

Edgewood Chemical  
Biological Center

**2000**

**Annual  
Report**

Finding the solutions to providing total chemical and biological protection to our warfighters and to U.S. interests makes for an arduous journey. We made significant progress in the year 2000 travelling down our road to success. This report provides insight to some of our major achievements this year in light of our three strategic goals. This has been a sound financial year allowing for key promotions and hiring personnel to significantly enhance our biotechnology capabilities. I look forward to an even better year in 2001.

# *Table of Contents*

<b>Director's Message</b>	2
<b>Mission and Vision Statement</b>	3
<b>ECBC Today</b>	4
<b>Financial Overview</b>	7
<b>Goal 1: An Exceptional Work Force</b>	13
Army's R&D Achievement Awards	14
Increased Biological Expertise	14
The Hammer Award	15
Sharing Expertise with the Community	16
Marine Corps Team at ECBC	17
2001 Congressional Science Fellow	17
<b>Goal 2: Apply the Best Science and Resources</b>	19
Biological Integrated Detection System P3I	20
Biological Attack Warning System (BAWS)	21
Critical Reagent Repository	22
Low Level Toxicology	22
Transportable Glovebox and Filtration System for MALS	23
Forensic Analytical Center CB Sampling Kit Development	23
Assembled Chemical Weapons Assessment (ACWA)	24
Restoration of Formerly Used Defense Sites	25
United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) Support	26
Special Programs – Combating Terrorism	26
EPA Environmental Response Team	27
Respiratory Standards Development for Domestic Preparedness Operations	28
Nanoreactor-Based Topical Skin Cream	28
Rapid Prototyping	29
Sustainment of Chemical Defense Equipment	29
Integrated Materiel Management Center (IMMC) Matrix Support	30
<b>Goal 3: Manage Critical Resources</b>	33
Chemical Surety Inspection for the DOJ	34
Engineering Data Management System	34
International Cooperation Strategy	35
Technology Transfer	35
Cooperative Defense Initiative (CDI)	36



Dear Stakeholders,

I am pleased to present to you the Edgewood Chemical Biological Center (ECBC) 2000 Annual Report. This report is for our customers, our employees, and our industrial and academic partners. The year 2000 was marked by significant hirings in the biological sciences and with promotional opportunities across all categories of the workforce. It was a good year financially. We increased revenues by 46% from last year, kept our cost of doing business down, and were able to make modest but important infrastructure additions. The Annual Report describes major accomplishments in calendar year 2000 in pursuit of our three overarching strategic goals.

- 1 – Establish an exceptional workforce of government, academia and industry that embraces and is optimized to meet the changing needs of our customers.
- 2 – Ensure the application of the best science, technology and engineering to solve the needs of our customers.
- 3 – Develop effective tools and support systems for the management of critical resources.

The expertise of our **PEOPLE** is the reason ECBC is able to deliver appropriate CB solutions to our customers. ECBC has an outstanding cadre of scientists and engineers who have dedicated their lives to a public service that ultimately saves the lives of our warfighters and protects our national interests. Many of the accomplishments of our scientists and engineers received public recognition this past year and I am proud to share some of those recognitions with you in this report. This report also makes note of our community service outreach programs. ECBC people also give their time and talents to the community.

Today there is serious concern about chemical and biological warfare and terrorist attacks on our homeland. ECBC can be depended upon to provide the needed products and “expert” services. ECBC developed and fielded a significantly improved biological detection system, which will provide critical defense against battlefield biological attacks. Our scientists, engineers and technicians have worked diligently this past year to advance the state of the art in chemical and biological defense technologies. In the year 2000, we continued to support efforts in domestic preparedness, chemical demilitarization, and CB counter-terrorism.

ECBC has a unique mission: “Protect the warfighter and U.S. interests through the application of science, technology, and engineering in chemical and biological defense.” This report demonstrates that we accomplished our mission in the year 2000. On behalf of the ECBC management team, I want to thank our stakeholders for the contributions you made this past year.

J. H. ZARZYCKI  
Director, Edgewood Chemical Biological Center  
Technical Director, SBCCOM RDEC



# ***Mission Statement***

"Protect the warfighter and U.S. interests through the application of science, technology and engineering in chemical and biological defense"



# ***Vision Statement***

"The source of choice for chemical and biological defense research, development and acquisition"

# *ECBC - Today*

## People

A diverse workforce of nearly 1,000 employees with a wide variety of scientific, engineering, and technical support disciplines forms the Edgewood Chemical Biological Center (ECBC) located in the Edgewood Area of Aberdeen Proving Ground, Maryland.

An organizational grandchild of the old Edgewood Arsenal, ECBC is a world leader in applying state-of-the-art science, technology, and engineering to chemical and biological defense problems. ECBC provides CB solutions to the warfighter and to U.S. civilian authorities at all levels of government. Traditionally strong in chemical warfare defense related disciplines, recently ECBC has accelerated expansion of capabilities in the biological sciences, bio safety, and biotechnology. Simultaneously in the late 1990's, ECBC engineers and acquisition specialists fielded important biological warfare defense systems.

## Organization

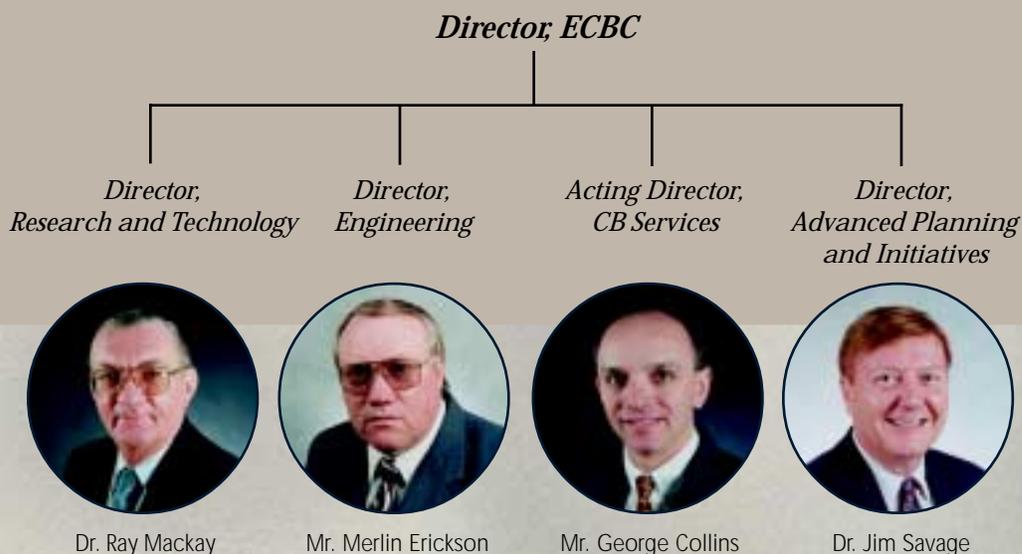
## Organization

ECBC is organized into four directorates. Research and Technology (R&T) Directorate is the source of chemistry, biology, toxicology, and aerosol physics expertise for CB solutions. R&T couples basic science with engineering to identify technology for future development.

Engineering Directorate personnel develop and improve transitioned technologies, resulting in the production of end items that are fielded to the joint forces to increase operational effectiveness on the battlefield. State-of-the-art engineering capabilities such as Computer Aided Engineering (CAE)/Computer Aided Design (CAD)/Computer Aided Modeling (CAM) and toxic/environmental test chambers are used to facilitate development and production activities. Engineering Directorate leads ECBC efforts in Weapons of Mass Destruction (WMD) Domestic Preparedness.

The CB Services Directorate provides a full range of chemical surety and biological materiel management services. The directorate applies its CB agent handling experience and chemical weapons expertise to address munitions clearing and demilitarization problems, assess and reduce risk posture, support CB agent operations, and develop risk management standards.

The Advanced Planning & Initiatives (AP&I) Directorate ensures that ECBC's technological expertise is transitioned to organizations outside the Department of Defense including other government agencies, industry, and our allies throughout the world. AP&I manages an extensive program of international scientific and technical collaboration in CB defense on behalf of the Joint Services.



## PM Matrix Support

ECBC activities span the CB defense equipment life cycle. R&T Directorate performs basic and applied research that allows technology to transition to the Program Management (PM) Offices. The Engineering Directorate provides the acquisition qualified technical talent to the PMs to manage product maturation and production. Other members of Engineering Directorate work hand in hand with SBCCOM's Integrated Materiel Management Center at Rock Island to sustain fielded items. In this process, ECBC provides the matrixed services of over 300 scientists, engineers, and support personnel to the Project Manager for Nuclear, Biological and Chemical Defense Systems (PM-NBCDS), Program Manager for Chemical Demilitarization (PMCD), Program Manager for the Assembled Chemical Weapons Assessment (PM ACWA), and the Joint Program Office for Biological Defense (JPO-BD).

The PMs also reach back to ECBC for the underpinning science supporting programs and to perform modeling and simulation, rapid prototyping, and limited production.

## Customers

An irreplaceable national asset, ECBC counts among its customers nearly every federal agency. Many of these agencies look to ECBC to support their efforts in combating terrorism. For Example, as the Department of Defense focal point for all United Nations support in chemical and biological related matters, ECBC provides chemical and biological specific training, advice, and planning to the U.N. Monitoring and Verification Inspection Center.

## Infrastructure

ECBC's infrastructure of laboratories, chambers, computer systems, and fabrication facilities not only support PMs but also respond to other national security needs. The most recent ECBC infrastructure addition is the "Critical Reagent Program (CRP) Repository" (a repository to store and validate all immunological and DNA-based biodetection reagents). ECBC's facilities are operated by well-trained, experienced workers to ensure national defense needs are met in a safe and environmentally responsible manner.

## Essence

While many agencies and organizations today are engaged in matters related to chemical and biological weapons, it is ECBC that remains the "hands on" development and applications leader. ECBC is a dedicated workforce continuing a proud 84-year tradition in chemical and biological warfare defense.



# *Financial Overview*

The funding summary chart shows an overall increase to our funding from last fiscal year (FY) of \$58.2M or almost 46%. The Center's mission funding increased by 18%. By far the largest increase 79% or \$45.7M was associated with funding from customer programs. Our increased customer revenues demonstrated our focus on customer satisfaction.

### Appropriation (\$ in Millions)

	FY00	FY99	FY98
<b>Army Funding</b>			
Basic Research	1.3	1.2	1.4
Exploratory Development	4.6	5.6	4.0
Demonstration and Validation	0	0	0
Management and Support	4.0	3.3	6.5
<b>RDTE Total</b>	<b>9.9</b>	<b>10.1</b>	<b>11.9</b>
<b>Army OMA</b>	<b>7.8</b>	<b>8.4</b>	<b>9.4</b>

**Total Army Funding**                      **17.7**      **18.5**      **21.3**

### OSD Funding

Basic Research	2.3	2.3	2.1
Exploratory Development	40.0	25.5	34.9
Advanced Development	6.3	11.1	9.1
<b>RDTE Total</b>	<b>48.6</b>	<b>38.9</b>	<b>46.1</b>
<b>OSD PROC</b>	<b>13.8</b>	<b>11.2</b>	<b>5.2</b>
<b>OSD DARPA</b>	<b>1.6</b>	<b>0.6</b>	<b>0.3</b>

**Total OSD Funding**                      **64.0**      **50.7**      **51.6**

**Mission Funding**                      **81.7**      **69.2**      **72.9**

### Customer Funding (\$ in Millions)

	FY00	FY99	FY98
RDTE	32.4	24.2	17.6
OMA	54.7	21.3	17.1
PROC	8.3	5.2	2.2
Other	7.9	6.9	6.3

**Customer Funding**                      **103.3**      **57.6**      **43.2**

**Total Funding**                      **185.0**      **126.8**      **116.1**

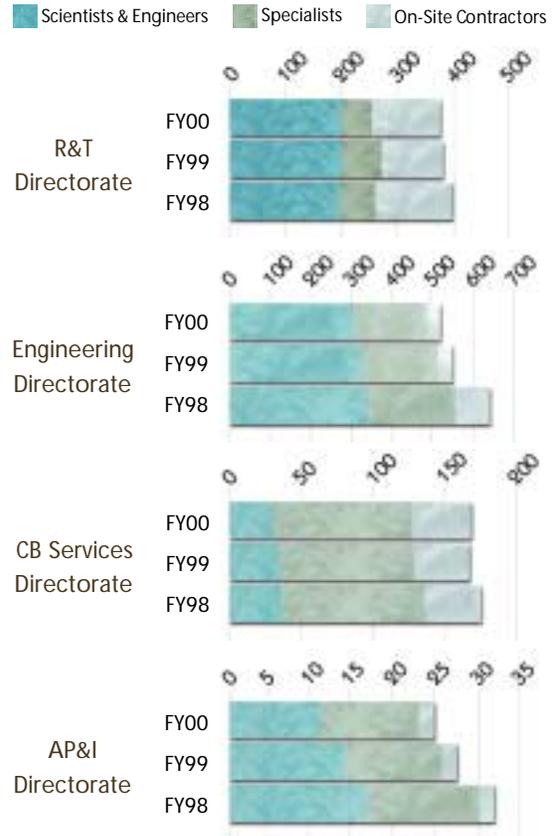
### ECBC Major Customer Accounts (\$ in Millions)

Domestic Preparedness	28.8
Program Manager Chemical Demilitarization	20.1
Huntsville Engineering Support Center	6.5
Navy	4.9
Department of Justice	4.9
Defense Threat Reduction Agency	4.6
Integrated Materiel Management Center	3.8
Airforce	3.8
Intelligence Community (FBI, CIA, NSA, etc.)	3.6
SBCCOM PM	2.6
<b>Subtotal</b>	<b>83.6</b>
<b>Others</b>	<b>19.7</b>

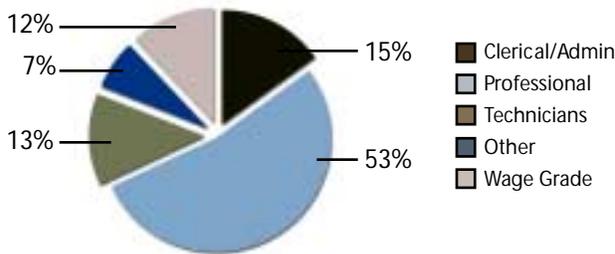
**Total**                      **103.3**

**Number of Personnel**

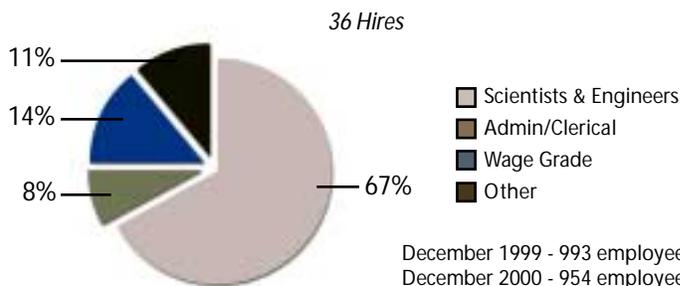
	FY00	FY99	FY98
<b>R&amp;T Directorate</b>			
Scientists & Engineers	211	212	205
Specialists	57	72	68
On-Site Contractors	126	115	143
<b>Engineering Directorate</b>			
Scientists & Engineers	323	343	364
Specialists	193	203	230
On-Site Contractors	33	34	88
<b>CB Services Directorate</b>			
Scientists & Engineers	32	36	40
Specialists	104	102	107
On-Site Contractors	46	42	42
<b>AP&amp;I Directorate</b>			
Scientists & Engineers	12	15	18
Specialists	13	13	15
On-Site Contractors	2	2	2



**Promotions (Temporary & Permanent)**



**Hires During 2000**



**Grade Level Evaluation of Research and Experimental Development Positions (Factor IV):**

As an Army Laboratory, ECBC uses the Factor IV process to reward scientists and engineers for their specific innovative contributions and achievements. Factor IV is a system used to evaluate the impact of the "person-in-the-job" and provides a technical ladder for promotion opportunities. Creativity and originality are of central importance in a research/experimental development situation with the extent to which these qualities are actually brought into play is dependent upon the incumbent. A panel of technical experts uses the Office of Personnel Management (OPM) Research Grade Evaluation Guide and the OPM Experimental Development Grade Evaluation Guide as guidelines in evaluating those qualifications and individual contributions. ECBC currently has 123 individuals in the Factor IV system (108 Research/ Experimental Development positions) . During FY00, two individuals were promoted to the GS13 level and three were promoted to the GS14 level.

FY00 Funded Program (\$ in Millions)

**Labor Obligations**

Civilian Pay, Full-Time Permanent	37.1
Civilian Benefits, Full-Time Permanent	7.7
Civilian Pay, Full-Time Temporary	0.5
Civilian Pay, Part-Time	0.2
Other Labor	0.1
<b>Total Labor</b>	<b>45.6</b>

**Non Labor Obligations**

Travel and Transportation of Persons	2.3
Other Contractual Support	70.4
Supplies and Materials	6.2
Service Charge Functions	28.3
Equipment	14.0
<b>Total Non Labor</b>	<b>121.2</b>

**Total Labor & Non Labor Obligations 166.8**

**Carryover 18.2**

**Total Program 185.0**

ECBC Infrastructure

Capital Equipment (Science & Engineering)

Capital Asset Acquisitions FY00: \$1.8M

*Bioprocessing System*

*Rapid Prototyping Machine*

*Benchtop Mass Spec*

*Sequencer*

Capital Asset Acquisitions FY99: \$.95M

Capital Asset Acquisitions FY98: \$1.9M

**Science & Engineering Equipment FY00: \$43M**

Facilities

869,471 square feet laboratories

279,932 square feet admin

284,054 square feet storage

**Total square feet-1,589,469**

Unique Facilities

Berger Lab Complex (high bays, chem labs, engineering labs and admin)

BL3 Suite

Smoke Breeze Tunnel

CB Forensic Analytical Center

Critical Reagent Program Repository

Chemical Transfer Facility

Design Evaluation Lab

Electro-Optics Lab

M-field Environmental/Field Testing Areas

Experimental Aerodynamics

Hazardous Materiel Explosion Areas

Individual Protection Equipment Lab

McNamara Life Sciences Research Lab

Microland

Process Engineering Facility

Pyrotechnics Building

Respirator Prototyping Lab

Rubber Lab

Special Containment Facilities

Wet Chemistry Lab



Design Evaluation Lab



Pyrotechnics Building



Microland



Smoke Breeze Tunnel

# GOAL

An exceptional workforce of government, academia and industry that embraces and is optimized to meet the changing needs of our customers.



*Hammer Award Ceremony*

## Army's R&D Achievement Awards

Eight ECBC personnel received the U.S. Army Research and Development (R&D) Achievement Award at the 22nd Army Science Conference in December 2000. The U.S Army R&D Achievement Award is a very prestigious award bestowed in recognition of outstanding technical achievements that have resulted in significantly improving U.S. Army capabilities to the nation's welfare.

For his work with nanoreactor-based topical skin protectant creams, Dr. H. Dupont Durst, a Research Chemist at ECBC, joined colleagues Dr. Ray Yin of the U.S. Army Research Laboratory and Captain Stephen T. Hobson, Ph.D. of the U.S. Army Medical Research Institute of Chemical Defense as award winners. This team designed a novel approach that uses nanoscale reactors to tackle the problem of preventing chemical agents from penetrating human skin.

For their work with the Biological Attack Warning System (BAWS), the ECBC team of Dr. Richard Smardzewski, David Sickenberger, Felix Reyes, J. Michael Cress, and Karen Vado also took home Army R&D Achievement Awards. This team developed a lightweight, easy deployable BAWS to protect an area approximately 30km by 30km for a 300-day mission.

Finally, for their contributions towards the Pre-Planned Product Improvement (P3I) - Biological Integrated Detection System (BIDS), Mr. Bruce Jezek and Mr. Patrick Berry of ECBC were honored with this distinguished achievement award. P3I BIDS allows the soldier to detect and identify twice the number of biological agents in half the time of its predecessor technology.

## Increased Biological Expertise

Through recruitment and training efforts, we continue to improve our workforce to meet the changing needs of our customers in the biological arena. ECBC has recently hired several personnel with biological experience including a world class bio scientist to lead these efforts.

Dr. Jose-Luis Sagripanti brings BL3 experience as well as experience from the Food and Drug Administration (FDA) and the National Institutes of Health (NIH). Dr. Sagripanti is an S&T hire, only 1 of 33 S&T positions in the U.S. Army. The BL3 lab will have several unique qualities, including a high surety level and integration with a variety of biological and chemical research capabilities. The BL3 will allow cutting edge Army research on pathogens of military interest, leaving enough installed capacity to perform work for other government agencies or private companies. Dr. Sagripanti will be running the BL3 lab along with two newly hired GS13 microbiologists, who have BL3 experience, Jim Rogers and Lisa Collins. Phil Koga was hired as a Senior Team Leader with experience in BL3 and cGMP (Good Manufacturing Practices).

## The Hammer Award

Our Domestic Preparedness Team recently received the “Hammer Award.” This award was established by former Vice President Al Gore as special recognition of a team of federal employees (not individuals) who make significant contributions in support of former President Clinton’s National Performance Review principles. These principles include putting customers first, cutting red tape, empowering employees, and getting back to the basics. The Hammer Award was Gore’s answer to yesterday’s government and its \$400 hammer. Fittingly, the award consists of a \$6 hammer, a ribbon, and a note from Gore, all in an aluminum frame.



The Domestic Preparedness (DP) Team that received this Hammer Award is the result of a federally-funded effort mandated by the Nunn-Lugar-Domenici legislation of 1997, to decrease our CB terrorism vulnerability. The World Trade Center bombing of 1993 and the Oklahoma City bombing of 1995 exemplified our vulnerability to acts of terrorism involving weapons of mass destruction.

Our DP Team was recognized for breaking new ground in knowledge transfer, instruction techniques, and interagency cooperation. The leadership of the DP program enabled six partnering federal agencies (Department of Health and Human Services [DHHS], Federal Emergency Management Agency [FEMA], Department of Justice [DOJ], Department of Energy [DOE], Environmental Protection Agency [EPA], and Department of Defense [DoD]) and their regional representatives to network with local community emergency responders and establish crucial working relationships that will prove to be invaluable during future incidents, emergencies, and projects requiring collaboration between federal, state and local authorities. The Domestic Preparedness program was designed and executed to achieve the most significant impact on the safety of America’s population with the most efficient use of federal, state and local resources. They pioneered a new way for government agencies to interact in the next century.



# Sharing Expertise with the Community

## Volunteers for Medical Engineering Team

In addition to our commitment to sharing chemical and biological expertise with our armed services partners, ECBC maintains a strong philanthropic commitment to helping its surrounding community. In November 2000, ECBC's Volunteers for Medical Engineering (VME) Team received the VME Team of the Year award at the annual awards banquet, held in the Fire Museum of Maryland. VME's mission is to improve the independence of individuals with disabilities through the use of innovative engineering.

ECBC partnered with the Center for Health Promotion and Preventive Medicine workforce and members of the Harford and Cecil County communities to form a VME team to design and create innovative medical and supportive devices for senior citizens and those with disabilities. Team members design and make devices on their own time. The VME team, now in its third year of existence, had 18 volunteers from ECBC lending their expertise in the year 2000. Taking the opportunity to "give back" to those in need has certainly made a difference, with the ECBC VME Team completing and delivering nine projects in such a short period of time.



Wheelchair backpack designed to allow a handicapped high school student easy access to her school materials. The backpack is a front-mounted tray that tilts up with the touch of a button to open for easy access for the student.

## Kids and Chemistry

Not only do members of ECBC reach out to meet the needs of senior citizens and those with disabilities, our personnel also take the opportunity to give back to the next generation of scientists and engineers. Kids & Chemistry is an outreach program developed by the American Chemical Society (ACS) to give scientists the resources and training necessary to share hands-on science with children ages 9 to 12, focusing on 5<sup>th</sup> graders in local schools.

Over the course of the year, more than 25 ECBC volunteers visited local elementary schools on several occasions and conducted hands-on experiments for captive audiences. ECBC volunteers took their show on the road and participated in Kids & Chemistry activities at the American Chemical Society Convention in Washington D.C. Judging by the smiles on children's faces and positive feedback received by volunteers, this activity has been a tremendous success. ECBC intends to continue this spirit of service by providing children with fresh opportunities to understand the world through the eyes of a scientist.

## Marine Corps Team at ECBC

At the request of the USMC, a team of ECBC engineers and scientists was established to provide expertise to the Program Manager for Nuclear Biological and Chemical Combat Support Logistics Equipment (CSLE). The ECBC multi-disciplined team has a broad scope of responsibilities addressing USMC NBC areas in consequence management, contamination avoidance, collective protection, and decontamination.

ECBC engineers and scientists will manage select NBC projects; represent Marine interests at Joint Service acquisition programs; assist current Marine project staff by providing technical assistance to Marine decision makers; and coordinate technical work at SBCCOM for the Marines.



## 2001 Congressional Science Fellow

The Congressional Science Fellows Program was created by the Society of Toxicology to provide scientific expertise in governmental decisions related to toxicology. ECBC was honored this past year to have an esteemed member of its scientific community selected for this prestigious program.

Dr. Harry Salem, Chief Scientist at ECBC and member of the Society of Toxicology, was selected to serve as the Society's 2001 Congressional Science Fellow. He brings a wealth of credentials to the experience including Master and Doctoral degrees in Pharmacology from the University of Toronto. He also has extensive teaching experience and is widely published in his field. Dr. Salem has often worked with a range of federal agencies and departments and currently serves as DoD's representative on the Interagency Coordinating Committee for the Validation of Alternative Methods and the Interagency Committee on Neurotoxicology. Dr. Salem is the third Fellow from ECBC sponsored by the Society of Toxicology.



# Goal 2

Effective processes that ensure the application of the best science, technology and engineering solutions for our customers.



*ECBC Laboratory*

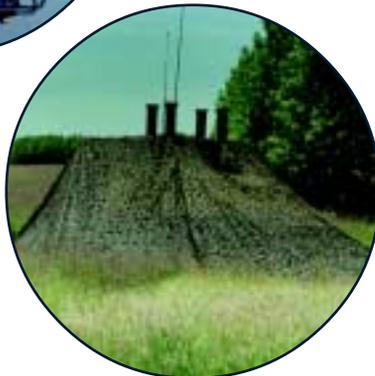
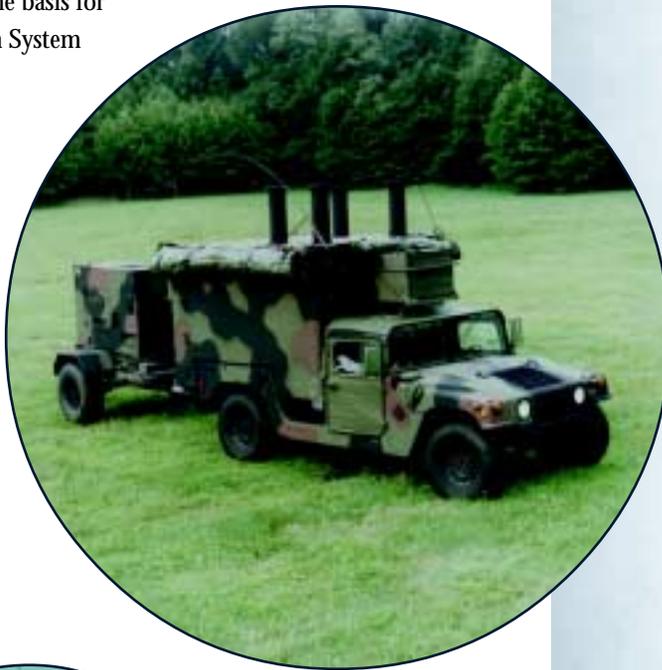
# Biological Integrated Detection System P3I

A significant accomplishment this past year was the completion of the M31A1 Biological Integrated Detection System (BIDS) Pre-Planned Product Improvement (P3I) acquisition program. The BIDS P3I is the U.S. Army's second-generation biological detection system, providing a complementary, multicomponent biological detection and identification system. This system has significantly enhanced the U.S. Army's biological defense capability by advancing the sensor technologies and data fusion methodologies used in the first generation system. The ECBC personnel developed, integrated, and produced the 42 BIDS P3I in-house, beginning in 1996.

The culmination of this effort occurred in April 2000 with the successful delivery of the BIDS P3I to the U.S. Army 7th Chemical Company, Ft. Polk, LA, and the U.S. Army Chemical School, Ft. Leonard Wood, MO.

The P3I BIDS allows the soldier to detect and identify twice the number of biological agents in half the time of the non-developmental item (NDI) system. Many of the components in the P3I BIDS are being considered for direct integration into allied detection systems or for improvement to meet future U.S. requirements.

In addition, the BIDS technologies established the basis for the design of the Joint Biological Point Detection System (JBPDS), a next-generation system under development to meet U.S. Joint Service requirements. These technological advancements have also contributed to the national welfare in that they have direct applications to environmental monitoring and medical diagnostics.



# Biological Attack Warning System (BAWS)

The completion of the BAWS Advanced Technology Demonstration Program is our most significant technology effort in the past year, transitioning several technologies to PM development programs. The system employs a 2-tiered state-of-the-art network of lightweight, remote, battery/vehicle-powered sensors radio frequency-linked to a small, briefcase-sized central base station, which graphically displays the GPS-positions of each remote sensor, alarm status, and meteorological conditions. This system provides early warning to a fixed installation of a biological warfare attack.



The Tier I sensors are highly sophisticated remote aerosol particle counters with on-board GPS, wind speed and wind direction indicators, full duplex telemetry, aerosol samplers, data-handling and an optional interface to the standard M22 Automatic Chemical Agent Detector Alarm (ACADA). Using field-tested algorithms, they alert to a sudden increase in

aerosol particle concentration that would occur from a close in scud/bomblet attack. The

Tier II sensors employ sophisticated 3-channel MicroUV-laser based aerosol particle discriminators designed to detect, in high ambient backgrounds, low agent particle concentrations such as those expected in a large area biological attack (UAV, aircraft, speedboat). They also serve the secondary mission of an unmasking indicator. The final sensor in the BAWS is the Automated DNA Detection device that provides a field identification of samples collected by the Tier I sensors. This system will play significantly in the Joint Biological Point Detection System (JBPDS). A reduction in the cost of consumable material will result in a major operating and support cost savings for the field.



The BAWS program resulted in the transitioning of the following technology to major biological development programs:

- Tier-III BAWS transitioned to JPO-BD to be used as a trigger within JBPDS
- Tier-III BAWS recommended by the Restoration Operations ACTD Technical IPT for Portal Shield and may be adopted as overall Portal Shield Program
- The Air Force, Force Protection Battlelab used BAWS to successfully demonstrate C2I initiative during the USAF Joint Expeditionary Force Experiment (JEFX 2000)
- Tier-I array transitioned to Air Force, Force Protection Battlelab and is serving as experimentation platform for expeditionary forces.

## Critical Reagent Program (CRP) Repository

The ECBC recently marked the opening of the CRP Repository at the Process Engineering Facility located at the Edgewood Area of APG. The Joint Program Office for BioDefense (JPO-BD) provided funding for the CRP Repository to store and validate all immunological and DNA-based biodetection reagents for their DoD programs. The Process Engineering Facility provides four labs covering 1215 cubic feet of the facility including a validation lab to perform quality control and quality assurance on antibody and Polymerase Chain Reaction reagents. This facility includes a 1500-gallon liquid nitrogen tank for supplying uninterrupted coolant for archiving hybridoma cell lines as well as remote facility monitoring, a backup generator, and secured access. Programs supported include Portal Shield, Joint Biological Agent Identification and Diagnostic System, and the Joint Biological Point Detection System. The CRP Repository established a Hybridoma Production Lab that will support reagent validation activities and the long-term storage of cryopreserved samples. Our people have worked closely with the biodefense community to foster standardization of methods, accessibility of the information, and validation of processes and products.



## Low Level Toxicology

Probably one of our most important scientific endeavors during the last year is the ECBC Low-level Operational Toxicology Program. This critical work addresses the question of how sensitive chemical agent detectors have to be to measure toxicologically significant effects of the classical chemical warfare agents (CWA). Initial phases of the program focused on GB vapor. These studies were to 1) identify threshold exposure conditions at which toxicologically significant effects occur in laboratory mice and 2) develop models for predicting dose-response effects of low CWA concentrations as a function of exposure duration. These studies examined the effects of varying exposure concentration and duration on the probability of lethality (Phase – I) and miosis (Phase –II) occurring in rats exposed to Sarin (GB) vapor. The onset of clinical signs and changes in blood cholinesterase activity were measured with

each exposure. The results of these studies help fill critical toxicological data gaps and the development of predictive models to address low-level CWA questions for development of chemical defense related materiel. From these results, we will decide if standards need to change to ensure our customer is adequately protected.

Our results were presented at the International Chemical Weapons Demilitarization Conference, The Hague, Netherlands, May 2000, and the Society of Toxicology Meeting, March 2000. An update of these studies will be presented at the NATO Research and Technology Agency “Human Factors & Medicine Symposium: Operational Medical Issues in Chemical and Biological Defense” to be held in Lisbon, Portugal, 14-17 May 2001 and at the 2001 Scientific Conference on Chemical & Biological Defense Research”, Hunt Valley, MD, March 6-8, 2001.

## Transportable Glovebox and Filtration System for MALS

ECBC provided a novel solution to transport questionable CB material while preserving evidence. The Glovebox and Filtration System is a component of the Mobile Analytical Laboratory System (MALS) designed and fabricated in-house for the Consequence Management Program Integration Office (COMPIO). It is a self-contained, transportable system designed to contain unknown materials for analytical screening and classification. The materials could be toxic chemical agents, toxins, or infectious biological materials.

The design of the system resulted from the need to develop improved technology in support of treaty verification inspections under the Chemical Weapons Convention and in response to incidents that pose a credible threat that chemical or biological warfare agents may be used against the general population.

First responders to these incidents generally acquire evidence with little or no reliable information on the makeup of the hazardous substance. Consequently, those first responders must assume the substance is the most toxic material possible within the given scenario until it is proven to be a less toxic material. The transportable glovebox and filtration system is patented and licensed for commercial application. So far, 10 units have been fielded to National Guard, Weapons of Mass Destruction – Civil Support Teams. The system provides greater protection for first responders, the general public, and the environment.

## Forensic Analytical Center CB Sampling Kit Development

The ECBC CB Forensic Analytical Center (CBFAC) developed a CB Sampling Kit, which is being supplied to numerous Federal Government Agencies and to local first responders. The sampling kit was designed and developed under the CBFAC's ISO 9001 quality system and is certified for cleanliness in accordance with ISO Guide 25 accreditation. It meets the most stringent requirements for collecting and preserving evidence that may be introduced in a court of law. To meet the increasing requirements for the kit, ECBC entered into a unique Cooperative Research and Development Agreement with Quicksilver Analytics, Inc. to produce the kit under ISO 9001 and perform the testing in the ECBC CBFAC under its quality system.

All components of the kit are tracked by serial number so that, if needed, analytical data proving cleanliness of each component can be provided on demand. The kit is ergonomically designed to be used in Level A protection. All sample handling and collection components are heat-sealed in Mylar to preclude cross-contamination. Chain-of-custody documentation, accepted by law enforcement agencies, is provided.

# Assembled Chemical Weapons Assessment (ACWA)

The congressionally-mandated Public Law 104-208, ACWA Program calls for the demonstration of alternative technologies to the incineration process for chemical demilitarization of U.S. Army chemical weapons stockpiles. ECBC has supported this initiative since 1999, and our efforts were an essential element in the technical evaluation of proposed demilitarization technologies. In addition to technical expertise, ECBC provided the two toxic agent chambers used to test neutralization technologies. The two chambers used in the ACWA Program can conduct explosive, toxic, and chemical testing in a 32-foot diameter by 20-foot in height contained environment. Each chamber complex includes Resource Conservation and Recovery Act (RCRA) compliant liquid handling and storage systems, exhaust air filtration systems, auxiliary power, data collection instrumentation, and remote systems monitoring and control. Our chambers were used to evaluate several alternate technologies to meet an accelerated schedule set by Congress.

The Gas-Phase Chemical Reduction process, aimed at disposal of contaminated waste, is a non-incineration disposal technology, which was demonstrated in an ECBC test chamber. Testing was conducted on chemical weapons waste streams of liquid and solid waste.

Chamber testing of the Silver II process was conducted with DMMP (dymethyl methylphosphonate), CB (chlorobenzene), VX, HD, and GB. The Silver II Plant is an electrochemical process that used nitric acid, silver nitrate and de-ionized water along with a battery cell to neutralize organic materials through oxidation and electrochemical reduction.



# Restoration of Formerly Used Defense Sites

ECBC continues to provide its services in the area of environmental remediation and restoration. Over the past year, we supported the U.S. Army Corps of Engineers in remediation activities at a number of Formerly Used Defense Sites (FUDS) associated with past CW activity. Projects supported by the ECBC included the following: Operation Safe Removal in Spring Valley, Washington DC; 5th Field Supply Depot in Mong Mong, Guam; and Defense Depot in Memphis, Tennessee.

We supported these projects by developing site-specific plans for monitoring of environmental media (air, water, soil) for agents of concern as well as their break down products. Risk assessment, hazard analyses, and general site safety support was also provided as part of the project planning process. Once all health and safety plans were approved, ECBC personnel were responsible for equipment mobilization and set up as well as all logistics associated with getting the site operational.

Due to the close proximity of each of these work sites to residential areas, we developed improved procedures for the safe removal and disposal of recovered items. The Vapor Containment Systems (VCS) and Miniature Chemical Agent Monitoring System (MINICAMS) monitored the air. The Depot Area Air Monitoring System (DAAMS) provided confirmation and historical monitoring. Open Path Fourier Transform Infrared (OP-FTIR) Spectrometry and DAAMS provided perimeter monitoring. Our personnel provided on-site analytical services for all samples collected during the remedial action and support from laboratory facilities at the Edgewood Area of APG.



## United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) Support

The UNMOVIC was formed to replace the former United Nations Special Commission (UNSCOM) which was tasked with inspecting Iraq. ECBC was tasked to teach UNMOVIC staff how to perform inspections effectively and efficiently by the Security Council. ECBC hosted 50 UN inspectors for 5 days of Chemical Biological Radiological (CBR) Safety and Health training.

The ECBC developed a 3-day CBR Safety and Health training module, which included formal classroom lectures and interactive hands-on practical exercises. Several of our personnel and speakers had participated in UNSCOM inspections in Iraq, and they provided an overview of facilities and inspection methods and lessons learned from their UNSCOM inspections. Interactive practical exercises were conducted at ECBC in a building that closely resembles an Iraqi plant. The students were presented with a “mission” and had to use the skills learned during training to accomplish this practice “mission.” Exercises included donning/doffing various levels of protective clothing, practicing clothing and personnel decontamination, and applying safe work practices.



The ECBC prepared a comprehensive course manual for the United Nations inspectors to understand the operational health and safety issues and specifically, how to protect themselves from potential hazards during inspections. The feedback from the participants, as well as the UNMOVIC staff, was extremely positive and we anticipate additional training being conducted in the near future.

## Special Programs - Combating Terrorism

The ECBC Special Projects team is made up of technical experts in the research, development and engineering disciplines. Technical services and specialized training were provided on very short notice and were available on a 24/7 basis to meet the timing needs of the customers. The team supported three Joint Forces exercises; two company level exercises and the TOPOFF exercise and led 6 training missions. CB equipment sets were purchased and supplied to users to support ongoing missions. These efforts supported the mission of many U.S. agencies charged with roles in defeating terrorism.

## EPA Environmental Response Team

The ECBC entered into an Interagency Agreement (IAA) with the EPA to provide support to its Environmental Response Team (ERT). The IAA provides for assistance in a variety of areas including improved CB monitoring techniques, health and safety protocol development, new technology assessments, and field assistance during emergency response operations where CB agents are known or suspected to be present. The following are tasks accomplished for the EPA during this past year.

- Generated quantitative vapor-phase spectro to facilitate clean-up operations at a Superfund site containing a number of cylinders containing perfluoroisobutylene (PFIB). PFIB is a highly reactive, toxic compound that is derived from the decomposition of Teflon. The generated reference spectra will be used to facilitate perimeter air monitoring during on-site clean up operations.
- Prepared a Health and Safety Standing Operating Procedures (SOPs) to supplement EPA/ERT Superfund guidance documents and 29CFR 1910.120 covering environmental sampling, personal protective equipment descriptions and selection criteria, decontamination requirements and procedures, medical monitoring and immunization requirements and health and safety training requirements.

## Respiratory Standards Development for Domestic Preparedness Operations

In 2000 ECBC, in partnership with the National Institute for Occupational Safety and Health (NIOSH), began to break new ground by developing respiratory standards for equipment exposed to chemical and biological agents. Under regulations pursuant to the Occupational Safety and Health Act of 1970, employers are required to provide emergency responders with personal protective equipment, including NIOSH-approved respirators. Currently, there is no NIOSH program in place to certify respirators for potential terrorist incidents where Biological Warfare Agents (BWA), Chemical Warfare Agent (CWA), and certain Toxic Industrial Materials (TIM) may be involved. Under the Department of Justice Domestic Preparedness program, NIST was charged with developing protective equipment standards for biological and chemical incidents. NIST entered into Interagency Agreements with NIOSH and ECBC in 4QFY00 to develop respiratory system approval standards. NIOSH has the regulatory authority to develop respirator standards, and ECBC is supporting the effort by providing the military technical expertise on respirator performance, quality, and reliability standards and by doing live agent respirator testing with CWA. Standards will be developed based on NIOSH policy decisions and through formal “rule-making” procedures in a process that solicits and encourages public comment. Initial standards for certain classes of respirators are anticipated in approximately 1 year. Once standards are in place, manufacturers may submit their respirator systems to NIOSH for certification and approval testing.

## Nanoreactor-Based Topical Skin Protective Cream

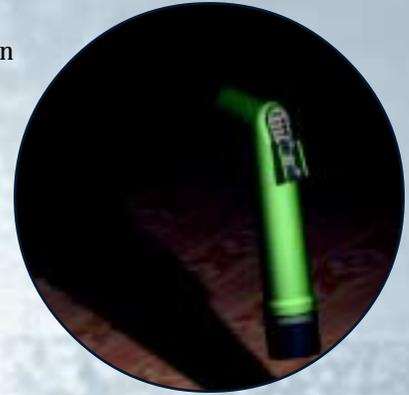
The ECBC Decon Team, ARL and MRICD established a novel approach using nanoscale reactors (nanoreactors) to effectively decontaminate against sulfur mustard (HD), a blister agent that can rapidly penetrate both clothing and human skin. The present Topical Skin Protection (TSP) Cream was modified to incorporate the nanoreactors. A variety of live agent tests (with both liquid and vapor challenges) were performed on nanoreactor-based TSP creams with exceptional results. The new reactive TSP protects against HD vapor and significantly extends the nerve agent protection time, (e.g., 20 hr vs. 4 hr). The nanoreactors are the first and only mild ingredient that works for both nerve and blister agent protection. Only 1% of the nanoreactor material is added into the existing TSP base creams to achieve these results. Due to superior performance, the new reactive TSP will significantly reduce the weight as well as logistics of the current CB protective gear, thus providing a great advancement for the Future Combat Systems.



## Rapid Prototyping

ECBC Computer Aided Engineering Team has developed numerous rapid prototypes in the past year. The following are selected examples:

- The Automatic Chemical Agent Detector Alarm (ACADA) Surface Sampler Probe is a hand-held device for improved point detection and identification of nerve and blister chemical agents. It was conceptually modeled and various configurations were “plotted” as rapid prototypes. At this early stage user feedback was collected by allowing soldiers to get the feel of the concepts. Their preferences were immediately captured; and along with functional and productivity constraints, the resultant product was designed and produced in twelve months.
- The lightweight motor blower for the Apache Aircrew Mask needed to be relocated from crew carried to cockpit mounted with a quick egress mechanism. Conflicting requirements for operation made a single solution difficult. By modeling and rapid prototyping a variety of functional quick-release concepts, the merits and shortcomings of the various approaches could be quickly demonstrated and a customer consensus on the best design was quickly reached.



## Sustainment of Chemical Defense Equipment

During FY2000, ECBC personnel provided services and support required to maintain the operational availability and readiness of standard chemical defense equipment used by all Services to conduct NBC missions. Engineering support was provided to maintain configuration control of the technical data and incorporate changes to address safety, environmental, and source availability deficiencies, and to comply with the new requirements for use of performance specifications in all procurements.

Support to military users was provided to maintain readiness of assigned equipment, and monitoring and tracking of radioactive sources used in chemical agent detectors, in accordance with Nuclear Regulatory Commission License. Numerous production acceptance testing/analyses were conducted of products manufactured for the U.S. Army to include charcoal lots, charcoal filter/canisters and butyl coated chemically protective clothing. Surveillance test/analyses were performed of samples of various size charcoal filters/canisters, samples of agent decontaminating mixtures, samples of decontamination kits, detection kits and detection paper products.

## Integrated Materiel Management Center (IMMC) Matrix Support

The ECBC Engineering Directorate provides matrix personnel to the SBCCOM IMMC at Rock Island, IL. Item managers at the IMMC provide for the long-term sustainment of CBD items to include procuring items to complete fielding; procuring spare parts; managing the war reserve; depot maintenance, storage, and demilitarization of the item. The following are examples of successful accomplishments this year.

### Chemical-Biological Protective Shelter (CBPS) and Chemical Protective Deployable Medical (CPDEPMEDS)

ECBC matrix personnel at Rock Island provide integrated logistics support for the CBPS and the CPDEPMEDS hospital including provisioning, item management, logistics engineering, equipment specialists, and technical manuals services. Significant accomplishments this year included the validation of the maintenance and operating technical manuals; a review of the CBPS Technical Data Package that corrected over 3000 data errors, omissions, and inconsistencies; the assumption of more of the production management function from Natick; development of performance descriptions and specifications for logistics support; and the creation of a final Work Breakdown Structure for logistics support.

### M1 Laser - Ballistic Outsert

A “best value” contracting approach was developed by ECBC matrix mask team at Rock Island for the initial procurement of the M1 laser-ballistic outsert, which fits over the eye lens of the M40 Series Mask. This new accessory item for the M40 Series Mask was released into the military inventory and made available to the soldier this past year. Besides protecting the primary mask eye lens from scratches and other damage, the M1 outsert enhances the soldier's ability to fight in all environments by providing the user two wavelengths of laser protection and protection from low-speed fragments.



## Chemical Defense Equipment Shelf Life Information System

During 2000, ECBC matrix personnel made it easier for the soldier in the field to determine if his chemical defense shelf-life equipment is still serviceable. An interactive shelf-life information system was designed to directly support soldiers and other customers by providing access to a repository of shelf-life data on chemical defense items managed at the Rock Island site. The new interactive system is an internet web-based program that resides on the Army Electronic Product Support (AEPS) network. Users can search the existing database using NSN, lot number, or contract number.

## Chemical Agent Monitor (CAM) and Improved Chemical Agent Monitor (ICAM)

During FY00, the first option of ICAM modification kits was awarded. A total of 435 of these kits were applied to unserviceable CAMs that were awaiting repair in depot storage at Rock Island or obtained by PM-NBC from other services. The modification process conducted at Rock Island involved total disassembly of the CAM, restoring, and shipping to the field.

In addition, the disassembly of the CAMs yielded several high demand parts that were in low supply or on back order.

# Goal 3

Effective tools and support systems  
for the management of critical resources.



*Factor IV Promotions*

## Chemical Surety Inspection for the DOJ

ECBC initiated an Interagency Agreement (IAA) between the DOJ, Office for State and Local Domestic Preparedness Support (OSLDPS), and DoD, which sets out conditions of joint interest to DOJ and ECBC. Under this agreement, ECBC supports the Center for Domestic Preparedness (CDP).

ECBC personnel provided assistance and reviewed all areas of the CDP's chemical agent safety, reliability, security, environmental compliance, accountability, medical surveillance, protective clothing and equipment maintenance, and issue and storage programs. We reviewed all program documents, MOAs with the local hospitals, law enforcement, and emergency response agencies, and SOPs.

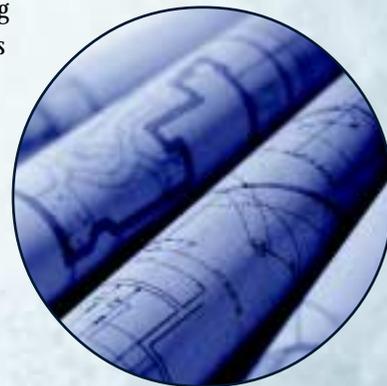


Security exercises were conducted and evaluated. ECBC personnel witnessed 100 percent chemical agent inventories, chemical agent operations, and participated from start to finish in chemical agent training. The CDP, as a component of OSLDPS, houses the COBRATF, which is the nation's premier emergency responder training facility and the only one whose graduates have been trained in a toxic-agent environment.

Under an IAA between the ECBC and Office of Justice Programs (OJP), the CDP requested support from ECBC to prepare for a Chemical Surety Inspection (CSI) to be conducted by the Department of the Army Inspector General (DAIG). Security exercises were conducted and evaluated, exercising all three shifts of security forces. ECBC personnel witnessed 100 percent chemical agent inventories, chemical agent operations, and participated from start to finish in chemical agent training. As a result the CDP successfully passed the Security Management Review (SMR) and the CSI and received positive comments about the excellence of their chemical agent programs. The COBRATF established a new benchmark of performance and now serves as the model to be followed for CSIs.

## Engineering Data Management System

In the past year, the Engineering Directorate of ECBC implemented the existing ECBC Data Management System to the Soldier System Center at Natick. This united into a single data management system for SBCCOM. This eliminated the need for two data storage systems at Natick, and significantly improved the Command data management.



## International Cooperation Strategy

Interoperability and commonality of equipment, procedures and protocols between the United States and its major partners is a primary focus of SBCCOM's RDA international strategy. The ECBC international program is very active through data exchange agreements (DEA), technology research and development project agreements, foreign comparative testing, MOU, engineer and scientist exchange assignments, cooperative program personnel, and loans of equipment. We currently have agreements with 13 different countries, including 29 DEAs, 2 loans, 2 project agreements, 2 MOUs, and 2 engineer and scientist exchange assignments. During FY00, several new key agreements were implemented. This included a new DEA with the Czech Republic, (the first such agreement with the Former Warsaw Pact country) and a new MOU with the United Kingdom and Canada. Several new initiatives were started that should result in new agreements in 2001: a new project agreement with Singapore and Sweden, expected to be signed during the first half of 2001, a new DEA with Poland, and a reciprocal loan agreement that will lead to better standardization of test protocols and procedures. Several hundred thousand dollars of cooperative R&D has been leveraged through these agreements, resulting in both a savings to ECBC and an acceleration of several U.S. programs.

## Technology Transfer

The U.S. Army has established a program to license intellectual property rights on behalf of the government. A Patent License Agreement (PLA) can be granted on patents already issued or filed by the government on an exclusive, partially exclusive, or nonexclusive basis to commercialize federally-owned technology for the benefit of the U.S. economy. During the past year, the following patents were awarded to ECBC employees:

- "Respirator for Protection Against Biological Hazards" by Paul Gardner and Linda Strickler
- "Portable System for Vapor, Aerosol or Airborne Hazard Suppression of Hazardous Environmental Spills" by Paul Schabdack and James Genovese
- "Enzymatic Detoxification of Organophosphorous Compounds" by Tu-Chen Cheng and Joseph DeFrank
- "Solid Particle Aerosol Belt and Dissemination Method" by Raymond Malecki, William Rouse, Michael Arr, Daniel Harman and Samuel Morgan
- "Infrared Mueller Matrix Detection and Ranging System" by Arthur Carrieri, Jerald Bottiger, David Owens, and Erik Raese
- "Continuous Fed-Batch Degradation of Decontaminating Solution 2 (DS2)" by Michael Kim and Joseph DeFrank
- "System and Method for Detection, Identification and Monitoring of Submicron-Sized Particles" by Charles Wick and David Anderson
- "Propellant Based Aerosol Generating Device and Method of Use" by Raymond Malecki, William Rouse, Daniel Hartman, Samuel Mirger and Tom Mills
- "Hydrolysis and Biodegradation of the Chemical Warfare Vesicant Agent HT" by Stephen Harrey, Linda Szafraniec, and William Beaudry

### *CRADA*

A Cooperative Research and Development Agreement (CRADA) provides a means for private industry and academia to collaborate with Army R&D activities. The parties to a CRADA may exchange intellectual property, expertise and data; use of personnel or services; materials; and the use of equipment and facilities. Federal agencies can accept funding under a CRADA to perform research or development of benefit to the CRADA partner. Two CRADAs were executed during this year.



### *TSA*

Government laboratories are authorized, for an appropriate fee, to test materials, equipment, models, computer software and other items for any person or entity. These are called Testing Service Agreements (TSAs). We executed 28 TSAs in the year 2000.

The ECBC is executing TSAs with each of the nine certified Contractor-Owned, Contractor-Operated (COCO) Research, Development, Test and Evaluation (RDT&E) chemical agent and RDT&E solution testing facilities. The COCOs are Battelle Memorial Institute Columbus Operations, O-I Analytical (CMS Field Products Group), Quicksilver Analytics, Calspan/UBRC, Inc. (formerly Veridian Engineering), IIT Research Institute, Geomet Technologies, Inc., Southern Research Institute, Southwest Research Institute, and Midwest Research Institute. Under these agreements, ECBC will provide the required Government certification for these COCOs to receive and conduct testing with chemical agents.

SBCCOM is required to review certification documentation including laboratory Chemical Hygiene Plan, training, medical and chemical agent accountability records, Physical Security Plan, and Employee Reliability Program Plan, to inspect sites on a 24 month basis and observes a Chemical Accident/Incident Response Assistance exercises.

### *SBIR*

The SBIR program is designed to stimulate technological innovation in the private sector, strengthen the role of small business in meeting military research and development needs, foster and encourage participation by disadvantaged persons in technological innovation, and bring the benefits of government-supported R&D to the public through increased commercial application.

In the year 2000, 16 Phase I SBIR contracts were awarded at approximately \$70,000 each, and 4 Phase II contracts were awarded at \$730,000 each. Incremental funding totaling \$4.6M for ongoing SBIR contracts was received for award.

## Cooperative Defense Initiative (CDI)

The Office of the Assistant Secretary of Defense for Strategy and Threat Reduction established a CDI with Jordan, Egypt, and the six Gulf Cooperation Council nations (Saudi Arabia, Bahrain, Kuwait, UAE, Qatar, and Oman) in U.S. Army Central Command's (CENTCOMs) area of operation to combat WMD. ECBC was requested to provide support for the CDI for the testing and inspections of decontamination, detection, individual protection and collective protection equipment. Masks, suits, boots, gloves, detectors, and packaging were visually inspected. Surveillance and fit testing were performed on the masks, and leak tests were performed on the boots and gloves. Operational capability was tested on the detectors. As a result of this evaluation, recommendations were made to improve the combat readiness of CB defense equipment.



**For additional information regarding ECBC or if you have a  
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