development Authority (BARDA)…"
http://federaltimes.com/index.php?S=2416694

MIT Develops Antimicrobial Paint
Science Daily
December 4, 2006
"An antimicrobial paint developed by U.S. scientists potentially offers a new weapon in the battle against diseases spread by viruses and bacteria."
http://www.sciencedaily.com/upi/index.php?feed=Science&article=UPI-1-20061204-10410500-bc-us-antimicrobial.xml

New Finding Points Way to Foiling Anthrax's Tricks
Media-Newswire.com Press Release
December 1, 2006
"University of California, Berkeley, chemists have discovered a trick that anthrax bacteria use to make an end run around the body's defenses, but which may turn out to be their Achilles' heel."
http://media-newswire.com/release_1039850.html

Microneedle Vaccination Technique Protects Rabbits Against Inhalation Anthrax Using Smaller Dosage
American Society for Microbiology
December 2006
"Microneedle-based vaccination with the current anthrax vaccine produced an equally effective immune response to intramuscular injection in rabbits using smaller dosage…"
http://www.asm.org/Media/index.asp?bid=47402

Microscopic Barcodes Could Identify Biological Weapons Quickly
Scott Fields
Fox News
November 30, 2006
"Microscopic metal wires marked with barcodes like so many boxes of grocery-store spaghetti might someday help identify biological weapons much more quickly than today's methods."
http://www.foxnews.com/story/0,2933,233440,00.html

Continued pg. 16

Vol. 4 No. 1 of the Chem-Bio Defense Quarterly Magazine is Now Available!

Vol. 4 No. 1 Chem-Bio Defense Quarterly Magazine

This issue of Chem-Bio Defense Quarterly Magazine honors the accomplishments of some of our nation's prominent African American historical figures in recognition of Black History Month. In recognition of Woman's History Month, we pay tribute to two incredibly zealous women who dedicated the majority of their lives to supporting national interests through their life's work and contributions. We also take a look at Joint Program Manager Guardian and some of the highly successful projects for which it is responsible.
To view the electronic version, visit: http://www.jpeocbd.osd.mil/page_manager.asp?pg=4&sub=0

Would you like to receive the link to upcoming issues or have a hard copy version for your office or organization? If so, complete the interactive form at http://www.jpeocbd.osd.mil/page_manager.asp?pg=0&sub=9.

Dr. Brennie E. Hackley, Jr.

Chemist, Teacher, Scientific Advisor
July 29, 1924 – November 5, 2006

Brennie E. Hackley Jr., Ph.D of Joppa, Maryland, passed away on Sunday, November 5, 2006. Dr. Hackley was Chief Scientist and Scientific Advisor to the Commander of the U.S. Army Medical Research Institute of Chemical Defense, Edgewood Area of Aberdeen Proving Ground, Maryland. He authored or co-authored more than 75 publications and 15 U.S patents. His publications and patents contributed significantly to the development of medical antidotes for chemical warfare agents.

Dr. Hackley received numerous honors and commendations during 57 years of continuous government service. He was an honorary, life member of the American Chemical Society and Fellow of the American Institute of Chemists. LTG Kevin Kiley, The Surgeon General U.S. Army has posthumously awarded the Decoration for Exceptional Civilian Service medal.

Dr. Hackley was commissioned in the U.S. Army Reserves and retired in 1981 as a Colonel with 31 years enlisted and officer service. He served as President of the Reserve Officers Association Chapter 28.

He was active in the Harford County community and a member of the Lion's Club, American Legion, and Omega Psi Phi Fraternity.

These are some of the facts presented in Dr. Hackley's obituary. However, friends, family, and coworkers know that there was so much more to Dr. Hackley's legacy than just his accomplishments.

> *"Dr. Hackley distinguished himself as Scientific Advisor to the Commander, United States Army Medical Research Institute of Chemical Defense. His professional competence and devotion to duty for 57 years resulted in significant accomplishments in the development of medical countermeasures for chemical threat agents. Dr. Hackley's meritorious service exemplifies the highest tradition of Federal Service, reflecting great credit upon him, the United States Army Medical Research Institute of Chemical Defense, and the United States Army."*
>
> *From proposal for Decoration for Exceptional Civilian Service*

Dr. Hackley received a BS in chemistry from Wilberforce University in 1946. Following graduation, he served as a private in the U.S. Army, assigned to the U.S. Army Chemical Center, Edgewood Arsenal, Maryland, and was later commissioned by the Army Officers Corps. In 1952, after discharge from the U.S. Army, Hackley returned to Edgewood Arsenal to begin his federal civilian career as an organic research chemist in the Medicinal Chemistry Branch of the Army Chemical Center, later known as the U.S. Army Biomedical Laboratory, and now known as the U.S. Army Medical Research Institute of Chemical Defense (USAMRICD). He went on to earn advanced degrees in chemistry from the University of Delaware to include a PhD in 1957. During his career, Dr. Hackley studied the relationship between chemical structures and chemotherapeutic activity with reference to efficacy against toxic agents. He contributed to the elucidation of mechanisms of reactions of nucleophiles with organophosphorus compounds and synthesized a number of oximes, for which he held 18 patents. One oxime synthesized by Dr. Hackley, toxogonin, was adopted as an antidote against chemical nerve agents by the U.S. Air Force.

In 1984, Dr. Hackley was designated chief scientist and scientific advisor to the commander of USAMRICD. In this important position, he provided advise and support to management. During Operation Desert Storm, Dr. Hackley responded to emergency calls for pre-deployment briefings by combat divisions regarding medical management of chemical casualties by initiating a traveling training program. As a result of his efforts, deploying medical personnel were significantly more prepared to treat Soldiers on the battlefield if chemical weapons were employed. As an instructor and course director for the Medical Management of Chemical and Biological Casualties Courses, Dr. Hackley delivered lectures in Saudi Arabia, Johnston Island, Hawaii, Okinawa, Japan, and Germany on pulmonary agents, cyanide, vesicants and nerve agents.

While serving as chairman of a Scientific Steering Committee on Nerve Agent Antidotes, Dr. Hackley advised the U.S. Army Medical Research and Materiel Command that one of the precursors that was used at that time in the synthesis of the oxime HI-6, under consideration as a replacement for the fielded 2-PAM, is carcinogenic. Dr. Hackley convinced the command that HI-6 would not pass scrutiny by the Food and Drug Administration and that the effectiveness of HI-6 over 2-PAM was neither great enough nor cost effective enough for the U.S. Army to justify replacing 2-PAM.

Dr. Hackley represented the U.S. Army Medical Research Program competently and effectively for almost 6 decades. His efforts significantly improved communication and relationships between the Chemical and Medical Corps and strengthened USAMRICD's image as the lead laboratory for the development of medical countermeasures for chemical threat agents. He leaves a legacy of commitment and passion for U.S. service members and he will be greatly missed.

Employment History:

1980 to 2006. Scientific Advisor, U.S. Army Medical Research Institute for Chemical Defense, Aberdeen Proving Ground (APG), MD
1979-1980. Research Chemist, U.S. Army Biomedical Laboratory, APG, MD
1977-1979. Research Chemist, Chief, Biomedical Protection Group, U.S. Army Biomedical Laboratory, APG, MD
1970-1971. Research Chemist, Chief Cell Biology Branch Medical Research Laboratory, Edgewood Arsenal, MD
1967-1970. Research Organic Chemist, Acting Chief, Experimental Zoology Branch, Medical Research Laboratory, Edgewood Arsenal, MD
1962-1967. Research Organic Chemist Biochemistry Branch, Medical Research Laboratory, Edgewood Arsenal, MD
1960-1965. Associate Professor Chemistry, University of Maryland, College Park, MD
1958-1962. Organic Chemist, Assistant Chief, Bioorganic Chemistry Branch, Medical Research Laboratory, Edgewood Arsenal, MD
1957-1958. Organic Chemist, Assistant Chief Chemotherapy Branch, U.S. Army Chemical Center, MD
1954-1957. Organic Chemist, Assistant Chief, Chemotherapy Branch, Biochemistry Research Division, CRDL, U.S. Army Chemical Center, MD
1952-1954. Organic Chemist, Medicinal Chemistry Branch, Medicine Division, U.S. Army Chemical Center, MD

can be decontaminated and how well the material will perform in a contaminated environment. It is obvious that materials used in subsystems that cannot be decontaminated will result in assemblies that cannot be decontaminated. The hardness performance of a material encompasses the quantifiable physical degradation caused by contamination or decontamination processes.

Both chemical agents and decontaminates may permanently damage materials. Chemical agents, once absorbed into certain materials, can alter their physical characteristics and degrade their ability to perform as designed. Numerous chemical and biological decontamination processes that are currently used have known adverse effects on materials. This highlights the need for a proven decontamination methodology that will effectively neutralize the threat without modifying material characteristics. Biological agents are innocuous to inorganic components, thus are not included in material testing.

To begin a material down selection process, a review of approximately 1,960 materials that were submitted by Lockheed Martin was conducted. Out of these, more than 350 unique materials were found. This number was then reduced to 30 material families that had conflicting or no data on chemical effects. These identified material families were used in material property testing that included offgassing, transfer hazard, sorption, hardness, and material damage assessment. The testing highlighted material families that are degraded by contact with either contaminates or proposed decontaminates. These materials should be exchanged for materials that are more resistant to contaminates and decontaminates, protected from contamination, or identified as components that must be removed and replaced after exposure.

Subassembly Testing

Material testing provides valuable results without incorporating all the intricacies of testing a representative artifact. Subassembly tests provide results for an initial CB design evaluation and for verifying the feasibility of the proposed decontamination method. The fact that a material passes all physical property tests does not ensure that a subassembly test would be equally successful, because crevices, cracks, drainage, and other design characteristics are not apparent until the subassembly level. Figure 1 shows an electronics bay mock-up and emphasizes the difficulties that can be faced in decontaminating an operational aircraft. Any porous materials or areas that restrict airflow can be extremely difficult to decontaminate.

Subassembly tests are also the ideal medium to assess the efficacy of the proposed decontamination process. At this level of testing, the balance between controlling the decontamination process while capturing the realism of the system is optimized for process verification. A process that can be successfully demonstrated on a subassembly would have an increased probability of succeeding in a system-level assessment. Both VHP and HAD proved to be viable decontamination methods during subassembly testing.

System-Level Assessment

Initially, the F-22 was selected as the Lightning II surrogate for the system-level assessment since it also has chemical hardness requirements. Unfortunately, the selected asset was not available when testing began. The F-16 aircraft is the next best choice of currently

Figure 3- Biological Decontamination Preparation

available operational legacy aircraft for this testing, as it is being replaced by the Lightning II Air Vehicle and is also manufactured by Lockheed Martin. The F-16 was selected and used as an early Lightning II prototype to understand decontamination test issues before testing the actual aircraft. The F-16 used for testing had an operational engine and avionics systems for functional ground operations with all panels and doors in place. There are known differences in materials between the F-16 and the Lightning II that have been addressed by material-family testing at the coupon level. This system-level test was the first fully instrumented, tactical aircraft interior and exterior CB decontamination test performed.

A total of seven CB decontamination tests were performed on the F-16. Testing included three biological ingestion tests, three chemical ingestion tests, and one chemical exterior test. An ingestion test corresponds to the scenario in which an aircraft is covered during contamination but must be taxied or flown through a contaminated area. Since contaminate can be disseminated throughout both the exterior and interior of the aircraft, the decontamination process must also focus on both regions of the aircraft.

The F-16 was placed in a steel shelter for chemical decontamination. The shelter was heated to approximately 180°F while fans circulated the air inside the shelter. Thermocouples where strategically placed around the aircraft to enhance awareness of the thermodynamic characteristics of the process. Close monitoring of the thermocouples permitted the process to be controlled so that sensitive avionics equipment would not exceed temperature thresholds. Real-time chemical detection devices and post-decontamination sampling also provided insight to the decontamination process.

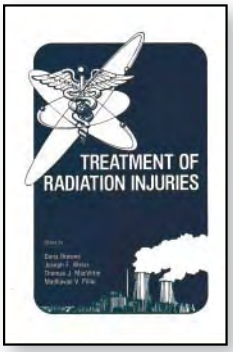
To expedite internal chemical decontamination, two augmentation flow locations on the forward avionics bays and two Environmental Control System (ECS) ports were used to introduce heated air inside the aircraft. ECS control valves were manipulated so that the interior of the aircraft could be decontaminated using the same flow paths that disseminated the contamination. Figure 2 shows the complexity of the HAD decontamination configuration for controlling the ECS valves, acquiring test data, and maintaining the desired temperature throughout the aircraft.

Continued pg. 10

New CBIAC Information Resources • *By Richard M. Gilman*

Books

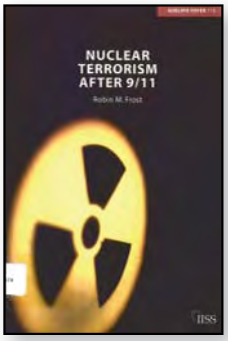
Brown, Doris, Joseph F. Weiss, Thomas J. MacVittie and Madhavan V. Pillai, eds. **Treatment of Radiation Injuries**. New York: Plenum Press, 1990.



"The proliferation of radioactive materials in industry, in diagnostic and therapeutic medicine, in scientific and medical research, in the military, and as a source of energy has increased the likelihood of accidental exposure to ionizing radiation. Further, the number of individuals exposed in accidents, such as Chernobyl, U.S.S.R.; Goiania, Brazil; and San Salvador, El Salvador, underscores the potential for large-scale radiation accidents. Because of these accidents, health care providers have found themselves treating patients with acute radiation injuries and subsequent complications. Often the radiation injuries are combined with burns or other trauma and the infectious and immune complications associated with such injuries…" *(Preface)*

CB-193290
ISBN 0-306-43729-5
Plenum Press
A Division of Plenum Publishing Corporation
233 Spring Street
New York, NY 10013
Phone: (212) 620-8000

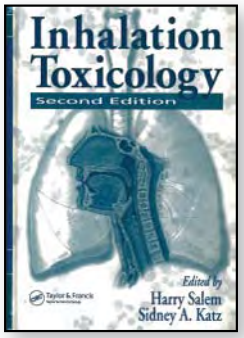
Frost, Robin M. **Nuclear Terrorism After 9/11**. New York: Routledge, 2005.



"This paper takes a position that runs counter to the views on nuclear terrorism expressed by many politicians and academics, as well as the media. It argues that the risk of nuclear terrorism, especially true nuclear terrorism employing bombs powered by nuclear fission, is overstated, and that the popular wisdom on the topic is significantly flawed. There are technical, psychological and strategic grounds for this assertion, and the paper will deal with each of these categories in turn. At the same time, there are good reasons for concern about the state of nuclear security worldwide, and nothing in this paper should be read as suggesting that there is any cause for complacency. Far from it: serious efforts are required to improve the situation. Radioactive materials, and potential targets of nuclear terrorism, such as reactor complexes, must be protected." *(Introduction)*

CB-035276
ISBN 0-415-39992-0
Routledge
270 Madison Ave.
New York, NY 10016
Phone: 1-800 634-7064

Salem, Harry and Sidney A. Katz, eds. **Inhalation Toxicology**. Boca Raton, FL: CRC Press, 2006.



"The objective of **Inhalation Toxicology** is to provide the practicing professional as well as the aspiring student with a pragmatic textbook. Included in **Inhalation Toxicology** are contributions from scientists in the academic, commercial/industrial, and governmental sectors focusing on regulatory aspects of exposure and testing, testing equipment and procedures, biomarkers and pathology of exposure, respiratory allergy and irritation of the respiratory tract, risk assessment, bioaerosols ranging from household molds to anthrax and botulinum toxin, low-level exposures, toxicology theory and toxicology modeling, and toxic effects of some individual toxicants ranging from tobacco smoke to botulinum toxins." *(Preface)*

CB-035585
ISBN 0-8493-4049-7
CRC Press
Taylor & Francis Group, LLC
600 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742
Phone: 1-800 272-7737
Fax: 1-800 374-3401

Richard Gilman Retires

Mr. Richard M. Gilman, the CBIAC's Acquisition Coordinator, recently retired after 9 years as a member of our staff. In addition to serving in this role, Mr. Gilman also produced this column and served as a member of the CBIAC's Inquiry Staff.

Mr. Gilman initiated unique acquisition strategies, focusing on electronic acquisitions, that were key to the massive growth of the CBIAC's collection during his tenure. He also personally wrote a number of CBIAC publications, including a Critical Review on Anti-Crop Biological Agents and Associated Technologies and a Critical Review on Demilitarization Technologies for Biological and Toxin Weapons.

Before joining the CBIAC's staff in 1997, Mr. Gilman had worked extensively in academic and industrial information and library settings.

Mr. Gilman received a BS in Biology from the University of Michigan, an MILS from the School of Information and Library Studies of the University of Michigan, and an MLS from Eastern Michigan University.

Mr. Gilman will be missed by all of his colleagues at the CBIAC. Please join us in wishing him well in retirement.

Biological decontamination was quite similar. The F-16 was placed in an inflatable shelter for decontamination. VHP was introduced to the interior of the aircraft using the same ECS and augmentation ports. The shelter was maintained at a slight negative pressure to ensure VHP was not leaking into the environment and to enable the VHP concentrations to be maintained at a concentration of 250 ppm. Fans circulated air inside the shelter to ensure a uniform VHP concentration.

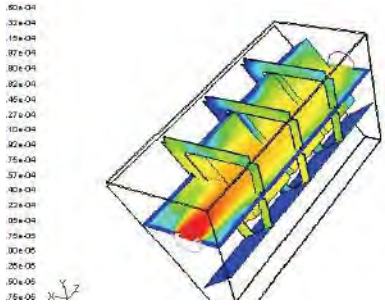


Figure 4- VHP Dissemination in the Avionics Subassembly

These tests provided data that will be used to validate decontamination processes which will set the precedence for all tactical and fighter aircraft. Samples were taken before contamination, after contamination, and post decontamination in order to determine the efficacy of both decontamination processes. The test results are pending review and were not available at the time this article was written.

Modeling and Simulation

Modeling and Simulation (M&S) is being used to bridge the differences between the system-level test on the surrogate F-16 and the planned Lightning II aircraft-level test in 2012. A Computational Fluid Dynamics (CFD) model of a digital full-up Lightning II aircraft is being developed to evaluate the elements needed for a successful decontamination. The subassembly tests previously discussed were used to validate the modeling process.

Temperature and airflow, essential parameters for chemical decontamination, will be evaluated in the CFD model. Areas of the aircraft that do not achieve the desired temperature or have insufficient airflow will be more resistant to chemical decontamination and will be emphasized. The primary concern for successful biological decontamination is the proper dissemination of VHP. The VHP concentration throughout the Lightning II will be analyzed by M&S to locate areas that do not meet the required concentration level. Figure 4 shows a contour plot for VHP dissemination at 29 sec into the decontamination process for the subassembly test. At the ten-minute mark, VHP was completely disseminated throughout the subassembly model, which was consistent with test data from the actual subassembly test.

A key benefit in leveraging M&S to assess the decontamination process on a fully populated Lightning II is the ability to optimize the number and location of augmentation airflow inputs. If an aircraft configuration is modeled and produces results that indicate certain regions do not meet the decontamination goals, the configuration can be modified and re-analyzed. Leveraging M&S for this type of iterative design yields significant cost and time savings for downstream test activities.

Conclusion

The Lightning II program, which has both a CB decontamination and vulnerability requirement, has performed decontamination techniques and material hardness testing at the material, subsystem, and system levels. Although the Lightning II program has scheduled a full aircraft CB simulant decontamination test in 2012, qualification by simulation testing on an available operational aircraft was performed before this test to mitigate risk. The testing performed on an F-16 demonstrated the complexities of the decontamination process and provided significant insights well in advance of the Lightning II CB validation tests. These insights will avoid an increase in testing costs and will shorten test time on this critical limited asset.

References

1. Aircraft Chemical Biological (CB) Survivability Systems Test Risk Reduction Test Plan. 9 September 2005.
2. Biological Decontamination Testing of a Cluttered Joint Strike Fighter Electronics Bay Mockup. Document, Number XG-SV-CB-04B-TR. 18 March 2005.
3. Joint Strike Fighter Model Specification Document. 8 November 2000.
4. Physical Property Testing of Joint Strike Fighter (JSF) Aircraft Materials After Chemical Agent Contamination and Decontamination. 15 July 2005.
5. Test Report for Hot Air Decontamination of Chemical Agent Simulant in a cluttered Joint Strike Fighter Electronics Bay Mock-up. Document Number XG-SV-CB-04B-TR. 25 February 2005.

*For further information, please visit the **F-35 Joint Strike Fighter Program** Web site at http://www.jsf.mil/.*

*This article also appeared in the Fall 2006 issue of **Aircraft Survivability.** http://www.bahdayton.com/SURVIAC/asnews.htm.*

CBIAC Information Products

Critical Reviews

Code/Price	Title/Distribution
CR-05-15 $10.00	**Technical Report on the Portable Airlock for Non-Procedural Entry or Exit of CSEPP Pressurized Shelters** Approved for Public Release; Distribution Unlimited
CR-05-14 $10.00	**Dispatcher's Guide for WMD Incidents** Approved for Public Release; Distribution Unlimited
CR-05-13 $25.00	**Biological Incident Operations: A Guide for Law Enforcement** Approved for Public Release; Distribution Unlimited
CR-04-12 $2.00	**Emergency Decontamination Corridor and Ladder Pipe Decontamination Systems** Approved for Public Release; Distribution Unlimited
CR-04-11 $2.00	**Quick Response Guidelines for a Suspected Chem/Bio Attack** Approved for Public Release; Distribution Unlimited
CR-04-10 $25.00	**The Psychological Effects of Weapons of Mass Destruction (WMD) on Military and Civilian Personnel** U.S. Government Agencies and their Contractors Only; Unclassified
CR-03-09 $10.00	**Law Enforcement Officers Guide for Responding to Chemical Terrorist Incidents** Approved for Public Release; Distribution Unlimited
CR-03-08 $10.00	**Medical Aspects of Biological Agents** Approved for Public Release; Distribution Unlimited
CR-03-07 $25.00	**WMD Reference CDs** Approved for Public Release; Distribution Unlimited
CR-02-05 $25.00	**Chemical Agent Simulants and Associated Technologies** U.S. Government Agencies Only; Unclassified
CR-01-04 $45.00	**Joint Service Chemical and Biological Science and Technology Base Program in Decontamination** U.S. Government Agencies and their Contractors Only; Unclassified
CR-01-03 $25.00	**Air Purification Technologies** U.S. Government Agencies and their Contractors Only; Unclassified
CR-00-02 $25.00	**Critical Review on Anti-Crop Biological Agents and Associated Technologies** U.S. Government Agencies and their Contractors Only; Unclassified
CR-00-01 $75.00	**Chemical Biological/Smoke Modeling and Simulation (M&S) Newsletter Compilation** U.S. Government Agencies and their M&S Contractors Only; Unclassified
CR-99-10 $60.00	**Wide Area Decontamination: CB Decontamination Technologies, Equipment and Projects** Approved for Public Release; Distribution Unlimited
CR-99-09 $20.00	**Determination of Optimum Sorbent Material for Collection and Air Desorption of Chemical Warfare Agents** Approved for Public Release; Distribution Unlimited
CR-98-08 $25.00	**Demilitarization Technologies for Biological and Toxin Weapons** U.S. Government Agencies Only; Unclassified
CR-98-07 $15.00	**The Year 2000 Millennium Bug: A Chemical and Biological Defense Community Perspective** Approved for Public Release; Distribution Unlimited
CR-98-06 $15.00	**The Emergency Responder's Ability to Detect Chemical Agents** U.S. Government Agencies, their Contractors, State and Local Government Agencies Only; Unclassified

2007 CBIAC Products

Critical Reviews (cont.)

Code/Price	Title/Distribution
CR-98-05 $25.00	**Critical Review of Surface Sampling Technologies for Volatilizing Liquid Chemical Agents** Approved for Public Release; Distribution Unlimited
CR-98-04 $25.00	**Critical Review of Non-Lethal Grenade Technologies and Lethality Evaluation Criteria** Approved for Public Release; Distribution Unlimited
CR-96-03 $60.00	**Critical Review of Sources of Chemical and Physical Properties Data for Militarily Significant Compounds** Approved for Public Release; Distribution Unlimited
CR-95-02 $20.00	**A Critical Review of Sources of Spectral Data for Militarily Significant Compounds** Approved for Public Release; Distribution Unlimited
CR-95-01 $20.00	**A Critical Review of Nuclear, Biological and Chemical Contamination Survivability (NBCCS)** Approved for Public Release; Distribution Unlimited

Databases, Databooks, Handbooks, and Others

Code/Price	Title/Distribution
DBS-02-01 $125.00	**Chemical Sources Database and Databook: Toxicological Values for Catastrophic Release of Toxic Industrial Chemicals (Set)** U.S. DoD Agencies Only; Unclassified
DB-02-01 $75.00	**Chemical Sources Database: Toxicological Values for Catastrophic Release of Toxic Industrial Chemicals** U.S. DoD Agencies Only; Unclassified
DBK-02-01 $75.00	**Chemical Sources Databook: Toxicological Values for Catastrophic Release of Toxic Industrial Chemicals** U.S. DoD Agencies Only; Unclassified
DBK-99-02 $75.00	**Susceptibility of Aircraft Materials to Chemical Warfare Agents (Reprint)** U.S. Government Agencies and their Contractors; Unclassified
DB-97-01 $60.00	**Physiological and Psychological Effects of the Nuclear, Biological, and Chemical Environment and Sustained Operations on Systems in Combat (P2NBC2) Database** U.S. DoD Agencies and their Contractors; Unclassified
DBK-95-01 $10.00	**Chemical Defense Materials Databook** U.S. DoD Agencies and their Contractors; Export Controlled; Unclassified
HB-04-03 $175.00	**BACWORTH Encyclopedia Version 6.2a** U.S. Government Agencies Only; Export Controlled; Unclassified; For Official Use Only
HB-99-03 $75.00	**CB Terminology Handbook** Approved for Public Release; Distribution Unlimited
HBS-98-03 $100.00	**Worldwide Chemical Detection Equipment Handbook and Worldwide NBC Mask Handbook (Set of Both Handbooks)** Approved for Public Release; Distribution Unlimited
HB-95-02 $75.00	**Worldwide Chemical Detection Equipment Handbook** Approved for Public Release; Distribution Unlimited
HB-92-01 $75.00	**Worldwide NBC Mask Handbook** Approved for Public Release; Distribution Unlimited
SIMKIT-06-02 $810.00	**Explosive Simulant Kit** Federal, State, and Local Government Agencies Only—Further Distribution Only as Authorized by TSWG; Unclassified
SIMKIT-05-01 $650.00	**CBR Simulant Training Kit** Federal, State, and Local Government Agencies Only—Further Distribution Only as Authorized by TSWG; Unclassified
SIMKIT-96-01 $150.00	**Chemical Warfare Agent Simulant Training Kit** Approved for Public Release; Distribution Unlimited

2007 CBIAC Products

State-of-the-Art Reports

Code/Price	Title/Distribution
SOAR 06-19 $25.00	**Proceedings of the 2004 Scientific Conference on Chemical and Biological Defense Research** Approved for Public Release; Distribution Unlimited
SOAR-06-18 $25.00	**Proceedings of the 2003 Joint Service Scientific Conference on Chemical and Biological Defense Research** Approved for Public Release; Distribution Unlimited
SOAR-06-16 $10.00	**Proceedings of the 2nd DoD Sustainable Ranges Initiative Conference and Exhibition** U.S. Government Agencies and their Contractors Only; Unclassified
SOAR-06-15 $10.00	**Weapons of Mass Destruction Handbook—Terms and Operational Overview** Approved for Public Release; Distribution Unlimited
SOAR-05-14 $25.00	**Chemical and Biological Medical Treatment Symposium - V** Approved for Public Release; Distribution Unlimited
SOAR-05-13 $25.00	**Proceedings of the Scientific Conference on Obscuration and Aerosol Research 2004** Approved for Public Release; Distribution Unlimited
SOAR-04-12 $75.00–$150.00	**Sensing of Chemical & Biological Agents** U.S. DoD Agencies and their DoD Contractors Only; Export Controlled; Unclassified; *To order, visit the SENSIAC Web site at https://www.sensiac.gatech.edu/sensiac/external/index.jsf or contact SENSIAC at (404) 385-7367.*
SOAR-04-11 $35.00	**Chemical and Biological Medical Treatment Symposium - III** Approved for Public Release; Distribution Unlimited
SOAR-03-10 $20.00	**Best Practices and Guidelines for Mass Personnel Decontamination** U.S. Government Agencies, their Contractors, State and Local Government Agencies Only; Unclassified
SOAR-03-09 $10.00	**Criminal and Epidemiological Investigation Handbook** Approved for Public Release; Distribution Unlimited
SOAR-02-08 $25.00	**Possible Terrorist Use of Modern Biotechnology Techniques** U.S. Government Agencies Only; Unclassified; For Official Use Only
SOAR-02-07 $25.00	**Joint Science and Technology Chemical and Biological Front End Analysis and Master Plan – Individual Protection** U.S. Government Agencies Only; Unclassified
SOAR-02-06 $45.00	**Medical Risk Assessment of the Biological Threat** U.S. Government Agencies and their Contractors Only; Unclassified; For Official Use Only
SOAR-02-05 $75.00	**Tools to Minimize the Threat of Intentional Food/Water Contamination** U.S. Government Agencies, their Contractors, State and Local Government Agencies Only; Unclassified
SOAR-01-04 $15.00	**Weapons of Mass Destruction Level III Antiterrorism Training** U.S. Government Agencies and their Contractors Only; Unclassified
SOAR-01-03 $125.00	**Respirator Encumbrance Model** U.S. Government Agencies and their Contractors Only; Unclassified
SOAR-00-02 $95.00	**Weapons of Mass Destruction Force Protection Joint Service Training** U.S. Government Agencies, their Contractors, State and Local Government Agencies Only; Unclassified
SOAR-00-01 N/A	**Medical NBC Battlebook** Approved for Public Release; Distribution Unlimited *The Medical NBC Battlebook, USACHPPM Tech Guide 244, is available on the USACHPPM Web Site in electronic format at http://chppm-www.apgea.army.mil.*

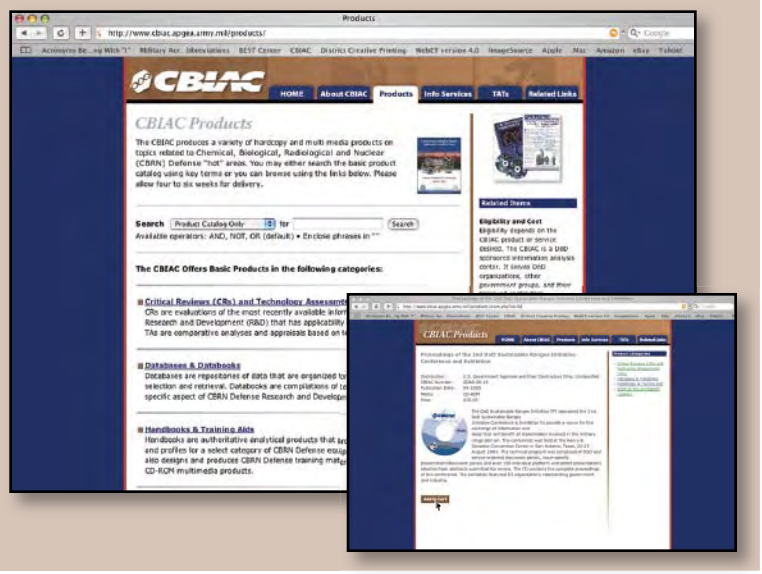
2007 CBIAC Products

State-of-the-Art Reports (cont.)

Code/Price	Title/Distribution
SOAR-99-13 $95.00	**CB Decontamination Market Survey and Tool** U.S. Government Agencies and their Contractors Only; Export Controlled; Unclassified
SOAR-99-12 $75.00	**CBR-D Curricular Materials** U.S. Government Agencies and their Contractors Only; Export Controlled; Unclassified
SOAR-99-11 $75.00	**Disaster Preparedness Operation Specialist (DPO) Curricular Materials** U.S. Government Agencies and their Contractors Only; Export Controlled; Unclassified
SOAR-99-10 $95.00	**Tactical NBC Information Tool** U.S. Government Agencies Only; Unclassified
SOAR-98-09 $75.00	**Technical Approach Options for Indoor Air Modeling** Approved for Public Release; Distribution Unlimited
SOAR-98-08 $95.00	**CINC NBC Information Tool** U.S. Government Agencies Only; Unclassified
SOAR-98-07 $125.00	**Disaster Preparedness Operation Specialist (DPO) Computer Aided Instruction** U.S. Government Agencies and their Contractors Only; Export Controlled; Unclassified
SOAR-98-06 $125.00	**CBR-D Computer Aided Instruction** U.S. Government Agencies and their Contractors Only; Export Controlled; Unclassified
SOAR-98-05 $75.00	**Assessment of Chemical Detection Equipment for HAZMAT Responders** U.S. Government Agencies, their Contractors, State and Local Government Agencies Only; Unclassified
SOAR-98-04 $75.00	**State-of-the-Art Report on the Australia Group Chemicals** Approved for Public Release; Distribution Unlimited
SOAR-97-03 $95.00	**An Overview of U.S. Chemical and Biological Defensive Equipment** Approved for Public Release; Distribution Unlimited
SOAR-95-02 $60.00	**State-of-the-Art Report on Biodetection Technologies** U.S. Government Agencies and their Contractors Only; Export Controlled; Unclassified
SOAR-95-01 $49.00	**Proceedings of the CB Medical Treatment Symposium: An Exploration of Present Capabilities and Future Requirements** Approved for Public Release; Distribution Unlimited

Order CBIAC Products Online!

Go to **www.cbiac.apgea.army.mil** and browse the "CBIAC Basic Products Catalog" or shop online using "shopping cart" technology. If purchasing with a credit card, you will be contacted by phone for the credit card number.



Detection *cont.*

Detection-*Fact Sheets*:
http://www.ecbc.army.mil/ps/products_detection.htm
Automatic Chemical Agent Alarm M21
Chemical Agent Detector Kit M256A1
Chemical Agent Detector Paper M8
Chemical, Biological, Radiological and Nuclear Unmanned Ground Reconnaissance Advanced Concept Technology Demonstration
Sampling Kit, CBR Agent M34A1
Surface Sampler Probe XM279
Artemis (Joint Service Warning and Identification LIDAR Detector)
Joint Biological Standoff Detection System (JBSDS) Blk I
Joint Biological Point Detection System (JBPDS) Blk II

Defense Threat Reduction Agency/Research and Development Enterprise/ Chemical and Biological Technologies Directorate
http://www.dtra.mil/rd/cbt/index.cfm
Provides fact sheets, program information and more.

DTRA Fact Sheets:
http://www.dtra.mil/newsservices/fact_sheets/index.cfm
An alphabetical listing that includes:

- Chemical, Biological, Radiological and Nuclear (CBRN) Unmanned Ground Reconnaissance (CUGR) Advanced Concept Technology Demonstration (ACTD) and
- Contamination Avoidance at Seaports of Debarkation ACTD

Programs:
http://www.dtra.mil/rd/cbt/programs/index.cfm
Introduction and additional information is available on the following programs:
Advanced Concept Technology Demonstration (ACTD)
Chemical, Biological, Radiological and Nuclear (CBRN) Unmanned Ground Reconnaissance (CUGR) ACTD
Contamination Avoidance at Sea Ports of Debarkation (CASPOD) ACTD
Military Applications in Reconnaissance and Surveillance (MARS) Unmanned Ground Vehicle (UGV)
Project Technology Review Assistance Notification Standards Integration & Testing (TRANSIT)

Chemical and Biological Defense Information Analysis Center (CBIAC)
http://www.cbiac.apgea.army.mil
"Warning and Identification" is included in the CBIAC scope and program and equipment information can be acquired through password access to the CBIAC database, through its Inquiry and Referral Services, CBIAC Basic Products, and the Technical Area Task (TAT) Program.

CBRN START Database *(password protected)*
http://www.cbiac.apgea.army.mil/info/index.php

Directory of Websites related to CBRN Defense -Warning and Identification
http://www.cbiac.apgea.army.mil/links/directory_warning.php

Office of the Special Assistant, Chemical and Biological Defense and Chemical Demilitarization Programs
http://www.acq.osd.mil/cp/

2006 CBDP Annual Report to Congress
http://www.acq.osd.mil/cp/2006_cbdp_annual_report_final.pdf
See section on "Contamination Avoidance".

Chemical and Biological Defense Reports (CBD)
http://www.acq.osd.mil/cp/reports.html#cbd

Continued pg. 22

In the News *cont.*

UA Has Key Role in Preventing Bioterror Attacks on Water Supplies
Larry Copenhaver
Tucson Citizen
November 22, 2006
"The University of Arizona is working to keep the water supply safe from bioterrorists with more than $13 million in federal grants."
http://www.tucsoncitizen.com/daily/local/33428.php

Plague Proteome Reveals Proteins Linked to Infection
Pacific Northwest National Laboratory Press Release
November 22, 2006
"Recreating growth conditions in flea carriers and mammal hosts, Pacific Northwest National Laboratory scientists have uncovered 176 proteins and likely proteins in the plague-bacterium *Yersinia pestis* whose numbers rise and fall according to the disease's virulence."
http://www.pnl.gov/news/release.asp?id=199

Bioterror Detectors Get Sensitive
Luke O'Brien
Wired News
November 21, 2006
"…In Chicago's Argonne National Laboratory, a Department of Energy research facility, scientists believe they have made a significant advance in identifying nasty pathogens such as anthrax, ricin or botulism…"
http://www.wired.com/news/technology/0,72149-0.html?tw=wn_technology_2

Using Nanotechnology and Lasers to Rapidly Detect Viruses
Nanowerk News
November 15, 2006
"Using nanotechnology, a team of University of Georgia researchers has developed a diagnostic test that can detect viruses as diverse as influenza, HIV and RSV in 60 seconds or less…the technique…could save lives by rapidly detecting a naturally occurring disease outbreak or bioterrorism attack."
http://www.nanowerk.com/news/newsid=1032.php

"Nanorust" Cleans Arsenic from Drinking Water
Nano News Press Releases
November 10, 2006
"The discovery of unexpected magnetic interactions between ultrasmall specks of rust is leading scientists at Rice University's Center for Biological and Environmental Nanotechnology (CBEN) to develop a revolutionary, low-cost technology for cleaning arsenic from drinking water."
http://www.thenanotechnologygroup.org/index.cfm?Content=88&PressID=1936

Arizona Universities Take on Bioterror
Anne Ryman
The Arizona Republic
November 10, 2006
"Arizona's three state universities are quietly becoming more involved in bioterrorism research, securing tens of millions of dollars in grants."
http://www.azcentral.com/specials/special21/articles/1110bioterrorism1110.html

Video Games Being Used for ER Tests
David Louie
ABC7/KGO-TV/DT
November 7, 2006
"Over 30 local and state agencies joined forces on the Peninsula today to prepare for a chemical and radiological attack. But unlike previous training exercises, this one involved new technology right out of video games…The ability to create a 3D view of a disaster scene."
http://abclocal.go.com/kgo/story?section=business&id=4738885

Global Initiative to Combat Nuclear Terrorism
The White House News Release
November 1, 2006
"Thirteen nations gathered this week in Rabat, Morocco to confront the grave international threat of nuclear terrorism by endorsing the Global Initiative to Combat Nuclear Terrorism, a joint initiative announced in July by President Bush and Russia's President Putin."
http://www.whitehouse.gov/news/releases/2006/11/20061101.html

Twenty-Five Nations to Join in Nonproliferation Exercise
Ralph Dannheisser
U.S. Department of State News Release
October 28, 2006
"Twenty-five countries will take part in the first Gulf exercise under the Proliferation Security Initiative (PSI) aimed at preventing the spread of weapons of mass destruction (WMD) and their delivery systems."
http://usinfo.state.gov/xarchives/display.html?p=washfile-english&y=2006&m=October&x=20061028130459emohkcabhplar0.3623468

DARPA Immune Building Dedication
Defense Advanced Research Projects Agency News Release
October 11, 2006
"Officials of the Defense Advanced Research Projects Agency (DARPA) and U.S. Army dedicated the Immune Building…(at) Fort Leonard Wood…a research effort to develop, integrate, and demonstrate a system to protect buildings against chemical and biological warfare agent attack."
http://www.darpa.mil/body/news/current/immunebuildingrelease.pdf

Antibacterial Wallpaper
Chemical Technology
October 26, 2006
"Zinc oxide nanoparticles have been coated onto paper, giving it an antibacterial surface suitable for use as wallpaper in hospitals."
http://www.rsc.org/Publishing/ChemTech/Volume/2006/11/antibacterial_wallpaper.asp

Researchers Uncover Secret to Anthrax Detection
Jessica Estepa
The Sagebrush
October 24, 2006
"The University of Nevada School of Medicine may hold the key to saving lives in the case of an anthrax attack by detecting infection in minutes instead of days."
http://www.nevadasagebrush.com/media/storage/paper553/news/2006/10/24/News/Researchers.Uncover.Secret.To.Anthrax.Detection-2384729.shtml?norewrite200701101403&sourcedomain=www.nevadasagebrush.com

Systems Engineering Approach to Chemical/Biological Design

By Hugh Griffis, USAF ASC/ENM Division Chief, and William Stewart, USAF ASC/ENMM Systems Engineer

The increased concern relative to asymmetric or non-traditional threats has highlighted the need to acquire military weapon systems able to operate and survive in a Chemical and Biological (CB) threat environment. The Department of Defense (DoD) has numerous programs with CB requirements to ensure robust combat capability within a CB environment.

The F-22 was the first fighter aircraft that required CB hardening and decontamination. In order to meet these requirements, the F-22 program established the overall CB design process for fighter aircraft. The F-35 fighter aircraft program, in its aggressive implementation of CB design led by Lucy DiGhionno, has significantly extended and enhanced hardening and decontamination processes. The following discussion summarizes a proven acquisition process for assets that are CB hardened and able to be decontaminated. The process is categorized into four task areas: Mission and Threat Vignettes, Warfighter Requirements, Performance-Based Specifications, and Design Evaluation.

Mission and Threat Vignettes

Mission vignettes are composed of the attack scenario, threat type, combat operations and threat challenges. Each of these factors must be defined in order to establish the performance based requirements that can be validated. The attack scenario defines where the air system encounters the threat and how the threat is delivered. An example attack scenario is an airbase that is attacked by three simultaneous surface-to-surface missiles. The airbase aircraft are exposed while they are either parked or taxiing. The operational plan calls for continued flight operations from the contaminated airbase using contaminated aircraft. This simple scenario description enables analysts to define the free-field threat environment, aircraft threat challenges, and operational needs.

The threat type must also be considered when defining the threat description. Chemical threats are classified into four categories: Nerve, Blister, Blood or Choking agents. Biological threats are categorized by bacteria, viruses and toxins. Since each agent will have different effects, each challenge limit should be directly traceable to individual chemical or biological agents.

The threat challenges will depend on the aircraft exposure zones. Recent CB assessments establish the free-field threat environment. The free-field threat environment (liquid and/or aerosol) may come in contact with the external regions of the aircraft. The aircraft has many different types of external surfaces such as external coatings, canopy, engine inlets and engine exhaust nozzles. Some internal regions of the aircraft such as the wheels, wheel wells, and air vents, may be exposed to liquid and/or aerosol contaminates during typical operations. All internal regions of an aircraft that are exposed to open air are also subject to an aerosol exposure.

Warfighter Requirements

Warfighter requirements are related to operational approaches and the required warfighting capability. It is critical that the warfighter establishes planned operational approaches as a function of time: prior to attack; during an attack; and post attack. The operational approaches for post attack will be different before and after thorough decontamination.

In the early stage of hostilities, the potential of CB exposure to our troops requires the commander to manage risk to troops by altering the personnel protection level and operational effectiveness. Personnel protection is obtained by wearing Nuclear, Biological, and Chemical (NBC) protection gear, which is called Mission-Oriented Protection Posture (MOPP). MOPP 4 provides the highest level of protection, but degrades the ability of maintainers and pilots to conduct most mission tasks. Early definition of the operational approaches enables the design team to provide additional flexibility to the commander.

During and post CB attack, personnel are in a dirty environment. The warfighter needs to establish the required operational effectiveness and duration of continued operations while in a dirty environment. Until the vehicle is thoroughly decontaminated, maintainers and pilots must wear adequate protection. Thorough decontamination is required to return the vehicle back to non-restricted operations and standard logistics parts control.

Continued pg. 18

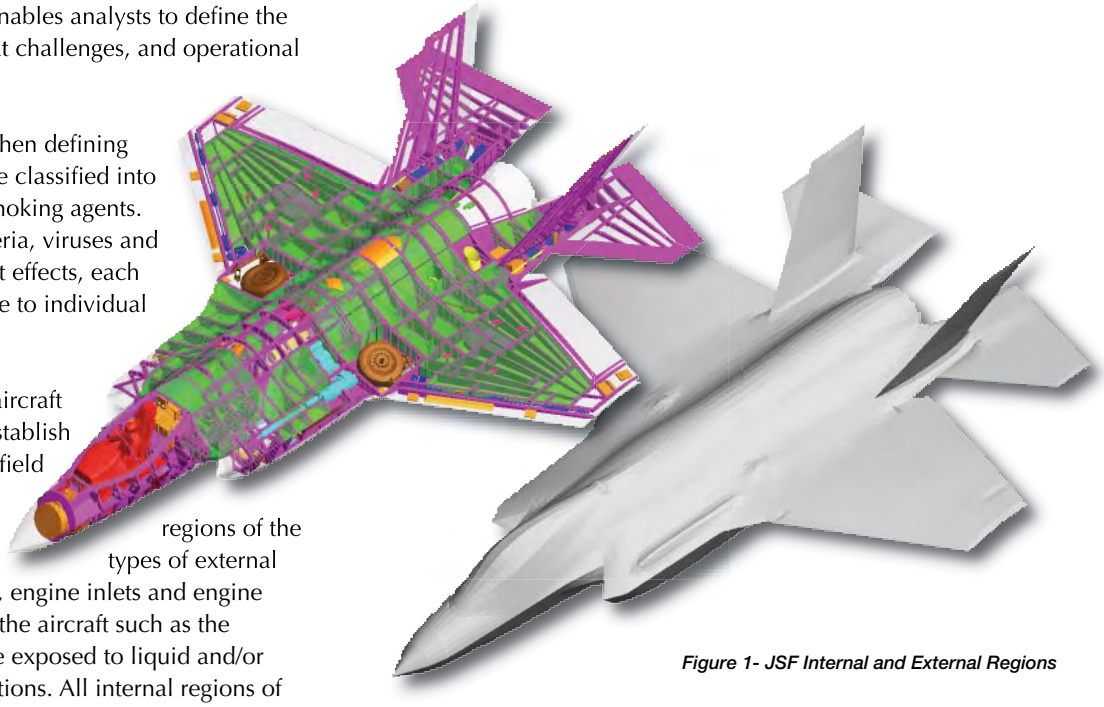


Figure 1- JSF Internal and External Regions

Performance Based Specifications

Performance-based specifications translate warfighter requirements into critical system requirements. In general, CB specifications should address Vehicle and Support Equipment (VSE) compatibility, hardness, and decontamination.

Compatibility to personnel revolves around ergonomic issues relative to performing mission tasks. Mission tasks must be completed by the maintainer and pilot without compromising the integrity of the CB protective gear being worn. The VSE designer flows-down detail design criteria for edges and corners to eliminate the potential of tearing the protective overgarment or gloves. In addition, criteria are provided to allow ample spacing between buttons, switches, and controls.

CB hardness requires the VSE to retain the ability to operate during and after contamination. The vehicle's hardness and decontamination is based upon top-coat and substrate materials. The VSE designer selects top-coatings and substrate materials based on the flowed-down detail design criteria. Proper selection of these material properties is critical to retaining functional capability. The external and internal regions of a vehicle have hundreds of different types of top coat materials. This is problematic, as different materials can have significantly diverse hardness and decontamination efficacies. Figure 1 shows the complexity of internal and external surfaces.

Figure 2 shows a coated internal bay for an aircraft. Even though most internal panels and structural surface areas have been coated to facilitate hardness and decontamination, there are numerous parts that can not be easily coated. These include electrical cables, insulation, tires, canopy, etc. Any part that is not resistant to CB challenge or decontaminable should be easily removed and replaced.

Figure 2- Coated Internal Bay

The decontamination process should provide the ability to undergo effective decontamination of the VSE without degrading functionality. Top-coats and substrate materials properties can alter the effectiveness of the decontamination process and are therefore a key concern in the design process.

Level	Technique	Best Start Time	Benefit
Immediate	Skin Decon	Before 1 minute	Stops agent from penetrating
	Personal Wipe Down	Within 15 minutes	
	Operator Spray Down		
Operational	MOPP Gear Exchange	Within 6 hours	Possible temporary relief from MOPP4
	Vehicle Wash Down		Limit liquid agent spread
Thorough	Detailed Equipment/ Aircraft Decon	When mission allows reconstitution	Probable long-term MOPP reduction with minimum risk

Table 1- Decontamination Levels

There are three levels of decontamination: Immediate, Operational and Thorough. An excerpt from a table in the Army's Medical NBC Battlebook that details these three levels of decontamination is shown in Table 1. User requirements can define the level of decontamination to be used and how clean the asset should be after decontamination.

The ability of a VSE to be decontaminated will depend upon the design and the process used for decontamination.

Design Evaluation

A logical approach to maximize the level of design verification can be adequately completed by performing incremental verification activities from the bottom up. This allows initial rudimentary testing to impact subsequent tests in order to maximize the probability of a successful decontamination at the VSE level. Design verification methods encompass analyses, modeling and simulation, live agent and simulant tests, demonstrations and design inspections.

The aircraft test planning process starts with the identification of families of materials that encompass several similar materials. Reducing the number of material families reduces test costs; however, this process increases the risk of overlooking specific materials that could lack characteristics for either hardness or decontaminability. Once the material families are determined, small specimens (4 in. by 4 in.) should be tested to ascertain the material properties given exposure to live agents, simulants, and decontaminants.

Material test data is a long-lead, critical element of all CB design activities. Tests are selected dependent upon the challenge, agents and the question of interest (material hardness or decontaminability). The chemical liquid challenge that remains in the surface provides a contact hazard (or liquid percutaneous threshold). Contact hazard is the level at which liquid chemical agent can be absorbed by unbroken skin. Chemical aerosol challenges define the threshold needed to avoid miosis (or vapor percutaneous). Miosis is the constricting of the pupil and is a common side effect of many chemical agents. Human allowable contact and miosis thresholds are available for different levels of risk (95%, 50%, and 5%) to damage the population. Allowable human exposure levels should use the conservative 5% damage threshold. Biological thresholds are determined by an allowable minimum infective dose defined by a set number of organisms.

Chemical liquid challenges also require physical property testing for materials. Property tests evaluate changes to material strength, color, signature, etc. Allowable changes in material properties are dependent upon the specific design application. In general, biological threats do not have the same degrading effects on material properties and are therefore omitted from physical property testing for materials.

Once the specimens material testing indicates that the coating system is decontaminable, tests should be scaled-up to an assembly-level test article. Assembly test articles should have representative geometry, surface area, clutter, wiring/plumbing, material/coatings and instrumentation. Assembly-level test hardware can control the air flow, temperature, and decontamination concentrations. These tests are particularly useful to down select competing decontamination options. Assembly-level test articles enable low cost, repeatable, contamination and decontamination to evaluate decontamination effectiveness.

Given effective decontamination at the assembly level, risks have been adequately reduced to proceed into system-level, full vehicle testing. Scaling up to full vehicle decontamination has many additional risks due to the complexities that were not captured in assembly tests. By following the overall process of incremental build-up design

Continued pg. 22

Calendar of Events

Do you have a Chemical and/or Biological Defense or Homeland Security course or event to add to our Calendar? Submit the pertinent information via email to **cbiac@battelle.org** *or online at* **http://www.cbiac.apgea.army.mil/info/posting_request.php**. *The CBIAC reserves the right to reject submissions. For a more extensive list of events, view our online calendar at* **http://www.cbiac.apgea.army.mil/info/calendar_06.php.**

March 26-28		**Defense Technical Information Center 2007 Conference** Alexandria, VA http://www.dtic.mil/dtic/annualconf/
April 2-4		**Impact 2007** Falls Church, VA http://www.nsi.org/Impact07.html
April 13-15		**Joint Senior Leader's Course (JSLC)** Fort Leonard Wood, MO http://www.wood.army.mil/usacmls/usacmlsflash/flashindex.aspx
April 14-20		**CBMTS-Industry V** Dubrovnik, Croatia http://www.asanltr.com/cbmts/cbmts-industry/V/CBMTS_%20Industry_V.html
April 17-19		**8th Annual Science & Engineering Technology Conference DoD/Tech Exposition** North Charleston, SC http://www.ndia.org/Template.cfm?Section=7720&Template=/ContentManagement/ContentDisplay.cfm&ContentID=15611
April 16-20		**COURSE: Field Management of Chemical and Biological Casualties** Aberdeen Proving Ground, MD https://ccc.apgea.army.mil/courses/in_house/brochureFCBC.htm

Reliability Information Analysis Center

Reliability, maintainability, quality, supportability and interoperability are inherent product and system design attributes that are as critical to mission success and customer satisfaction as functional performance. For over 35 years, the Reliability Information Analysis Center (formerly named the Reliability Analysis Center, or RAC) has served as the US Department of Defense Center of Excellence for the identification, collection, analysis and dissemination of reliability data for components, up through weapons systems.

Depth of Coverage
- Components and Materials
- Assemblies and Equipments
- Systems (Simple and Complex)

Breadth of Coverage
- Hardware
- Software
- Human Factors
- Processes

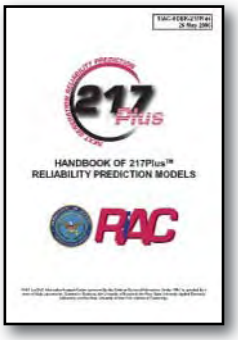
Life Cycle Coverage
- Concept Definition through Life Extension and Disposal

Examples of Services Offered:
- Acquisition Support
  - Requirements Development and Implementation
  - Risk Assessment and Management
  - Source Selection, Evaluation and Control
  - Program Planning, Development, Implementation, Management and Assessment
  - Critical Item Identification, Assessment, Management and Control
- Design and Process Support
  - Development/Assessment of Design and Process Guidelines
  - Modeling, Simulation, Estimation and Prediction
  - Design/Process Robustness (FMECA, FTA, Derating, Worst Case Analysis)
  - Parts Control and Qualification
  - Obsolescence and Diminishing Source Planning, Implementation and Control
  - Six-Sigma Design and Process Monitoring
  - Materials and Component Aging
- Testing and Screening Support
  - Accelerated Testing and Life Modeling
  - Experimental Design
  - Data Collection and Analysis
  - Planning, Development, Implementation, Control & Evaluation
- Logistic Support
  - Condition-Based Monitoring and Prognostics
  - Reliability-Centered Maintenance (RCM)
  - Spare Parts Analysis and Optimization
  - Lifetime Extension Analysis
  - Supply Chain Management

Mission and Scope: The mission of the Reliability Information Analysis Center (RIAC) is to serve as the DoD Center of Excellence, and provide technical support to the military, industry and academia, in the areas of reliability, maintainability, quality, supportability and interoperability (RMQSI). The technical expertise and wealth of experience of the RIAC team allows us to support our customers in the identification and implementation of cost-effective solutions for their qualitative and quantitative needs and challenges. The scope of the RIAC mission covers the areas outlined below.

History: On 21 June 2005, the DoD-funded, DTIC-sponsored RIAC (formerly the RAC) contract was awarded to a Wyle Laboratories-led team that includes Quanterion Solutions Incorporated, the Center for Risk and Reliability at the University of Maryland, the Applied Research Laboratory at Penn State University, and the State University of New York Institute of Technology. The RIAC operation builds on the 35-plus years of experience of the "old" RAC in RMQS and enhances its capabilities. Despite being under a new contractor, the RIAC includes many of the same personnel who have been instrumental in RAC's success over the years. The "new" RIAC adds Interoperability to its charter (the "I" in RMQSI), and provides a greater emphasis on overall system RMQSI by virtue of its concentration on the combined elements of hardware, software and human factors at the system level.

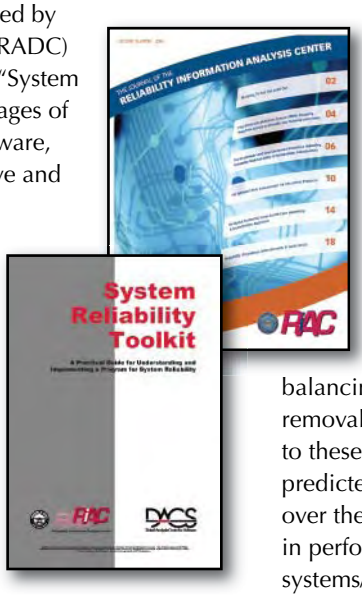
Publications and Training: The RIAC continues to be one of DTIC's most successful IACs in its development and dissemination of relevant products (over 80) and training courses (over 20) that directly support the needs of the RMQSI community. The "Journal of the Reliability Information Analysis Center" is published quarterly and addresses a variety of topics ranging from general-interest overviews of traditional RMQSI topics for managers and new practitioners in the field, to detailed discussions of state-of-the-art advances intechnology and processes for skilled and highly technical engineers and practitioners.



The RIAC recently released its 217Plus™ System Reliability Assessment software tool (and its companion document, the "Handbook of 217Plus™ Reliability Prediction Models") as a more current and accurate replacement for the increasingly outdated MIL-HDBK-217F, Notice 2 reliability prediction techniques. The 217Plus™ methodology can help reduce overall life cycle cost by avoiding potential over design of systems and equipment based on pessimistic failure rates obtained from the military handbook. The RIAC is working with the Aerospace Vehicle Systems Institute (AVSI) Reliability Assessment committee in their evaluation of reliability assessment efforts and has provided the VMEbus International Trade Association (VITA-51) committee with the 217Plus™ methodology to support their reliability prediction assessment efforts.

As its Center of Excellence in RMQSI, the DoD funds the RIAC to collect, analyze and disseminate scientific technical information (STI), including quantitative data, related to its charter. As a result, the RIAC has developed one of the largest failure rate and failure mode/mechanism databases in the world. The RIAC Nonelectronic Parts Reliability Data (NPRD) databook has, for years, been used as a de facto standard for component/equipment failure rates that are not modeled by MIL-HDBK-217, "Reliability Prediction of Electronic Equipment". The RIAC "Failure Mode/Mechanism Distribution" databook contains the data needed to support the development of modal failure rates for Failure Modes and Effects and Fault Tree Analyses.

The RIAC's flagship products include its Toolkit Series, evolving from the "RADC Reliability Engineer's Toolkit" developed by the US Air Force Rome Air Development Center (RADC) in 1988 into its current incarnation as the RIAC's "System Reliability Toolkit", published in 2006. The 850 pages of this latest Toolkit cover all critical aspects of hardware, software and human reliability required to improve and enhance overall system reliability.



The RIAC has been presenting training courses in reliability and related disciplines for over 35 years, using both open-course and on-site training formats. At the same time, the RIAC performs engineering and consulting services for hundreds of government and industry organizations annually. The RIAC's training programs give students a firm understanding of the tools and techniques needed to develop and maintain reliable systems and equipment. RIAC instructors have years of diverse practical reliability problem solving experience. Future expansion of the training program is intended to cover synchronous and asynchronous web-based training.

Technical Support and Success Stories: The RIAC has an extensive professional staff and database of subject matter experts (SMEs) that can be applied to any area within the RMQSI scope of the RIAC charter, as outlined in the sidebars of this article. RIAC scientists and engineers have helped solve problems for hundreds of DoD and industrial customers over its 35-year existence, as highlighted below in two typical examples.

RIAC Support Services

Basic Inquiry:
Up to four hours of free technical or bibliographic support
- Literature Searches
- Failure Rate and Failure Mode/Mechanism Data Analysis

Funded Inquiry:
For extended inquiries, support is provided on a cost-recovery basis
- Literature Search and Summary
- Technology Review and Analysis
- Data Collection, Compilation and Analysis

Technical Area Task:
Long-term funded projects focused on providing comprehensive technical solutions
- **R**eliability
- **M**aintainability
- **Q**uality
- **S**upportability
- **I**nteroperability

In 1998, the Taiwan Air Force (TAF) asked the US Navy (USN) to assist in developing several advanced Weapons System Operator (WSO) combat scenarios to incorporate into the 15F8 trainer for use by TAF students. In December 2005, the USN contacted the Reliability Information Analysis Center (RIAC) and asked them to program five scenarios into the 15F8 trainers. The trainer was used to assess the interoperability of the WSO and pilots with the new NP2000 propeller system. RIAC instructors provided TAF pilots with the most current training techniques available for the NP2000. The successful completion of this training signaled the continued resolve of both Taiwan and the US, in conjunction with the RIAC instructor team, to make safety a top priority.

In a second study, reliability analysis and review by the RIAC at each of the three levels of Naval Aviation Maintenance resulted in three recommendations that could improve on-aircraft performance and reduce Fleet Maintenance costs for the F/A-18 A/D Attitude Reference Indicator. The items noted were (1) requirements to bring the Depot-Level Maintenance Manual in line with best available commercial practices, (2) provide training to Depot Artisans in accordance with these revised procedures and, arguably most important, (3) that Depot Artisans perform all maintenance requirements called out in the current Maintenance Manual, including rotor balancing. The problem had manifested itself as a significant reason-for-removal at the Organizational Level. Based on expected conformance to these recommendations, and the projected workload, the savings predicted for the Indicator was $182,287 in direct labor cost avoidance over the next seven years. The RIAC team has over 15 years' experience in performing similar types of analyses on a wide range of aircraft/systems/subsystems/components, including C-130, P-3, E-6, E-2, EA-6B, F-15, and B-52 aircraft; engines; landing gear; structural components; refueling systems; mechanical systems; and avionics systems. Analyses completed on these systems has resulted in total cost avoidance that exceeds $42M.

For additional information, products and services, please contact RIAC:

Reliability Information Analysis Center
6000 Flanagan Rd. Suite 3
Utica, NY 13502-1348
Phone: 866.363.RIAC (7422) – Toll free
315.351.4200
Fax: 315.351.4209
Email: inquiry@theRIAC.org
Web: http://iac.dtic.mil/riac

Detection *cont.*

North American Technology and Industrial Base Organization (NATIBO)

http://www.acq.osd.mil/ott/natibo/

Biological Detection System Technologies Technology and Industrial Base Study

http://www.acq.osd.mil/ott/natibo/docs/BioDetectReport-2.pdf

DEPARTMENT OF ENERGY (DOE) NATIONAL LABORATORIES

http://www.energy.gov/

Lawrence Livermore National Laboratory

http://www.llnl.gov/

Reducing the Threat of Biological Weapons

http://www.llnl.gov/str/Milan.html

Sandia National Laboratories

http://www.sandia.gov/)

Sandia's Homeland Security & Defense Web screen links to "Publications and Fact Sheets". Additional detection and sensor information can be found under Science, Technology, and Engineering.

Publications and Fact Sheets

http://www.sandia.gov/mission/homeland/factsheets/index.html

Oak Ridge National Laboratory (ORNL)

http://www.ornl.gov/

SensorNet® *Nationwide Detection and Assessment of Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) Threats*

http://www.sensornet.gov/index.html

eMedicine

http://www.emedicine.com/

CBRNE-Chemical Detection Equipment

http://www.emedicine.com/emerg/topic924.htm

2006 NBC Product and Services Handbook

http://www.braddocksmithgroup.com/handbook_06.html

Sponsored by the NBC Industry Group, this handbook has a section on "Contamination Avoidance" and fact sheets on equipment items listed in the publication.

This article is a survey of Web resources. If any resource presented here was incomplete or incorrect as presented, the CBIAC would welcome a brief article presenting a more complete overview of your organization's detection or other CBRNE Defense mission and resources.

1 2 3 4 5

Photos courtesy of JPEO-CBD:

1. JPEO-CBD Joint Biological Standoff Detection System Fact Sheet
3. JPEO-CBD Artemis Standoff Chemical Detection Agent Detection System Fact Sheet

Photos courtesy of DefenseLink:

2. DoD photo by SGT MAURICIO CAMPINO, Image ID: DMSD0407463
4. DoD photo by LCPL HENRY S. LOPEZ, USMC, Image ID: DFSD0201536
5. DoD photo by SSGT JUSTIN D. PYLE, USAF, Image ID: DMSD0404782

Systems Engineering *cont.*

and evaluation process, the overall risk and cost is minimized. The incremental material, assembly and vehicle testing process is shown in Figure 3.

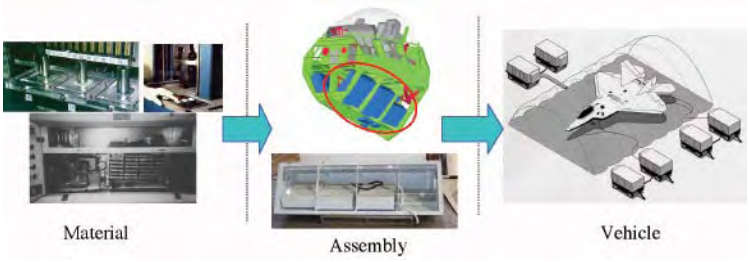


Figure 3- Incremental CB Testing

System-level tests can provide significant insight based upon direct measurements of temperature, decontaminate and contaminate concentration, and air-flow velocity. Vehicle-level tests select a limited number of sampling points. Modern computers and software tools provide new options to predict results on all surfaces within complex geometric shapes, such as aircraft. By using assembly-level and system-level tests to calibrate computer simulations, system engineers are expected to obtain high quality predictions. The combination of testing and advanced computing methods is expected to reduce overall test schedule, cost and risk.

Conclusions

System engineering concepts are applied to establish a low-risk acquisition approach to design systems to survive CB threats. A well-formed acquisition program establishes Mission and Threat Vignettes, Warfighter Requirements, and Performance-Based Specifications. A well-written CB performance-based specification for compatibility, hardening, and decontamination requires significant insight of the threat, warfighter needs, and design processes. Early establishment of these critical elements is vital to the success of acquisition programs.

VSE material data against CB live agents, simulants, and decontaminants is critical to VSE designers. The generation of material data is a long-lead task and historically is not available when it is needed. Hardness and decontamination information for VSE material data is required well in advance of the system design team.

Utilizing system engineering principles reduces program schedule, costs, and risks by incrementally escalating testing from small material tests, to assembly-level tests, to full-up system-level tests. This build-up approach demonstrates results at the material level (lowest complexity), at assembly level (modest complexity), and concludes at the system level (highest complexity).

For further information, contact William Stewart at william.stewart4@wpafb.af.mil

This article also appeared in the Fall 2006 issue of ***Aircraft Survivability.*** *http://www.bahdayton.com/SURVIAC/asnews.htm.*

References

1) DoD Instruction: Number 5000.2- Operation of the Defense Acquisition System. May 12, 2003. USD(AT&L)

2) Nuclear, Biological and Chemical (NBC) Defence Factors in the Design, Testing and Acceptance of Military Equipment. AEP-7 (Edition 4). September 2000.

3) Pedigree Database Document Set: Effectiveness Series- Survivability Subdocument, Vulnerability Subgroup, Volume 3: Chemical Hardening. Version 96-03-03. 25 January 2000.

4) The Medical NBC Battlebook. USACHPPM Tech Guide 244. July 1999

CBIAC Ends 2006 with 20th Anniversary Celebrations and Cogswell Award Presentation

In 2006, the CBIAC celebrated its 20th Anniversary of service to the Chemical, Biological, Radiological, and Nuclear (CBRN) Defense and Homeland Security communities and was also honored to be one of the recipients of the Cogswell Award for excellence in industrial security. Appropriate celebrations of each of these accomplishments brought nostalgic moments for the CBIAC and its staff as 2006 came to a close.

On November 3, 2006, CBIAC staff members and guests came together for dinner at a local restaurant to share history and anecdotes. Past directors of the CBIAC, Mr. Francis (Fran) Crimmins and Mr. James McNeely each shared the early adventures of developing and operating the CBIAC. Mr. Crimmins, the first Director of the CBIAC, now retired, described the early efforts of the first CBIAC staff members to turn a concept for a dedicated Chemical and Biological Defense Information Analysis Center into a reality. Jim McNeely, the second Director of the CBIAC, brought to light the challenges that faced the earliest staff members. Ron Evans, the current Director of the CBIAC, acknowledged the CBIAC commitment to excellence in industrial security that earned the CBIAC the Cogswell Award.

Left to Right: Francis (Fran) Crimmins, first Director of the CBIAC; Ron Evans, current Director of the CBIAC; and Jim McNeely, second Director of the CBIAC.

On December 7, 2006, the celebrations continued with an Open House at the CBIAC main office on the Edgewood Area of Aberdeen Proving Ground (APG), Maryland. Mr. Ron Evans, Director of the CBIAC, provided opening remarks as he welcomed visitors and introduced the guest speakers.

Mr. Christopher Forrest, Regional Director of the Defense Security Services (DSS) presented the Cogswell Award to the CBIAC. Dr. James King, Deputy Director of the CBIAC and CBIAC Facility Security Officer (FSO) accepted the Cogswell Award on behalf of the CBIAC and its security officers.

Guest speakers Dr. Ray Mackay, Director, Research and Technology, Edgewood Chemical Biological Center (ECBC), U.S. Army Research, Development, and Engineering Command (RDECOM), and Mr. Terry Heston, Program Manager, Information Analysis Centers, Defense Technical Information Center (DTIC), spoke about the significant role the CBIAC has played in supporting the DoD CBRN and Homeland Defense communities over the last two decades.

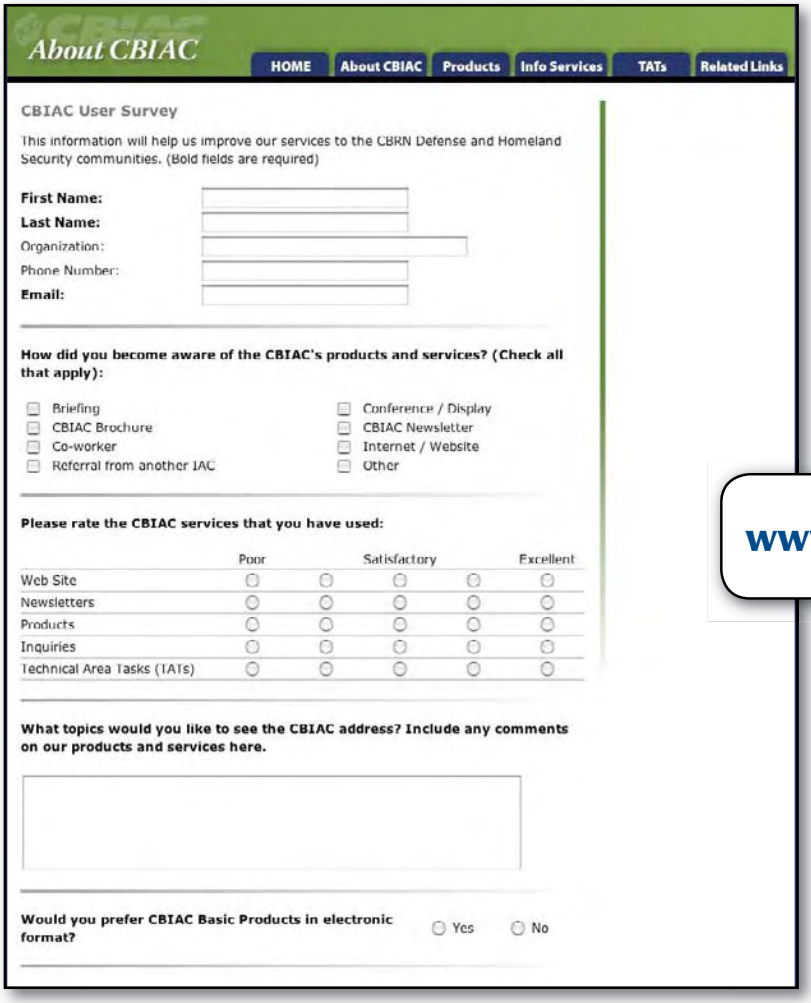
Mr. Evans took a moment to acknowledge one staff member, Ms. Jeanne Rosser, who was part of the starting CBIAC team, and is now the Coordinator of the CBIAC Inquiry and Referral Services. At the end of the presentation, guests had a chance to meet the CBIAC staff, acquire CBIAC and DTIC introductory materials, and enjoy light refreshments.

DSS presents the Cogswell Award to the CBIAC.
Left to Right: Mr. Christopher Forrest, DSS Regional Director, and Ms. Vanessa Williams, Industrial Security Representative, DSS; Ms. Jeanne Rosser, CBIAC Inquiry Analyst/ Inquiry Coordinator and CBIAC Alternate Facility Security Officer (AFSO); Mr. David Benna, CBIAC Alternate Information System Security Officer (AISSO); Dr. James King, CBIAC Deputy Director and CBIAC FSO; and Mr. Faisal Hussain, CBIAC Information System Security Officer (ISSO).

Dr. James King, CBIAC Deputy Director, and Mr. Christopher Forrest, Regional Director, DSS make the first cut of the cake celebrating the Cogswell Award.

Photos courtesy of Edgewood Chemical Biological Center (ECBC).

Dr. Ray Mackay, Director, Research and Technology, ECBC, Mr. R. Paul Ryan, DTIC Administrator, and Mr. Terry Heston, Program Manager, Information Analysis Centers, DTIC, make the first cut of the cake celebrating the CBIAC 20th Anniversary.



2007 User Survey

Help us develop CBRN defense information resources of value to our user community by completing our online user survey.

www.cbiac.apgea.army.mil/about/survey

CBIAC
Aberdeen Proving Ground – Edgewood Area
P.O. Box 196
Gunpowder, MD 21010-0196

Presorted
First-Class Mail
U.S. Postage
Paid
Edgewood, MD
Permit No. 15