EDGEWOOD CHEMICAL BIOLOGICAL CENTER

INSERVICE

RDECOM

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

INFORMATION

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TABLEOFCONTENTS

IN**SUMMARY**

In this Annual Report we review the contributions ECBC made to military and civilian chemical and biological defense during 2006. I believe 2006 was a most creative and productive year and am proud to present a selection of the many accomplishments of ECBC's scientists, engineers, and field support personnel. ECBC's workforce achieved important milestones and technological breakthroughs in 2006, bringing immediate and direct support to the warfighter while advancing technology that will be crucial for the warfight of tomorrow.

The year was also one in which creative solutions for expanding and enhancing ECBC infrastructure - intellectual and physical - produced important results. We continued to attract highly qualified scientific and engineering talent from all over the country. The workforce at Edgewood increased; however, we saw dramatic growth in ECBC Pine Bluff Arsenal, Arkansas, and ECBC Rock Island Arsenal, Illinois, as well.

Due to rapid growth in recent years, ECBC needed to revamp its human resources department, its quality management activities and its safety processes. With over half the workforce hired in the last seven years, clearly ECBC needed support systems tailored to this population. During 2006, ECBC implemented many new business process initiatives, laying the foundation for future growth and development.

I take great pride in the contributions ECBC made in 2006 to our national security and look forward to the challenges ahead. Building upon 2006, we are poised for even greater achievement.

J. H. ZARZYCKI
Director, Edgewood Chemical Biological Center

IN**PROFILE**

ECBC is the principal research, development and engineering center for non-medical chemical and biological defense. ECBC is an organizational element of the Army's Research, Development and Engineering Command, which reports to the Army Materiel Command. ECBC develops technology in the areas of detection, protection and decontamination and provides support over the entire materiel lifecycle—from basic research through technology development, engineering design, equipment evaluation, product support, sustainment, field operations and disposal.

Vision
The premier national resource for chemical and biological defense solutions.

Mission
Provide integrated science, technology and engineering solutions to address chemical and biological vulnerabilities.

Core Competence
Working safely with chemical and biological agents at all stages of the materiel lifecycle.

Location
- Edgewood Area, Aberdeen Proving Ground, MD
- Rock Island, IL
- Pine Bluff, AR

Established
1917

Employees
1173 government and 398 on-site contractors
(As of 30 September 2006)

Organization
Four directorates:
- Research and Technology
- Engineering
- Chemical and Biological Services
- Advanced Planning and Initiatives

Customer Base
Military, government and private industry

IN**PROFILE**

ECBC is staffed by a highly-trained, multidisciplinary team of scientists, engineers and specialists capable of providing cradle-to-grave project support in all areas of chemical and biological defense technology. In this photo, ECBC scientists conduct a wind tunnel experiment to determine the collection efficiency of an aerosol sampler.

ECBC**PEOPLE**

Over the past seven years, ECBC has actively recruited highly qualified professionals at all levels to ensure that institutional knowledge of veteran staff approaching retirement could be transferred via years of mentoring. This strategy has ensured that critical capabilities can be maintained despite numerous retirements. During FY06, the workforce continued to grow with 113 new hires (and 45 retirements), bringing ECBC's total workforce to almost 1,600 government and on-site contract employees. Much of ECBC's growth in 2006 took place at Rock Island, Illinois and Pine Bluff, Arkansas, where ECBC is engaged in sustainment engineering and chemical demilitarization activities, respectively. The work accomplished at these sites is discussed in more detail later in this document.

In 2006, building on successive years of meeting hiring targets, ECBC's strategic focus moved from recruitment and hiring to retention and development. Strengthening the human resources function and developing training and leadership programs became the highest priorities. To that end, ECBC added human resource specialists and realigned the human resources department more centrally within ECBC. In addition, ECBC established a new electronic personnel management system to improve the efficiency of human resources management.

ECBC made tremendous progress in 2006 in building a foundation for employee success. Recognizing that the organization not only needed additional managers to decrease the staff-to-manager ratio, but also needed managers with exceptional leadership skills, ECBC initiated several leadership development initiatives in 2006. These activities included a leadership cohort, mentoring classes, and participation in external leadership programs—providing the foundation for future ECBC leader development.

ECBC's Rock Island Team

In 2006, ECBC's staff at Rock Island Arsenal in Illinois grew to almost 100 people and its mission expanded to include complex information technology projects. Rock Island's primary mission is to provide technical, engineering, testing, industrial base and quality assurance support to chemical and biological equipment managers. Its capability offering has grown to include information management and technological support for the defense community.

ECBC-Rock Island developed the Joint Acquisition Chemical Biological Radiological Nuclear Knowledge System for the Joint Program Executive Officer for Chemical Biological Defense. The system provides chemical, biological, radiological and nuclear defense communities with a single source of information on procedures, materiel, equipment, availability and acquisition of items. Equipment advisory messages, training links and contact information are all available on the system, which can be found at http://jacks.jpeocbd.osd.mil. ECBC information technologists also serve as program managers for other knowledge management systems in the joint chemical and biological defense community, to include the Joint Total Asset Visibility Reporting Warehouse; the Navy's Chemical Biological Radiation and Nuclear Inventory Management System; and an industrial base decision support tool.

Another key accomplishment in 2006 for this ECBC-Rock Island team was the development of a joint, international database for chemical biological defense equipment interoperability between Canada, the United States and the United Kingdom. The purpose of this database is to share information in the research, development, and acquisition communities across national boundaries in any or all of these activities.

Mr. Jim Zarzycki addresses the employees at Rock Island during a recent meeting.

ECBC personnel received several prestigious awards in 2006

Commander's Award for Civilian Service:

- Donna Cannella
- Steve Norman
- Joyce E. Kuykendall
- Dean Hansen
- Dexter Jennings
- Jean M. Salvatore
- Alan W. Zulich

Baltimore Federal Executive Board, 2006 Excellence in Federal Career Awards:

- George Collins
- Richard Moore
- James Rogers
- Dr. Vipin Rastogi
- Tracey Kelly
- Carol Hansen
- Matthew Reber

2006 Military Packaging Hall of Fame inductee: Nancy Waltman, ECBC Packaging Team Leader, was inducted into the Military Packaging Hall of Fame, for her outstanding work in the packaging field, to include development of new packaging designs and maintenance of technical data. Waltman leads a team of Army civilians and contractor personnel responsible for a broad spectrum of packaging functions to include designing packaging for chemicals and ammunition. This team provided on-site support to packaging efforts in Kuwait, to include improving shipping, distribution and retrograde operations, as well as training military personnel in proper packaging operations. Nancy serves as the ECBC representative/voting member on the American Society for Testing and Materials ASTM D10 Packaging Committee and ASTM/Department of Defense Liaison Group. Nancy also won the Superior Civilian Service Award in 2006.

ECBC employees with Jim Zarzycki and Major General Roger Nadeau, receive their 2006 Excellence in Federal Career Awards.

IN**PROFILE**

ECBC **INFRASTRUCTURE**

ECBC's ability to attract and retain highly technically qualified employees is dependant upon maintaining state-of-the-art equipment and facilities. Working with toxic agents requires advanced engineering and environmental controls. Significant investments were made in 2006 to renovate existing laboratories, to add engineering and acquisition space, and to develop additional test capability.

ECBC has over one and a half million square feet of laboratory, engineering and warehouse space, with people working in 50 principal buildings. In 2006, ECBC completed a study of its chemical and biological surety facilities to gain an in-depth understanding of the condition of the mechanical, electrical and plumbing systems. From the results of this study, modernization priorities were established and designs for the most critical system upgrades were initiated, providing the basis for modernization in the years ahead.

FY06 was a pivotal year for ECBC's infrastructure. Not only did many long-standing facility maintenance and modernization problems get resolved, but ECBC broke ground on its newest specialized facility, the Chemical Biological Radiological (CBR) Sample Receipt Facility. For decades, ECBC has played a critical role for the military, domestic law enforcement agencies and the international community in receiving and analyzing samples known or suspected to contain hazardous biological, chemical or radiological materials. This mission has been carried out piecemeal in multiple facilities across the Edgewood peninsula. Because of increased workload, technical complexity of this mission, and the need to maintain sample integrity for prosecutory actions in either U.S. or world courts, a new integrated facility was needed.

ECBC was originally scheduled to start construction of the CBR Sample Receipt Facility in FY08 with $20 million in military construction funds. As a result of Congressional direction, in part due to the urgent requirement for this facility, the project funding was brought forward to FY05, but with just $13 million available. In FY06, ECBC found a solution to this dilemma by rescaling and redesigning the CBR Sample Receipt Facility to incorporate the needs of the Federal Bureau of Investigations and Department of Homeland Security, who had similar and complementary missions. The CBR Sample Receipt Facility is the first multi-agency funded project at Aberdeen Proving Ground and perhaps throughout the federal government.

ECBC **FUNDING**

In 2006, two-thirds of ECBC's revenue came from programs under the oversight of the ASTD(NCB) to perform mission-specific chemical and biological defense research and development. The Joint Program Executive Office for Chemical and Biological Defense, the Defense Threat Reduction Agency and the Chemical Materials Agency are ECBC's largest stakeholders. The remaining one-third of the revenue came as a result of support ECBC provides to other government agencies and commercial entities. In all, ECBC served about 100 distinct customer organizations in FY06. These include domestic agencies with which ECBC has active agreements.

Army Mission	**37,030.0**
Research, Development, Test, And Evaluation	16,980.0
Operations and Maintenance Army	15,071.9
Army Working Capital Fund	4,978.1
Department of Defense Mission	**217,172.2**
Defense Threat Reduction Agency Joint Science and Technology Office	65,307.1
Small Business Innovation Research & The Defense Advanced Research Projects Agency	4,344.4
Chemical Materials Agency	32,809.7
Defense Threat Reduction Agency	31,492.0
Joint Program Executive Office for Chemical and Biological Defense	79,619.8
Other Program Executive Offices/Product Managers	3,599.2
Other Department of Defense	**41,190.3**
Army	27,612.0
Office of the Secretary of Defense	1,337.9
Air Force	6,240.8
Marines	2,266.0
Navy	2,214.0
Intel	1,519.6
Non Department of Defense	**44,297.2**
Law Enforcement/Intelligence	13,014.6
Other Federal Agency	22,537.7
Private Industry	8,744.9
ECBC Total	339,689.7
Office of the Secretary of Defense Congressionals	24,013.0
Army Congressionals	7,859.0
Total	**371,561.7**

CONFERENCE **SPONSORSHIP**

Sponsoring conferences is an effective way for ECBC to communicate with other scientists and engineers from the chemical and biological defense community, industry, and academia. ECBC, in coordination with the Defense Threat Reduction Agency, organized the Scientific Conference on Chemical and Biological Defense Research held in 2006. This international conference covered topics such as standoff detection, advanced fabrics and barrier materials, advanced air purification, toxicology, decontamination, and medical countermeasures.

The Second National Conference on Environmental Sampling and Detection for Bio-Threat Agents was held in October 2006 and directed by ECBC scientists. Conference participants included over 600 environmental sampling and bio-detection representatives from the first responder and scientific communities gathered to share advances in technology and new methods of sampling and detection. Also in 2006, ECBC chaired the seventh Joint Conference on Standoff Detection for Chemical and Biological Defense in Williamsburg, VA. With the support of ECBC committee members and multiple organizations, the conference brought together operational and material developers and practitioners for a state-of-the-art review of chemical and biological standoff detection/identification and related activities.

ECBC sponsors many conferences each year to increase exchange of ideas and information within the chemical and biological defense community.

Two ECBC environmental toxicologists examine plants used to study soil contamination.

TECHNOLOGY **TRANSFER**

Over the past 10 years, ECBC has built an extensive technology transfer program encompassing partnership agreements with hundreds of commercial entities and government organizations. In 2006, ECBC's success in technology transfer was recognized with four prestigious awards.

Two awards were issued by the Department of Defense. The first highlighted efforts under a Cooperative Research and Development Agreement between ECBC and Strategic Technology Enterprises, Inc., a subsidiary of STERIS Corporation, to develop and test a breakthrough decontamination technology, modified Vaporized Hydrogen Peroxide. This technology has been demonstrated to be effective in chemical and biological agent decontamination of buildings, aircraft, vehicles, and sensitive electronic equipment. ECBC received the second Department of Defense award for its development of customized mobile laboratories and kits for other government agencies, such as the Food And Drug Administration, the Environmental Protection Agency and the New York City Department of Health and Mental Hygiene. ECBC has employed Cooperative Research and Development Agreements with GermFree Laboratories, Inc. and Quicksilver Analytics, Inc. to transfer this technology to the private sector.

Mr. Jim Zarzycki, ECBC's Director, was recognized by the Federal Laboratory Consortium for Technology Transfer as the 2006 Laboratory Director of the Year for the culture he has established within the Center that encourages interaction and cooperation with outside organizations. Mr. Zarzycki also won this award in 2003.

Also in 2006, ECBC won an Excellence in Technology Transfer award for its work with enzymatic decontamination technology. This technology was transitioned to Genencor Inc. via a patent license agreement. Genencor now manufactures the enzymes as a product for use by firefighters and emergency responders under the trademark DEFENZ™.

IN**SERVICE**

ECBC SERVES **THE COUNTRY AND THE COMMUNITY**

Marking its 90th Anniversary of service this year, ECBC has a long and successful history of developing technology in the areas of detection, protection, and decontamination. ECBC also provides support over the entire technology development lifecycle—from basic research through engineering design, equipment evaluation, product support, sustainment, field operations and demilitarization.

The following pages illustrate ECBC's dedicated service to the country -- through its continuous support to the warfighter and its critical role in ensuring the security of the homeland.

ECBC scientists volunteer in local elementary school classrooms, offering their expertise to the community through programs such as Kids and Chemistry.

In 2006, ECBC also made numerous contributions to the local educational community and shared its science and technology expertise with both education professionals and students. Through programs such as Kids and Chemistry, Aberdeen Science and Math Academy, eCYBERMISSION, and developing a new Emergency Preparedness curriculum for local high schools, ECBC reached hundreds of local students and teachers.

ADVANCES IN **STANDOFF DETECTION**

Biological weapons are a top concern of military and civilian leaders because they are inexpensive to produce and can be used as terrorist weapons. The ability to remotely detect and identify biological warfare material in "real time" and from a distance is one of the most important technological objectives for research and development efforts today. Until very recently, standoff detection of biowarfare materials at operationally relevant levels was considered unattainable by many experts in the field. In FY06, ECBC achieved a critical breakthrough in standoff biological aerosol detection because of technology advancements, test methodology and algorithm development. Results from work ECBC conducted in FY06 suggest that for the first time ever, warfighters and emergency responders will be able to conduct integrated chemical and biological detection and identification from standoff distances.

Technological advancements in Long-Wave Infrared Differential Scattering Light Detection and Ranging have been central to this breakthrough. This is a remote sensing technology used to measure the optical properties of distant targets and has been widely applied to atmospheric remote detection. A laser is used to transmit light at one or more wavelengths. The light that is scattered back to the detector is collected and analyzed to determine the optical properties of the target. These properties can then be used as fingerprints to identify the target.

Test Methodology: Distinctions between innocuous, ambient bacteria and other biota and virulent microbes amount to subtle differences in the molecular make-up. Since these subtle changes involve such a small percentage of the molecules, only a slight effect on their optical signatures is observed, making high confidence detection and discrimination difficult. However, laboratory measurements of the infrared spectral signatures of biological materials conducted at ECBC indicated that signatures did exist in the long-wave infrared region. The backscatter and concentration estimates were used to construct a generalized likelihood ratio test statistic for the presence of aerosol. Once the presence of a material is detected and the spectrum is estimated, the discrimination algorithm is applied.

Algorithms were tested against data collected during field trials in 2005 and 2006. Testing was conducted in an outdoor semi-controlled environment. The initial results are highly encouraging, and the current iteration of the technology has demonstrated detection and discrimination of biological simulants at operationally significant ranges and concentrations during day and night testing. Further optimization is underway which is expected to improve the sensitivity by another factor of 10.

ECBC is developing standoff detection technologies that will allow operators to identify hazards from a distance.

ON-THE-MOVE **REAL-TIME SURFACE DETECTION**

Current technology does not allow for reconnaissance at maneuver speeds, and requires warfighters to perform dismounted operations outside of safe collective protection systems. These fielded systems use a double-wheel ground contact sampling system and a mass spectrometer to detect surface contamination. In 2006, ECBC demonstrated a breakthrough non-contacting sensor employing Raman spectroscopy to successfully detect and identify liquid and solid chemicals at speeds upwards of 70 kilometers per hour. For the first time ever, Raman spectroscopy can be used in a field environment because of advances in enabling technologies.

Raman spectroscopy is an inelastic light scatter phenomenon in which an incoming photon interacts with a particle, whose internal energy and energy of the photon are instantaneously altered. The magnitude of the photon energy change corresponds to energy levels of the scattering species, and information concerning the identity of the scattering particle can be inferred by precisely measuring the energy change of the photon. This technology benefited greatly from the invention of optical lasers in the 1960s and again more recently with the development of diode lasers and ultraviolet sources. That progress, as well as increased computing speed and advanced spectroscopic and detection systems, has allowed ECBC to achieve this breakthrough technology development at this time.

The technology was incorporated into the Joint Contaminated Surface Detector, built under contract with ITT Corporation and includes both a sensor and a control analysis processing and power system. In operation, the sensor unit fires the ultraviolet laser to interrogate the ground for chemical solids and liquids. The telescope picks up the scattered energy and passes it to the spectrometer where the scattered light is analyzed spectroscopically and compared to the on-board library. The speed of the Raman technology will permit reconnaissance assets to keep pace with maneuver forces, which represents a marked improvement over existing technologies.

This work was conducted under Thrust One of the Chemical Biological Radiological Nuclear Unmanned Ground Reconnaissance Advanced Concepts Technology Demonstration (CUGR ACTD). Under Thrust Two, ECBC demonstrated in 2006 a capability for warfighters to remotely conduct chemical and radiological missions inside of tunnels, caves and buildings, using a robot equipped with chemical warfare agent and toxic industrial chemical detectors, radiological detectors, and aerosol collectors. This robot will eliminate the need for the warfighter to manually perform reconnaissance operations in potentially hazardous environments and minimize exposure to hazardous contamination. In 2006, ECBC demonstrated these robots as well as three modified reconnaissance vehicles during technical demonstrations at Aberdeen and Dugway Proving Grounds, and operational demonstrations at Fort Richardson, Alaska.

The CUGR Robot equipped with chemical and radiological sensor package was ready for acquisition a year ahead of schedule.

FIELD OPERATIONS AT **PINE BLUFF**

In June 2006, ECBC began working with the U.S. Army Chemical Materials Agency to destroy approximately 1,200 recovered munitions at Pine Bluff Arsenal in Arkansas. ECBC placed almost 50 employees on-site in Pine Bluff to conduct this operation, which is expected to last through January of 2008.

Part of the mission ECBC is conducting at Pine Bluff is the destruction of German Traktor Rockets, which were removed from Germany after World War II and brought to Pine Bluff Arsenal for storage and destruction.

ECBC operators are using the Explosive Destruction Systems to destroy these munitions. This mobile technology, which belongs to the Non-Stockpile Chemical Materiel Project, part of the Chemical Materials Agency, provides on-site treatment of chemical-filled, explosively-configured munitions. The system uses cutting charges to open chemical munitions, destroying their explosive elements. Reagent is then added, which neutralizes any chemical agent contained within the munitions. The system can treat up to six munitions at one time.

The on-site team, with support from Edgewood-based divisions such as the Risk Reduction Office, Monitoring Branch, Operations Management, and Field Operations, includes a range of expertise—chemists, engineers, explosives specialists, and air monitoring specialists. Once the mission is complete at Pine Bluff Arsenal, the ECBC team will deploy to other areas around the country to destroy other recovered munitions.

OTHER DEPLOYMENT LOCATIONS **IN 2006**

- Former Camp Sibert, AL
- Atlantic City, NJ
- Tulalip Army Depot, Washington
- Spring Valley, Washington D.C.
- Dover Air Force Base, DE
- Dugway Proving Ground, UT
- Schofield Barrack, HI

ECBC experts operate the Explosive Destruction System in locations around the country.

BUFFALO SURROGATES **TRAINING THE WARFIGHTER**

In June 2006, ECBC was asked by the Army's Rapid Equipping Force to help design and build a training surrogate for soldiers operating the Buffalo Mine Protective Clearance Vehicle in theater. This vehicle is used in Iraq and Afghanistan to clear improvised explosive devices from roads and other areas. Combat units at the National Training Center at Fort Irwin, California needed a realistic surrogate to learn how to execute improvised explosive device defeat missions using a Buffalo. The vehicle is heavily armored with a long hydraulic arm, which safely interrogates suspicious roadside artifacts to protect convoys from improvised explosive devices. Because these vehicles are vital to operations in Iraq and Afghanistan and are sent there as soon as they are assembled, none are available for warfighter training. The challenge was enormous - ECBC had four weeks to design, build and deliver a new training surrogate.

Using the M923A2 5-ton cargo truck as the base, the surrogate was fabricated to look like the real Buffalo from the outside and carefully engineered to emulate the Buffalo's interior. The same hydraulic arm used on the real Buffalo is incorporated on the training surrogate to provide the most realistic training experience. The surrogate was also constructed with a lightweight hood and other removable panels to provide for easy maintenance.

ECBC delivered the first prototype to the National Training Center in July 2006. In all, six Buffalo surrogates were produced and integrated into pre-combat training programs at the National Training Center, Fort Stewart, the Joint Readiness Training Center at Fort Polk, the Joint Multinational Readiness Center in Germany, Camp Beuhring, and by Marines at the 29 Palms training center in California.

The demand for the training vehicle has been so great that ECBC continues the production of additional Buffalo surrogates, and will provide a year of logistics support.

Engineers and technicians turned 5-ton military trucks into Buffalo surrogate training vehicles.

TOXINS RESEARCH

The deadly protein toxin ricin is linked to terrorist activity around the world. Easy to acquire and weaponize, ricin is considered a potential threat because of its extreme toxicity and no known antidote. Although the use of ricin has been traced back to ancient times, not much research data exist about the toxin. In 2006, ECBC scientists conducted two studies that contributed to the body of scientific knowledge about ricin. In particular, ECBC shed light into the genetic characterization of ricin, and learned how ricin behaves under different environmental conditions and in different matrices, such as water. For the military community, understanding the properties of ricin is important in order to deter, detect or decontaminate an enemy action that involves the use of ricin, and ECBC scientists made progress in 2006 in expanding that understanding.

In one ricin study, scientists developed a method to trace the lineage of ricin back to its geographical area of origin. This information will be useful to the law enforcement and intelligence communities as they investigate incidents involving the use of ricin. To accomplish this, ECBC scientists are pursuing a genetic characterization of members of *R. communis*, the plant from which ricin is derived, collected from around the world. An extensive literature survey revealed little published information regarding the molecular diversity of the genes that encode ricin. Such data, or "fingerprints" of ricin genes, and knowledge about the genetic diversity of *R. communis* varieties worldwide are required to establish assays that can identify and characterize a ricin sample regardless of its genetic or geographical source.

In another research study, ECBC is determining whether the protein toxins ricin and *staphylococcal enterotoxin B* become inactivated over time in buffered water, chlorinated water or tap water. This is important because current detection methods do not discriminate between active and inactive toxins and circumstances may exist where the toxin is present but deactivated. A protein toxin has a characteristic fold. Mild changes such as heating can cause certain proteins to unfold, or "denature," which will deactivate the toxin. A case may also occur in which a toxin has been broken into pieces but some of the fragments retain toxicity. The matrices, or substance in which the ricin is found, influence the toxin's behavior.

Scientists are monitoring for changes in the toxin's fold, for chemical reactions that may fragment the toxin, and for the toxin's ability to kill cells or cause cells to proliferate. In FY06, researchers found that for *staphylococcal enterotoxin B* the average mass of the protein increases as the chlorine concentration increases, indicating that a chemical reaction occurs that may affect activity.

Once the stability of these toxins has been characterized, the data obtained and protocols developed can be used in a number of ways to support future efforts. For example, if the toxin will be inactivated under mild heating conditions like those in the desert, new detection technologies will be required that distinguish between active and deactivated toxin. On the other hand, if the toxin is deactivated by treatment with chlorine, it will not be necessary to monitor for that toxin in chlorinated water supplies. The analysis procedures developed for this project can also be used to evaluate decontamination formulations for their ability to adequately deactivate toxins.

ECBC scientists conduct studies to understand properties of toxins.

ALL HAZARD **RECEIPT FACILITY**

Forensic quality analytical information is an essential tool in the war on terrorism both in a theater of operations and at home. For over a decade, ECBC has leveraged its science and technology expertise to design and build mobile chemical and biological analysis systems for military and civilian applications. The first field laboratories were developed in the mid-1990s and were used oversees as part of the execution of the Chemical Weapons Convention. Mobile laboratories were deployed in support of Operation Enduring Freedom and Operation Iraqi Freedom. Since then, ECBC has continued to refine and harden its mobile laboratory technology and is sought out by military and civilian organizations for new system development. In FY06, ECBC was asked by the Department of Homeland Security to develop several unique field analysis systems for use here in the US.

In 2003, the Association of Public Health Laboratories recommended that the federal government "provide all state public health laboratories with safe and secure sample screening and processing facilities to handle unknown or mixed threat samples." The construction of specialized screening facilities was intended to enhance laboratory worker safety and prevent the loss of critical laboratory infrastructure due to damage or contamination. The Department of Homeland Security formed a workgroup to address the need for the newly named All Hazards Receipt Facilities and the sample screening protocols to support them. ECBC was designated as lead agency for design of the facilities and ECBC was tasked with the design, fabrication, validation, and deployment of two facility prototypes. In addition, ECBC was tasked to provide technical support to the development of screening protocols for use in the new facilities.

Based on the recommendations of the interagency workgroup, ECBC modified the initial design for the facility to include a sample receipt area designed to BSL-2 requirements and a high containment sample screening area designed to BSL-3 requirements. The prototypes also included redundant ventilation control and electrical systems to ensure that containment is maintained at all times

A screening protocol was developed to allow personnel working in these facilities to safely screen, package, and ship unknown samples. The screening protocol was intended to characterize the hazards present in unknown samples. The information generated during screening could then be used to mitigate the hazards and reduce the risk of harm to laboratory workers and critical laboratory infrastructure. The screening protocol was also intended to maintain the forensic value of any evidentiary samples screened.

In the fall of 2006, the facility prototypes were deployed to two evaluation sites, a public health laboratory and an environmental laboratory. Personnel from the evaluation sites were trained by ECBC on operation and maintenance of the facilities and performance of the screening protocol. ECBC also conducted proficiency testing for personnel from both evaluation sites. Results from these deployments will be incorporated into the facilities' final design.

Two prototype All Hazard Receipt Facilities were built and delivered to sites in New York and Massachusetts.

Soldiers and civilians attend electronics training offered by ECBC as part of a comprehensive chemical and biological training program for units and groups.

ECBC **METRICS**

Manpower

- Total federal personnel: 1173
  - On-site contractors: 398
    - Average GPA of new hires: 3.4
      - Staff with Masters: 202
        - Staff with technical PhD's: 89
          - Staff in Chemical Personnel Reliability Program (CPRP) and Biological Personnel Reliability Program (BPRP): 406
            - *CPRP Certified:*
              - Government: 242
              - Contractor: 59
            - *BPRP Certified:*
              - Government: 85
              - Contractor: 20

Technology

- CRADAs and other in-kind programs with academia, industry/other Government agencies:
  - 15 new CRADAs with industry and academia
  - 58 new Test Service Agreements with industry
  - 7 new Inter-Agency Agreements with other government laboratories
  - 8 Memorandums of Agreement with other government agencies
- Patents Awarded: 12
- Patent Applications Filed: 13
- Invention Disclosures: 20

Awareness

- External customers: 101
- Citations – cumulative: 3991

Infrastructure

- Facilities: over 200
- Square feet: 1.8 million
- Estimated value of facilities and equipment: $1.4 billion

FY06: October 1, 2005 – September 30, 2006

TECHNICAL REPORTS

ECBC publishes hundreds of technical reports each year. Below are the titles of unclassified technical reports published during 2006. They can be accessed through the Defense Technical Information Center Web site at www.dtic.mil.

- Difference Between the Spore Size of Bacillus Anthracis and Other Bacillus Species
- Toxicity of a New Polynitramine Energetic Material CL-20 to Enchytraeid Worm Enchytraeus crypticus in a Sandy Loam Soil
- Classification and Identification of Bacteria Using Mass-Spectrometry-Based Proteomics
- Generation, Sampling, and Analysis for Low-Level GF (Cyclo-Sarin) Vapor for Inhalation Toxicology Studies
- Aerosol Identification Using a Hybrid Active/Passive System
- Biodegradation of HT Agent from an Assembled Chemical Weapons (ACWA) Projectile Washout Study
- Analytical Method & Detection Limit Studies for Detection of GB Hydrolysate
- Various Hydrogen Peroxide Decon of a C-141B Starlifter Aircraft
- Environmental Sentinel Biomonitor (ESB) System Technology Assessment
- Catalytic Enzyme-Based Methods for Water Treatment and Water Distribution System Decontamination
- Development of a Particle Counting Method for Assessing the Biological Protection Factor of Respirators: Final Report
- Powered Air Purifying Respirator (PAPR) Canister Particulate Efficiency Benchmark Testing
- Characterization and Neutralization of Recovered Lewisite Munitions
- Joint Contaminated Surface Detector (JCSD) for the Chemical, Biological, Radiological, Nuclear (CBRN) Unmanned Ground Reconnaissance (CUGR) Advanced Concept Technology Demonstration (ACTD)
- SUMMARY REPORT: Assessment of the Cross-Contamination Hazards to Firefighters Performing Immediate Rescue Operations in Response to a Potential Terrorist Chemical
- Deep UV Solid State Light Sources in the Tactical Biological Sensor (TAC-Bio)
- Managing Casualties from a Biological Outbreak - A Casualty Predictive Template
- Chemical Characterization of the Pyrotechnically Disseminated Red Phosphorus KM03 Floating Smoke Pot
- Oxidation/Biodegradation of Solid Propellants Used in Legacy Chemical Rounds
- Screening Smokes: Applications, Toxicology, and Medical Considerations
- Testing of Ahura's First Defender Handheld Chemical Identifier against Toxic Industrial Chemicals
- Decomposition of GD on Ce02/Alumina Adsorbents in a Gas Chromatograph on-Column Injector Tube Reactor
- Hair Follicle Bulb as a Biodosimeter for Low-Level VX Vapor Exposure: Initial Studies Validating Presence of Potential Protein Biomarkers of Exposure in the Sprague-Dawley Rat Whisker Follicle
- Potential Usage of Aqueous Alum for Decomposition of Chemical Warfare Agents. Part 2: Reactions with VX and QL
- Degradation of Mustard on Moist Sand, Asphalt, and Limestone Using 13C SSMAS NMR
- Biological-Warfare Agent Decontamination Efficacy Testing: Large Scale Chamber mVHP Decon System Evaluation for Biological Contamination
- Characteristics and Sampling Efficiencies of Two Personal Aerosol Samplers
- Evaluation of Silver-Exchanged Zeolites under Development by University of Maine for Chemical Warfare Agent Decontamination Applications
- Evaluation of FMTV Modular VHP/mVHP System & Fumigation Decontamination Process of a C-141B Starlifter Aircraft
- Evaluation of the Steris Sensitive Equipment Decontamination (SED) Apparatus on a 463L Pallet
- Biological aerosol detection with the tactical biological (TAC-BIO) detector
- The Chemistry, Biochemistry, Pharmacology, and Toxicology of CS and Synthesis of Its Analogs
- Chemical-Warfare Agent Decontamination Efficacy Testing: Large-Scale Chamber mVHP Decontamination System Evaluation Part 1
- Biological Stress Response Terminology: Integrating the Concepts of Adaptive Response and Preconditioning Stress within a Hormetic Dose-Response Framework
- Assessment of the Ocular Irritancy of Oleoresin Capsicum and Related Capsaicinoids in Guinea Pigs
- Low Level Chemical Agent Toxicology: Examination of Surface Contamination on Rats After Whole-Body Exposure to Lethal Levels of VX Agent Vapor