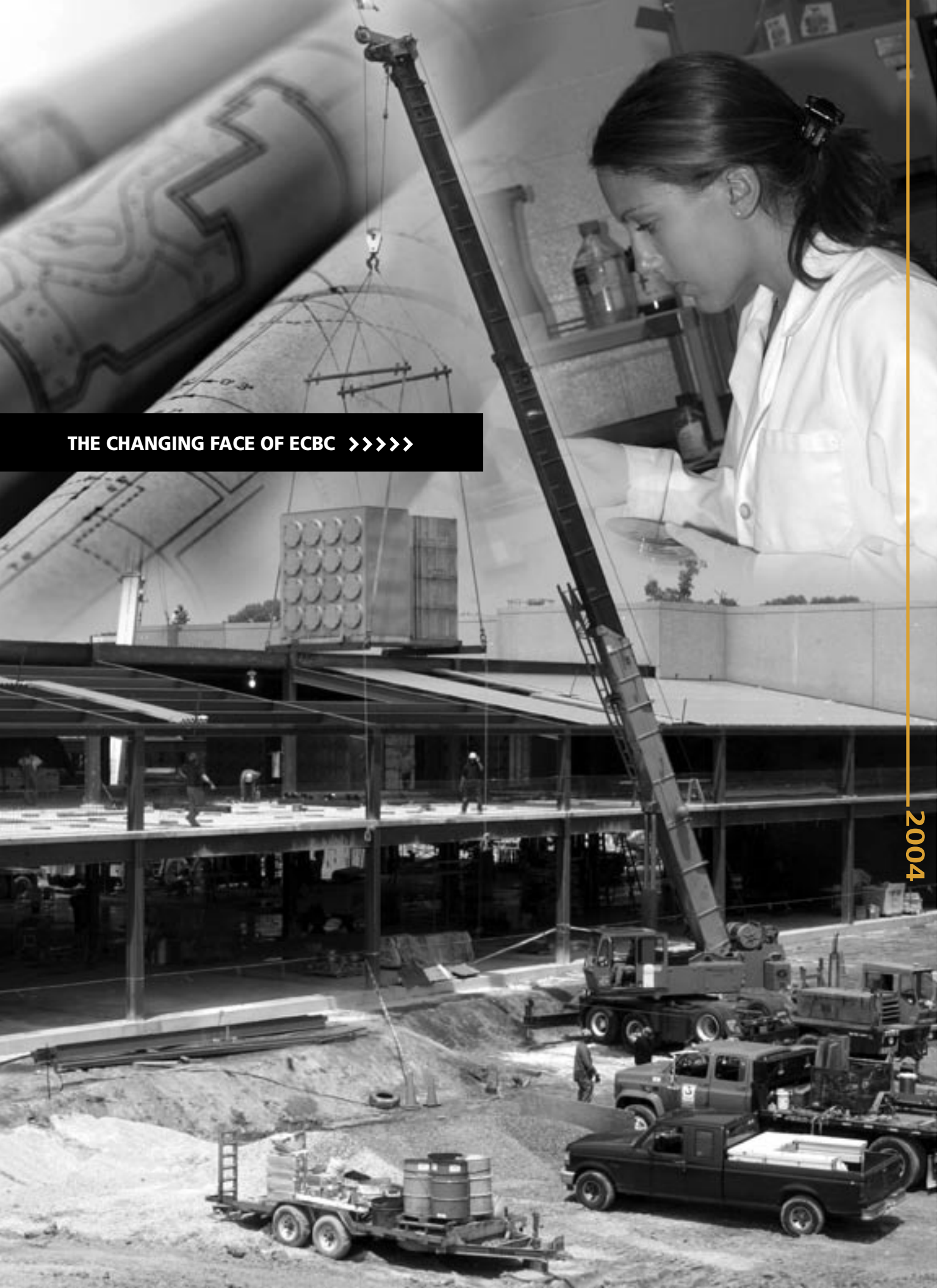

THE CHANGING FACE OF ECBC >>>>>

EDGEWOOD CHEMICAL BIOLOGICAL CENTER

2004

2004

For more information about the
Edgewood Chemical Biological Center,
visit our Web site at:
www.ecbc.army.mil

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Director's Message

As the calendar changes from 2004 to 2005, our nation continues to be engaged in a worldwide battle against terrorism, requiring commitment of our armed forces at home and abroad. In union with other Department of Defense organizations and with many domestic agencies, ECBC is working diligently to counter this threat. We are focused on delivering critically needed chemical and biological defense technology to our customers. This single-minded vision drives every team within our organization. We measure ourselves each year by assessing what we have accomplished to help strengthen our national security.

In 2004, our chemical and biological defense expertise benefited the warfighter, the emergency responder and programs of critical national importance such as intelligence gathering and destruction of chemical weapons. In this Annual Report we highlight a few of these contributions. These contributions span the entire spectrum of the materiel lifecycle: from research, such as the publication of toxicological data assessing the effects of low-level exposure to chemical warfare agents; to design and fabrication, including providing sophisticated mobile analytical laboratories to be used in homeland defense; to disposal, most prominently our operation of the drain stations at the Aberdeen Chemical Agent Disposal Facility.

The year 2004 marks the completion of the Five-Year Strategic Plan instituted in 1999 to rebuild ECBC's intellectual and physical infrastructure. The ECBC management team has the responsibility to ensure that capabilities consistently called upon by the nation in years past will be available in the years to come. We have made enormous progress in this regard doing nothing less than changing the face of ECBC. Concerned about the large number of retiring workers, we have hired more than 500 people over the past five years, many of whom have been recruited from the nation's top schools into our internship program. These young scientists and engineers are working in new and renovated facilities with state-of-the-art equipment.

Our infrastructure improvement program provides some of our most exciting news from 2004. During this past year, the new Advanced Chemistry Laboratory has risen from a few mounds of dirt to an impressive structure, bringing us closer to placing our scientists in an efficient, safe, technologically advanced environment. Recognizing the critical nature of what we do, Congress saw fit to accelerate funding for our new Chemical, Biological and Radiological Sample Receipt Facility. Consequently, $13 million was appropriated for construction beginning in 2005. This facility will ensure we can continue to serve as a national resource for the handling and characterization of samples and devices. In the area of test and evaluation, we qualified our Vortex Chamber, instituting a unique capability to study active and passive standoff detection technologies under controlled dissemination conditions. We have already begun the design for the enhancement of that facility. This progress is further detailed in the Report on Resources section of this document.

ECBC—its men and women and physical infrastructure—is a unique national asset in its dedication to chemical and biological defense. While we cannot know what this coming year will bring, we do know we are better able to support our nation in 2005 than ever before.

Sincerely,

Jim Zarzycki
Technical Director

Introduction

The Edgewood Chemical Biological Center (ECBC) is a U.S. Army research, development and engineering facility dedicated to non-medical chemical and biological defense. The Center's mission is to protect our warfighters and U.S. interests through the application of chemical and biological defense science, technology and engineering. ECBC's capabilities range from novel laboratory research and technology development to engineering and field services. These capabilities include expertise in chem-bio agent handling and analytical services, driven by personnel with a diversity of specialties.

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

Location:
Edgewood Area, Aberdeen Proving Ground, Md.

Established:
1917

Employees:
1,125 government and 250 on-site contractors

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

Laboratory, Chamber and Engineering Square Footage:
Over 1,000,000 sq. ft.
Value of Physical Plant $1,000,000,000

Customer Base:
Military, government and private industry

Point of Contact:
Public Affairs Office, 410-436-3610 (DSN 584-3610)

EDGEWOOD CHEMICAL BIOLOGICAL CENTER

2004 HIGHLIGHTED ACCOMPLISHMENTS ›››››› 2004

Chemical Agent Exposure Research

A report by ECBC researchers publishing new chemical agent low-level exposure results will serve as the most important document in setting future requirements for detection, protection and decontamination technologies. A key advance over previous research, this report will allow U.S. military commanders to better predict casualty rates and the impact of a chemical warfare agent attack. It will also answer the question "how clean is clean enough?" as it relates to decontamination. The new data has been incorporated into this year's revision of Army Field Manual (FM) 3-9.

Accurate toxicological data is essential when conducting health hazard analyses, establishing materiel requirements and solving decontamination challenges. ECBC's low-level inhalation toxicology research allows better predictions of agent impact on personnel, enhances risk assessment modeling tools and defines which detection thresholds are physiologically relevant. The breakthrough research modeled the relationship between chemical nerve agent sarin (GB) vapor exposure concentration and duration in determining the probability of miosis, or constriction of the pupil of the eye, developing as the "first noticeable effect" in an exposed population. A new method for measuring fluoride ion released isopropyl methylphosphono-fluoridate (sarin, GB) in red blood cell fraction and tissue was developed that utilizes an auto injector, a large volume injector (LVI) port, positive ion ammonia chemical ionization detection in the simulation mode, and a deuterated stable isotope internal standard. Evidence of nerve agent exposure could be detected in plasma and red blood cells at very low levels of exposure even below evidence of miosis.

Answering key scientific questions about the effects of low-level exposure has a direct benefit to the warfighter. This data, developed by ECBC in support of Defense Technology Objective CB.51, has application to both military and civilian risk assessment models. ECBC collaborated on integration studies with U.S. Army Medical Research and Materiel Command (USAMRMC), with the United Kingdom chemical biological (CB) research establishment at Porton Down, the Air Force Research Laboratory at Wright Patterson, the Environmental Protection Agency and Centers for Disease Control and Prevention.

International Programs

ECBC's international programs integrate the Center into the global CB defense community and ensure access to the best technologies available worldwide. In 2004, ECBC expanded its reach by establishing several important new relationships and strengthening existing ones. This network now extends to more than 20 different nations through more than 30 international agreements.

The newest of these agreements, a Data Exchange Annex (DEA) with Norway, was signed in September 2004 and will serve as the first mechanism for bilateral exchange of information on CB defense with this U.S. ally. In 2004, ECBC also entered into two new DEAs with Poland, continuing an active and mutually productive 10-year partnership between the two nations and expanding the exchange to encompass all aspects of chemical and biological defense. ECBC's successful cooperation with Singapore was also broadened in 2004 with the signing of a new DEA, which will permit the exchange of classified information to support a growing list of joint initiatives.

The greatest value of international cooperation comes from the opportunity to undertake collaborative projects, developed through Memoranda of Understanding. Ongoing projects in such areas as water monitoring and next generation detectors are serving to accelerate the transition of future technologies to the hands of U.S. warfighters. The most extensive collaboration has grown out of the Memorandum of Understanding for the Research, Development and Acquisition of Chemical, Biological and Radiological Defense Materiel (CBR MOU). This MOU with Canada and the United Kingdom allows for cooperation across the entire lifecycle of CB defense equipment. In 2004, this agreement spawned projects on collective protection and vaccine development.

In 2004, ECBC leveraged its international programs to gain unique access to foreign technology, secured over $10 million in research and development cost-sharing and ensured the compatibility of equipment and procedures with U.S. nation's allies.

Enzymatic Decontamination

For several years, ECBC scientists have been developing an enzyme- or catalyst-based new-generation decontamination technology to provide an environmentally safe, rapid and effective system for decontaminating chemical and biological warfare agents. Current decontamination technologies use large quantities of highly reactive or oxidative materials, which can pose risks to the user and the environment. Catalytic enzymes are highly efficient, detoxifying agents many times their own weight in seconds or minutes, and consequently reducing the amount required to achieve the desired level of decontamination. For example, in a test using nerve agent, enzymes applied in fire-fighting foam reduced the level of agent on painted metal surfaces to below detectable levels in less than five minutes.

The advanced catalytic enzymatic system or ACES formulation—a non-corrosive, non-flammable, user and equiptment-friendly technology—is biodegradable. The ACES technology attracted interest from a number of companies. One of those companies was Genencor International, Inc., a diversified biotechnology company that develops and delivers enzyme-based products and services into the healthcare, agriprocessing industrial and consumer markets. In 2004, under an exclusive Patent License Agreement with ECBC, Genencor began commercializing and manufacturing organophosphorous acid anhydrolase (OPAA) and organophosphorous hydrolyzing (OPH) enzymes, which decontaminate certain organophosphate-based nerve agents. Licensing the enzymes to Genencor has resulted in the availability of industrial-scale production of enzymes. Marketed as "Defenz", these enzymes are now available to military and civilian first responders.

CMA Support

Over 35 years ago, the United States embarked on a mission to destroy the nation's stockpiled chemical weapons. Working in partnership with the Chemical Materials Agency (CMA) and its predecessors, ECBC helped develop effective and safe chemical demilitarization technologies and provided subject matter expertise. ECBC helped CMA determine:

- The technology most appropriate for each of the nine unique stockpile sites
- The best method for in situ destruction of chemical munitions unearthed in remote locations
- The means for safely storing and handling deteriorating, explosively configured weapons, such as M55 rockets
- The methodology to hasten disposal of bulk chemical agent to remove a potential terrorist target

In addition to consulting on specific CMA projects, ECBC matrixes more than 60 of its scientists and engineers to CMA to help the agency fulfill its mandate to destroy the U.S. stockpile.

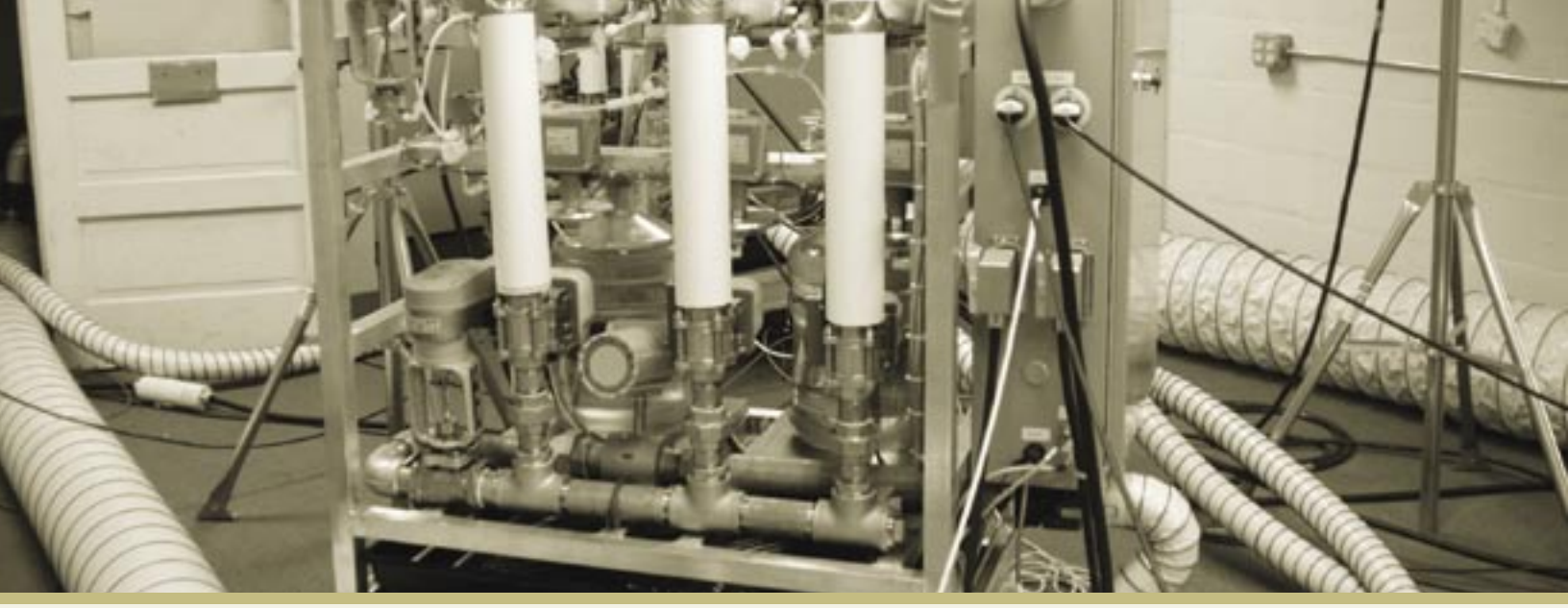
ECBC personnel are also helping disposal efforts at CMA's Aberdeen Chemical Agent Disposal Facility (ABCDF). After the events of 9-11, the Edgewood area of the Aberdeen Proving Ground was considered a potential terrorist target because of the mustard agent stockpile stored there. At that time, CMA was constructing a disposal facility at Edgewood but actual stockpile destruction was still several years away. The Department of Defense's decision to accelerate the schedule for destruction of the stockpile at Edgewood meant that CMA had to determine how to speed up the neutralization technology so that more agent could be processed in a shorter amount of time, without compromising worker or community safety. ECBC helped CMA solve this problem, and today stockpile destruction at ABCDF is nearly complete. ECBC personnel are responsible for the initial step in the demilitarization process, specifically operating the ton container drain stations, and associated specialized equipment jointly developed by ECBC, CMA and its contractors.

ECBC helped CMA develop and construct the Army's Munitions Assessment and Processing System (MAPS), a facility at Edgewood designed to treat explosively configured munitions containing chemical agents and acidic smoke mixtures recovered during Installation Restoration Program (IRP) or other construction or demolition activities that take place at Aberdeen Proving Ground. This $12.9 million system, permanently located at Aberdeen Proving Ground, opened in May 2004. ECBC operates this facility and is the Resource Conservation and Recovery Act (RCRA) permit holder.

In 2004, ECBC personnel also provided support to CMA's Explosive Destruction System (EDS) activities. The EDS is a self-contained, transportable destruction chamber designed to dispose of recovered chemical munitions. The EDS can be taken to the location of such found munitions, eliminating the need to transport potentially hazardous materiel to a suitable disposal facility. In 2004, ECBC personnel supported many EDS deployments and evaluation sessions including helping process 20 mustard- and two sarin-filled items during its deployment to Dugway Proving Ground, Utah, and deploying with the EDS to Dover Air Force Base in October 2004, where ECBC operators processed a recovered mustard agent-filled item. ECBC personnel also are helping CMA expand the range of items the EDS is certified to destroy safely and is leveraging other ECBC research to improve its service to CMA. A key discovery stemming from the Center's evaluation work with the EDS is the device's effectiveness against lewisite when used in conjunction with the decontaminant sodium permanganate. ECBC completed initial tests using this substance in conjunction with the EDS to decontaminate agents lewisite and arsinol, resulting in destruction of the agent and its isomers to below the 50 parts per million standard set by the U.S. Army and environmental regulators.

CMA has designed and installed sophisticated monitoring systems at each of its stockpile disposal facilities to warn of any release of agent during the demilitarization process. In 2004, ECBC developed and validated a tool that allows CMA to ensure accurate calibration of monitoring and detection devices. This automated solid-state chemical agent vapor generator produces user-selectable concentrations of chemical agents such as mustard and sarin, and enables technicians to generate the constant supply of pure, low-concentration chemical agent vapors necessary for accurate calibration of chemical agent monitoring and detection devices. ECBC has patents pending on this device and anticipates wide use in homeland security applications.

ECBC looks forward to continuing to provide the scientific and technological expertise in chemical defense that CMA needs to fulfill its mission to safely destroy the nation's stockpile of chemical weapons.



ECBC and EPA Collaboration on Homeland Security Technology

Since the start of the global war on terror, ECBC's expertise in chemical and biological defense has proven beneficial to many government and commercial organizations concerned with homeland security. The Environmental Protection Agency (EPA), newly tasked with homeland security responsibilities, looked to ECBC in 2002 to help address national defense issues related to building security, rapid risk assessment, and water security. ECBC's experience working with chemical and biological threats brought unique facilities and expertise to the partnership with EPA's Homeland Security Research Center. This collaboration achieved two notable milestones in 2004: the construction of the Water Test Loop System at Edgewood, and the discovery that an existing medical equipment sterilization technology with some modification would meet some of EPA's building security requirements.

The Water Test Loop System, developed jointly by ECBC, the EPA and the U.S. Army Corps of Engineers, will allow researchers to study the effects of contaminated water supply systems. The system, which consists of a series of pipes designed to mimic municipal water supply systems, is installed at ECBC's campus at Edgewood. Designed to be a modular system, the Water Test Loop's piping can be swapped out to meet unique requirements of various research efforts. For example, a section of piping with a specific type of sediment buildup on its walls can be inserted into the system to see how that substance would impact both the rate of contamination dispersion and the efficacy of decontamination efforts. The Water Test Loop System contains two sections, with one linked to the Center's Toxic Test Chamber to enable tests with actual chemical agents.

The Water Test Loop System will enable the EPA to validate predictions of water contamination impact. Previously, due to the lack of a system that could be used for testing with actual chemical agents, only educated guesses could be made about the ramifications of water system contamination and the efforts that would be required to decontaminate a system. Now the EPA and others will have access to data to help create action plans, timetables and risk assessments. The Water Test Loop System also will provide a forum for challenging and validating detection and decontamination technologies against a broad range of threat materials.

In support of EPA's building security needs, ECBC identified a technology with significant military and civilian potential. This technology was a decontamination process called Vaporous Hydrogen Peroxide (VHP). Developed by the STERIS Corporation, this technology long used as a medical sterilant had the potential to decontaminate buildings or vehicles containing sensitive electronic equipment that would be damaged or destroyed by existing decontamination processes. ECBC entered into a partnership with STERIS to create a modified version of the VHP process, or mVHP. mVHP can decontaminate chemical warfare agents in addition to pathogens. The resulting technology may prove to be critically important to efforts to decontaminate building interiors and aircraft.

mVHP is also part of the ECBC partnership with the EPA. Building protection and decontamination are part of the EPA's new homeland security responsibilities, and the mVHP system provides significant advantages over existing building decontamination systems. In addition to being useful in returning sensitive equipment to service, mVHP is safer for personnel to use and more environmentally benign than existing decontaminants. It can be easily stored and transported and requires no unique equipment for application. The mVHP process has been proven efficacious in combating a number of chemical and biological agents.

In May 2004, the EPA and ECBC hosted a Congressional Briefing and Homeland Security Technology Showcase highlighting two of the 10 ongoing homeland security technology projects ECBC is conducting with the EPA. Together with industry partner STERIS Corporation and the EPA, ECBC conducted briefings and tours to raise awareness among Maryland's lawmakers of the partnerships and technologies that are flourishing at Edgewood. U.S. Rep. C.A. "Dutch" Ruppersberger, U.S. Rep. Ben Cardin, and Mr. Peter Verga, Principal Assistant to the Assistant Secretary of Defense for Homeland Defense, were among the honored guests at the event, held on ECBC's campus at Edgewood.

Technology Transfer

The Stevenson-Wydler Technology Innovation Act of 1980 and the Federal Technology Transfer Act of 1986 established a policy framework that enables the federal government to transfer its technology to industry, state and local governments, and academic institutions. Through this technology transfer process, federal laboratories share the benefits of the national investment in research and development with all segments of society.

Technology transfer is an integral element of the national security mission, has a high-priority role in all Department of Defense programs, and is a key activity of Department of Defense laboratories. Over the past five years, the ECBC technology transfer program has placed numerous technologies into the private sector. Through these activities, ECBC discovered that a major benefit of technology transfer has been the accelerated development and lower cost of technologies coming back into the military.

In 2004, ECBC achieved significant milestones in several technologies that benefited both the warfighter and homeland security. ECBC's Biological Sampling Kit (BiSKit), which won the Federal Laboratory Consortium's (FLC) 2005 Award of Excellence, offers warfighters and first responders a more efficient way to obtain environmental samples from potentially contaminated sites. The unit allows for many samples to be taken in quick succession, with minimal hazardous exposure to the collector and fills a vital role in the biodetection, nonproliferation, and forensic analysis communities. Under a patent license agreement, the BiSKit is being manufactured in large quantities and is now available to both select military organizations and to the response community.

The Automated Decision Aid System for Hazardous Incidents (ADASHI), also a 2005 FLC award winner, is a computer-based integrated decision support system for improving military and civilian response to hazardous chemical, biological, radiological and explosive incidents. ADASHI combines the specific technical functions required to manage a hazardous incident—initial assessment, source analysis, decontamination methods, hazard area prediction, detection planning and sampling, medical treatment and casualty estimation criteria, and hazard mitigation—and integrates them with decision criteria. Though the system is being further enhanced for military use, ADASHI-based software is already on the commercial market and supporting emergency responders throughout the world.

In 2004, Genencor International commercialized an ECBC-developed enzyme and began marketing their product to the first responder community. As discussed on page 7 of this document, this method of decontamination is now available to both military and first responder communities because of ECBC's partnership with the private sector.

In all, ECBC executed 63 new technology transfer agreements in 2004, including 18 Cooperative Research and Development Agreements (CRADA), 43 Test Service Agreements (TSA), and 2 Patent License Agreements (PLA). Additionally, ECBC invested heavily in preserving its intellectual property this year and processed 17 invention disclosures and 11 new patent applications. Additionally, 15 patents were issued to individual ECBC personnel in 2004.

Setting Civilian Protection Equipment Standards

Quality and performance standards for military protective equipment have been in existence for some time. However, until recently there were no such standards for civilian chemical and biological protective equipment. ECBC has been working with the interagency community to help remedy this situation.

Since 2000, an agreement between ECBC and the National Institute of Standards and Technology (NIST) has enabled the two organizations to work collaboratively to define the levels of protection required for the civilian response community. This effort, which also includes the Natick National Protection Center (NPC) and the National Institute for Occupational Safety and Health (NIOSH), has resulted in standard criteria for chemical protective gear for civilian use in the United States. These civilian equipment criteria are needed so that the response community can purchase quality equipment most appropriate for their applications.

The performance requirements cover equipment such as respirators, protective ensembles, and personal decontamination devices. In 2004, this collaboration resulted in the chemical and biological standards for the Air Purifying Respirator/Escape Masks, and revised requirements in several National Fire Protection Association (NFPA) Protective Equipment Standards. The NFPA standards are used by emergency personnel to determine what protective equipment to obtain using the Department of Homeland Security's equipment grant programs.

ECBC's work in this area is expanding in 2005 to include determining standards for chemical detection equipment.

Mobile Laboratory Systems for the FDA

The United States receives a high volume of foreign-produced foods and pharmaceuticals that could be susceptible to potential tampering and use as instruments of terrorism. The Food and Drug Administration (FDA) is responsible for monitoring these imports and ensuring their safety. The potential use of chemical or biological agents is of particular concern.

Through an Interagency Agreement, the FDA and ECBC have partnered to address this challenge. Under the scope of work with the FDA, ECBC's Mobile Labs and Kits Team built a mobile laboratory system with chemical and microbiological analytical capabilities to supplement normal laboratory operations. In a news release following the agreement signing, Dr. Lester M. Crawford, FDA Deputy Commissioner, stated, "These mobile labs will provide our experts with the mobility they need to effectively protect the public health under exceptionally demanding circumstances."

The FDA plans to use the mobile labs in two ways. First, the agency intends to increase its presence at U.S. ports of entry. Second, these same mobile laboratories will also be able to respond to a potential terrorist incident anywhere in the contiguous United States.

With current design and construction practices, mobile laboratories can be equipped with sophisticated state-of-the-art instrumentation and can be moved frequently with minimal effort and without adversely impacting equipment performance. When not being used directly for counterterrorism response, they can be used to expand and supplement the FDA's routine import operations. Mobile laboratories, placed at ports of entry during times of high volume, can eliminate the lag time involved in shipping samples to remote labs and provide rapid turnaround of sample analyses. The movement of mobile laboratories to different ports of entry will allow the nation's protectors to maintain their best advantage—unpredictability—to monitor imported foods, and deter terrorism and criminal activity.

Installation Preparedness

To help prepare U.S. military bases and civil defense agencies to handle an attack involving weapons of mass destruction, the Joint Service Installation Pilot Project (JSIPP) provides equipment and training to enhance detection, protection, and emergency response capabilities for chemical, biological, radiological, nuclear, and explosive (CBRNE) incidents.

In support of this Defense Threat Reduction Agency (DTRA) project, ECBC designed and built six high throughput mobile laboratories; developed the accompanying Concept of Operations for the sampling, analysis and detection of potential threats; and fielded the units to nine pilot installations. ECBC also sent CBRNE experts to JSIPP sites to provide on-site training and consulting services and conduct tabletop and field exercises.

The lessons learned from JSIPP are available to the Joint Program Manager (JPM) Guardian's Installation Protection Program (IPP), which will be implemented at 200 military installations worldwide. The armed forces' ability to prosecute operations is dependent on military bases being safe from a chemical, biological or radiological threat. ECBC has provided critical information, materials and teams of experts to transition to the IPP. Much of this body of knowledge was developed by ECBC while conducting the Domestic Preparedness Program under the 1996 Nunn-Lugar-Domenici Domestic Preparedness Act. This law, authorized emergency response training and support to the 100 largest cities in the United States.

2004 Top Accomplishments by Team

CHEMICAL BIOLOGICAL SERVICES DIRECTORATE

EDS Support
Deployed the Explosive Destruction System (EDS) to Dugway Proving Ground, UT, and Dover Air Force Base, DE, during the period May - November 2004, and processed over 20 mustard- and sarin-filled items. Multiple round prove-out (DT/OT) testing was conducted at J-Field with test items filled with mustard, lewisite and arsinol. Personnel operated/maintained the EDS, operated the personnel decontamination station and performed air monitoring and laboratory analyses.

CB Field Process
Conducted Phase II Demonstration/Validation Testing of the TC-60 Controlled Detonation Chamber at the Defence Science and Technology Laboratory (DSTL), Porton Down, UK, during the period July - November 2004. ECBC personnel managed the project, operated/maintained the equipment and performed air monitoring and analysis during the test.

Ton Container Support
Deployed personnel to serve as Ton Container lead operators and shift leads to support the Aberdeen Chemical Agent Disposal Facility (ABCDF). During 2004, these personnel ensured safe transfer of the mustard agent and drainage of 1,500 ton containers.

Remediation
Supported the remediation at Formerly Used Defense Sites located at Harvard, NE; Spring Valley, Washington D.C.; Lowry, CO; Laurinburg-Maxton, N.C.; Holloman AFB, N.M.; and Camp Crowder, MO, in a teaming arrangement with the Huntsville Corps of Engineers.

CB Application
Completed start-up operations and received explosive approvals of the Munitions Assessment and Processing System (MAPS). MAPS will be used to dispose of recovered munitions at APG.

Stations of Robotic Monitoring (STORM)
Mobilized STORM high-throughput biological weapons analytical technology. This mobile laboratory has a capacity for 250 samples per day, and can simultaneously screen samples for seven biological warfare targets.

Risk Reduction Office (RRO)
Developed and implemented a plan of action to review and assess all areas of chemical surety regulatory compliance. ECBC passed all areas of the CY04 Chemical Surety Inspection (CSI) that was conducted by the Department of the Army Inspector General (DAIG) and the AMC Surety Management Review (SMR). In addition, conducted an audit of seven contractor owned, contractor operated (COCO) facilities for compliance with Army chemical safety, surety, and security so that all COCO facilities successfully completed CY04 DAIG chemical surety inspections with zero failing findings.

RESEARCH AND TECHNOLOGY DIRECTORATE

Cross Team Accomplishment for the Agent Fate Program
Developed the Direct Analysis in Real Time (DART) method that determines residual chemical warfare agents on surfaces. Nuclear Magnetic Resonance (NMR) and High Speed Solid Phase Microextraction (HS-SPME) methods demonstrated that simulated rain drives CW agents out of porous substrates such as soil and concrete after all secondary evaporation is complete. NMR determined that mustard (HD) on concrete, at 80% relative humidity (RH) and ambient conditions, decomposes 10% after 8 hours of exposure. All three wind tunnel sites achieved mass balance by performing HD on glass round robin testing.

Point Detection
Characterized three species of bacteria and one virus using Pyrolysis Gas Chromatography Ion Mobility Spectrometry (Py-GC-IMS) and Biological Sample Processing System Mass Spectrometry (BSPS-MS).

Laser Standoff Detection
Designed and constructed a unique Standoff Detection Technology Evaluation Facility that for the first time will allow precise testing of standoff detectors outside of a laboratory. This windowless Vortex chamber allows calibrated control and measurement of chemical and biological agent simulant, vapor and aerosol, clouds in a realistic but enclosed environment.

Passive Standoff Detection
Completed infrared signature measurements on 14 biological agents and near neighbors grown on five media types and several temperatures. A statistical analysis of the results indicated a potential for the spectra to correctly classify the microbes as Gram-positive or Gram-negative, and in many cases correctly identify the strain.

CB Technology Evaluation
Assessed 11 bio point detection systems against joint requirements, which provided definitive data for use by Joint Program Executive Office for Chemical Biological Defense (JPEO -CBD) and technology base portfolio managers in determining future year equipment specifications.

NBC Battlefield Management
Installed the Restoration of Operations (RestOps) Information Management (ROIM) system in medium- and high-threat Pacific Air Force bases. ROIM is a chemical and biological situational awareness tool integrating command, control and consequence management functions to minimize the impact of a CB incident at a critical military installation.

Modeling, Simulation and Analysis
Conducted modeling study to support technology down select decisions in support of Defense Technology Objective (DTO) CB.50, which calls for developing a small, person-portable, combined chem/bio agent detector.

CB Systems Integration
Developed and evaluated a test bed version of a low-cost, low-power, lightweight biological aerosol detector in support of ECBC's goal to develop and demonstrate detection technologies that can be remotely employed and serve as a cost-effective, early warning capability.

Decontamination Sciences
Provided DoD with proven capability to decontaminate buildings and aircraft through use of modified Vaporous Hydrogen Peroxide (mVHP) technology. mVHP was demonstrated in 2004 as an effective biological warfare and chemical warfare decontaminant in room-scale studies and as an effective BW decontaminant in building-scale studies at ECBC. Modular mVHP technology also was successfully demonstrated against BW and CW agent simulants in aircraft at Davis-Monthan AFB.

Agent Chemistry
Synthesized and characterized several non-traditional threat agents for the intelligence community.

CBR Filtration
Transitioned 10 Solid State Vapor Generators to the Chemical Materials Agency for field testing at stockpile disposal sites. Newly patented, the device allows precise calibration of chemical monitoring and detection systems.

Respiratory Protection
Supported NIOSH CBRN respirator qualification and standard development efforts, which included completing literature review and analysis and publishing report on workplace breathing rates. Executed research study to assess effect of high flow rates on inert and biological aerosol filtration efficiency of NIOSH-approved particulate respirators.

Environmental Toxicology
Established benchmark values for EPA's national effort to produce Ecological Soil Screening Levels (Eco-SSL).

Veterinary Support
Achieved full accreditation by Association for Assessment and Accreditation of Laboratory Animal Care.

Operational Toxicology
Under DTO CB.51: Low Level CW Agent Exposure: Effects and Countermeasures, completed inhalation data set to define longer time, lower level operational effects for GF in swine and VX in rodents that refine operational human health risk assessments.

Aerosol Sciences
Developed test methods and facility to challenge the United States Postal Services' Biohazard Detection System with very low, yet precisely known aerosol concentrations of inactive agent.

Protective Equipment
Applied the SMARTMAN testing protocol to four new DoD mask programs.

Mobile Labs and Kits
Delivered six BSL2+ modular biological laboratories to Defense Threat Reduction Agency for the Joint Service Installation Pilot Project (JSIPP).

Forensic Analytical Team
Provided personnel to operate on-site analytical laboratory in Baghdad at a full time (24/7) level.

Biosensors
Adapted Meso Scale Discovery (MSD) SECTOR PR technology to have the capacity for higher throughput analysis and presumptive identification of samples. The SECTOR PR is a compact simple machine that reads electrochemiluminescence (ECL) signals from a 96-well test plate designed specifically for the system. The team assessed the detection potential of the MSD

SECTOR PR multi-array based ECL analyzer against target bioagents on an FY04 funded In-house Laboratory Initiative Research (ILIR). This technology has the potential to provide a highly sensitive yet compact and lightweight detector for a number of warfighter and DOD applications.

Molecular Engineering
Selected to conduct a validation study for in vitro basal cytotoxicity testing, sponsored by the National Institute of Environmental Health Sciences (NIEHS) under an Interagency Agreement with ECBC. As one of three laboratories selected for this international collaboration, the Molecular Engineering Team successfully conducted a three-phase study in compliance with Good Laboratory Practice (GLP) standards. Seventy-two chemicals were tested using BALB/c 3T3 cells and Normal Human Keratinocytes (NHK). Data will be submitted to the FDA along with results from the other two laboratories for final approval. The primary goal of the validation study was to evaluate the usefulness and effectiveness of the two in vitro assays for reducing and refining animal use for acute toxicity determinations of chemicals.

Microbial Analysis and Products
Signed patent license agreement with Genencor for large-scale production of two enzymes developed at ECBC.

Smoke and Target Defeat
Conducted full scale field experiments on new vehicle obscuration protection grenade concepts. Demonstrated a top performing Advanced Infrared Obscurant in a laboratory environment and provided technical and evaluation support for PM Smoke's MMW Obscurant Module Program.

ENGINEERING DIRECTORATE

Cross-Team Accomplishment
Designed, prototyped, and tested toxic exhaust filtration units for the new Advanced Chemistry Laboratory at ECBC. Partnered with Letterkenny Arsenal to manufacture and deliver 21 individual filtration units to the construction site in the 3QFY04. The units provide the capability to filter 200,000 cubic feet per minute of exhaust generated from ACL laboratories' fume hoods and chambers.

WMD Installation Preparedness
Completed the last three installations under the Chemical Biological Radiological Emergency First Responder Program for the U.S. Navy, making a total of 19 naval installations (11 OCONUS, 8 CONUS) receiving the WMD Installation Preparedness Program.

Joint Service Installation Pilot Project
Supported the Defense Threat Reduction Agency JSIPP Program Manager in development of Concept of Operations (CONOPS), table top exercises and functional training exercises for six of nine pre-selected installations.

Military Improved Response Program
Developed the following materials: Capstone Document: Mass Fatality Management for Incidents Involving Weapons of Mass Destruction, Law Enforcement Biological Response Handbook, and Installation Chemical Biological Radiological Nuclear Explosive Dispatch Guidebook.

Weapons of Mass Destruction Civil Support Systems
Provided over $26 million of equipment to 12 National Guard Civil Support Teams.

Joint Service General Purpose Mask
Conducted developmental and user testing on 4,000 Joint Service General Purpose Masks to support the 2nd Quarter FY05 Milestone C decision. The Joint Service General Purpose Mask was designed for use by all four Services covering a multitude of environments and missions and in a variety of ground, shipboard and combat vehicle operations.

Collective Protection Equipment
Completed an effort addressing the corrosive effects of moisture on construction materials and physical integrity of the M48/M48A1 NBC protective filter. Based on a study of the amount of time a filter can function in a high moisture environment before suffering a catastrophic failure, ECBC designed and tested a disposable indicator that shows if a filter has been exposed to dangerous moisture levels. This item is currently in the acquisition process and will provide the warfighter with a higher level of confidence in the filter, which is an integral part of the nuclear, biological and chemical (NBC) protection subsystem on the M1A1 and M1A2 Abrams Main Battle Tanks and the Biological Detection Systems (BIDS).

Marine Corps Support
Tested C2, C2A1, and commercial canisters for breakthrough times against three chemical agents and 10 toxic industrial materials. This required prior coordination with the Navy and ECBC in order to evaluate elevated breathing rates for physically stressed warfighters. This data (over 1,200 tests) will enable the warfighter to predict canister breakthrough times for various agent concentrations and breathing rates. The results were published in two reports, entitled TR 395 - Effect of Decontamination Vapors on the Cyanogen Chloride and Dymethalphosphonate Breakthrough Times on C2 and C2A1 Canisters, and TR 396 - Effect of Environfoam and Technologies EasyDECON Decontamination Solution DF-200 on the M40 Individual Protection Systems.

Individual Protection (IP)
Completed an intensive fact finding investigation after receiving reports of leakage on new M40/M42/M45 Series protective masks. The investigation revealed a fault in the quick disconnect coupling on the mask facepieces due to non-conformance issues during the manufacturing process. ECBC sent a Safety of Use Message to the field, and initiated and completed replacement of all quick disconnect couplings.

Joint Service Mask Leakage Tester (JSMLT) Program Management
Evaluated the ability of the JSMLT to determine a warfighter's mask protective fit factor in comparison to fit factor values generated by the M41 Protective Assessment Test System (PATS) and ECBC's Protection Factor (PF) chamber. Numerous tests were designed and executed very quickly to support the 2QFY05 Milestone C decision.

RESET
Helped maintain critical chemical detection mission capability for Army units supporting OIF as part of the Army's RESET program by recalibrating and returning M21 Chemical Agent Detection systems to the field. The RESET program is a logistical support program to OIF that restores and returns equipment to the desired level of combat effectiveness.

Decon Core
Supported TACOM, Pine Bluff Arsenal, and Rock Island Arsenal in resetting M12A1 and M17 Decon apparatuses as part of the RESET program.

Smoke Ammunition
Redeveloped the production base for the riot control agent included in the M7A3 CS grenade in order to allow production to move forward on time after more than 15 years out of production.

Industrial Base Planning
Ensured that industrial base requirements during peacetime, contingencies, and replenishment are met as per the National Security Strategy, Strategic Planning Guidance, and Army Transformation, including reengineering obsolete parts in the M12A1 and M17 Decontamination Apparatuses; changing manufacturing methods and sources for the detection paper in the M256A1 Detector Kit; developing alternate sources of supply in support of the Individual Distribution Breathing Air Hose in support of the Abrams and Bradley combat systems, and assisting in the transfer of technology from the private sector to government organic manufacturing sources.

Surveillance
Conducted shelf life testing on 33 lots of M291 and M295 decontamination kits, 85 lots of C2A1 canisters, and 8 grand lots of DS2 decontamination solution.

Packaging
Designed packaging for Slat Armor Kits and oversaw packaging of the kits for shipment to Ft. Lewis within 19 days of the request from the field. This was in support of a task given to the Aberdeen Test Center (ATC) to design and fabricate the Slat Armor for the Stryker Vehicles being deployed.

Standardization and Specifications
Updated, prepared and published the military specification for biological agent simulants of the Bacillus species. Biological agent simulant made to this specification was used during the Technology Readiness Evaluation (TRE-02) at Dugway Proving Ground and for evaluation of complex biological background testing at Edgewood.

Low Volatility Hazard Detection enhancement to the M256A1 Detection Kit
Provided the Joint Service warfighters with an urgently needed enhanced capability to detect existing low volatility agents and newly emerging threats.

Advanced Design and Manufacturing
Manufactured 150 diaphragms for the M4A1 Mask Leakage Tester Diaphragm Actuator, a specialized valve long out of inventory, to meet Department of Defense and Department of Homeland Security respirator testing requirements. Developed the necessary data and tooling, and manufactured the parts within 90 days.

ADVANCED PLANNING AND INITIATIVES DIRECTORATE

Decision Analysis
Developed a logical, structured multi-criteria decision analysis methodology, which was used to help determine the appropriate funding strategies and to provide recommendations to improve proposed and ongoing research and development efforts in the $70+million FY05 Non-Medical 6.1-6.3 Technology Base Program.

International
In collaboration with Singapore, identified and demonstrated several promising technologies that may provide a more sophisticated and sensitive water monitoring capability for the military. This work supports Defense Technology Objective CB.37, which calls for improved awareness of and protection against potential contaminants in water supplies.

EDGEWOOD CHEMICAL BIOLOGICAL CENTER

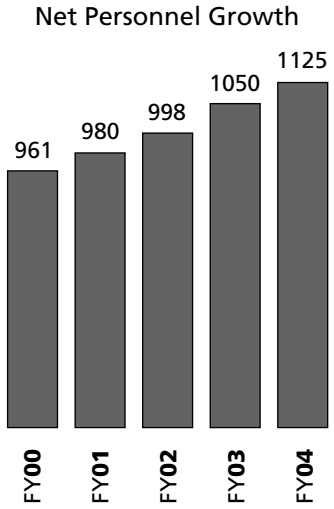
REPORT ON RESOURCES >>>>>>

FY2004

Information contained in the "Report on Resources" Section pertains to FY04 (October 1, 2003 through September 30, 2004).

People

The face of ECBC is rapidly and dramatically changing. Over the past five years, more than 500 people have joined the ECBC workforce, including many interns recruited from the best schools in the country. This effort has been in direct support of goal one of ECBC's Strategic Plan, building "an exceptional workforce optimized to meet the changing needs of our customers."



In 1999, at the beginning of this strategic planning five-year cycle, ECBC recognized that impending retirements could result in a loss of institutional knowledge. To overcome this potential issue, ECBC's leadership team has overlapped new hires with retirements so that institutional knowledge can be passed from one generation to the next. By actively recruiting top professionals at all levels and hiring over 500 new staff members, ECBC has replaced more than half its workforce and lowered the average age of the workforce by several years.

In FY04, there were 107 new hires and 32 retirements, for a net growth of 75 employees. Of the 107 new hires, 40 were interns. Additionally, there were 318 on-site contractors providing assistance to ECBC in FY03, and in FY04, that number jumped to 385, for a net increase of 67 people. On-site contractors are a vital part of ECBC's workforce, allowing the Center to quickly acquire diverse skills and backgrounds in a rapidly changing environment.

ECBC's internship program has been a major contributor to the continued growth of the workforce. Since its inception four years ago, the internship program has transitioned enough interns into positions within ECBC that they now make up more than 10 percent of the entire workforce.

ECBC recruiters are pursuing—and getting—the top students from the top schools. These students say that they chose ECBC over other organizations for two primary reasons: the unique science and engineering facilities and top notch laboratory equipment, and the many opportunities to do interesting, meaningful work that contributes to the nation's well-being. Through this aggressive hiring program, ECBC's workforce has been infused with energy, new ideas, and enthusiasm. This is an exciting time for the Center.

Infrastructure

Five years ago, the Center's leaders set out to rebuild the physical infrastructure of ECBC. The goal was nothing less than to lay the groundwork for the next decade of breakthrough chemical and biological defense research and technology development. Many of the initiatives begun at that time are now bearing fruit and in 2004 ECBC made enormous progress toward meeting that goal.

Standoff Detection Technology Evaluation Facility

For the first time ever, precise performance measurement of standoff detection systems can be made under true environmental conditions with the development of the "windowless" Vortex Chamber.

The only one of its kind in the country, the windowless Vortex Chamber utilizes curtains of air, produced by an interior vortex balanced by an exterior counter-flow of air, to contain a material cloud. This allows researchers to release a known amount of material and maintain a calibrated material scatter, so that a standoff detector's ability to "see" can be accurately measured from up to several kilometers. This also prevents the backscatter off of conventional hard windows from corrupting the desired measurements on the cloud inside the chamber. This increased precision reduces uncertainty about the potential field performance of standoff detectors.

The Vortex Chamber has generated a great deal of interest from the science and technology community due to the highly accurate data that can be obtained in the facility. Considered a prototype facility, the Vortex Chamber cost less than $1 million to construct and is being enhanced and expanded in 2005.

Advanced Chemistry Laboratory

In mid-2004, ECBC marked another important milestone in the construction of the nation's most advanced chemical and biological research facilities, with the installation of the Advanced Chemistry Laboratory's (ACL) state-of-the-art filtration system. The 21-filter system has the capacity to filter 200,000 cubic feet per minute, and is composed of two types of filters: 18 Multiple Cell Radial Filters (MCRF) and 3 Fixed Installation Filters (FIF). The sophisticated system can remove toxic vapors and gases, sub-micron-sized particles and nuclear, biological and chemical (NBC) agents.

The system, which exceeds the requirements for this kind of facility, will be an essential component of the ACL, helping make it the nation's premier site for work with military unique chemical agents. Scheduled to open in late 2005, the new 75,000-square foot ACL will enhance ECBC's ability to counter the evolving threat of chemical warfare and the use of chemical agents by terrorists.

Chemical Biological Radiological Sample Receipt Facility

For years, ECBC has supported the interagency community by receiving, triaging, analyzing, and exploiting samples and devices of unknown content from around the world. Current ECBC facilities are antiquated and inadequate for this purpose so the need for a new state-of-the-art facility was recognized by military construction planners. Congress also recognized the urgent national need for this facility and moved the funding forward into the FY05 budget. As a result, ECBC will construct a new Chemical Biological Radiological Sample Receipt Facility (CBR-SRF) sooner than expected.

The CBR-SRF will be the location where samples of materials to be tested or analyzed (such as those unearthed in Iraq) go first to be documented and triaged. This triage process can also include characterizing samples, determining contents of unknown samples, removing explosive configurations, and documenting a legal chain of evidence for the sample.

The facility will allow disassembly and evidentiary exploitation of improvised terrorist devices and munitions, including explosively configured munitions. The CBR-SRF is not a laboratory; rather, it is a facility that assesses and characterizes unknown devices prior to being analyzed in a laboratory or handled further. This work, currently being conducted in several locations at ECBC, will be consolidated into a single high-tech robotics-enhanced facility. Design work was initiated in 2004 and continues. The Federal Bureau of Investigation is collaborating on the design and will use a portion of the facility. Design is expected to be complete in late 2005.

Current Good Manufacturing Practices Clean Room

Current Good Manufacturing Practices (cGMP) refers to a set of regulations, created by the U.S. Food and Drug Administration (FDA), that ensure quality assurance in the production of any human use or diagnostic product. ECBC is currently building a 1,500-square foot, Class 10,000 clean room inside ECBC's Biotechnology Facility. Installation continued in 2004 and the room is expected to be complete in 2005.

After the 6-month validation process, the room will be fully compliant with cGMP standards, and will begin operations. There is already significant interest from both the military and the private sector, as the facility will be one of only three clean rooms of this type in the State of Maryland.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