



STC Part of Major Effort at ECBC With Biodefense Support

STC has over 27 years of experience supporting the Department of Defense and the military services in the chemical and biological defense area. Since 1980, STC has consistently delivered technical support services to the U.S. Army Research Development and Engineering Command (RDECOM) and its predecessor organizations. During this period, STC has been awarded over 40 contracts/subcontracts and performed critical research involving the biological defense programs of the U.S. Army. Currently, STC is performing tasks on five CB defense contracts for the Army.

Jim Gilbert, Vice President and Program Manager, has been responsible for STC's support to the U.S. Army Edgewood Chemical and Biological Center (ECBC) since 2002. He is assisted by **Richard Waller**, Human Resources and administrative support; **Glenda Lissimore**, Security and Biological Personnel Reliability Program officer; and **Diana Hejduk**, administrative support.

Our scientists have been an integral part of the biological research laboratories at the U.S. Army Laboratory Complexes, Aberdeen Proving Ground (Edgewood area) for RDECOM. STC has operated 12 biological research laboratories located at the ECBC in support of its biological detection program. These laboratories are equipped with the latest instrumentation and biological equipment to perform immunoassay and molecular research support. All STC laboratory personnel are in compliance with the Federal, State, and local regulatory requirements for environmental, safety, and OSHA requirements to include annual training in the following areas: CPR-First Aid, Toxic Aid, HEPA Respirator Use and Maintenance, RCRA and Hazardous Waste



Norman Green working on an electrical circuit board layout.

Management, Security Awareness, and Radiation Safety. STC has provided support with biosensor assays, reagent support, and training to customers which include: U.S. Army ECBC Biological Integrated Detection System (BIDS), ECBC Technical Escort Unit (TEU), Dugway Proving Ground (DPG), Joint Program Office (JPO), Biological Warfare Laboratory (BWL), Defense Technology Objective (DTO), ECBC Molecular Engineering Team (MET), and Point Biodefense Advanced Technology Demonstration (ATD).

For the last 17 years, STC has provided the design and development of innovative electronic hardware and software under a number of programs devoted to the detection and identification of chemical and biological agents. This work has been under contract to the Research and Technology Directorate. Although they are not considered to be electronic production, a number of fielded electronic assemblies have been manufactured by STC's experienced Electronics Engineer at ECBC.

STC's electronics capabilities include the design of hand wired breadboards and multiple layer printed circuit boards. STC has developed surface-mounted electronic component capability to facilitate state-of-the-art circuit design.

The programs have included circuit and systems designs of point detectors, laser standoff detectors, communications electronics, solid-state laser drivers and receivers, and digital data acquisition systems. Some examples of STC electronics programs are:

- Design of a wide range digitizer and control for the Frequency Agile Laser Lidar data acquisition system.

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Honors and Awards

STC Receives Contractor of the Year Award

STC was awarded the "Small Prime Business of the Year" for 2007 by NASA Langley Research Center (LaRC). This award is in recognition of STC's "exceptional achievement and dedication in support of NASA Langley Research Center programs and missions". In addition to other technical support to NASA LaRC, STC is the Prime Contractor providing center-wide Electronic Fabrication & Electronic Equipment Support (EFS). STC's EFS personnel have received numerous awards and recognitions from NASA for their outstanding work. STC is actively engaged in supporting NASA's Crew Exploration Vehicle (CEV) design and fabrication of the launch vehicle for future space missions. □



From left to right: Vernon Van (LaRC), George Wood (STC), Chand Deepak (STC), Glen A. Delgado (Office of Small Business Programs, NASA HQ), Lesa Roe (LaRC Center Director), and Randy Manning (LaRC).

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- Fabrication of a custom computer chassis, and designed the data acquisition electronic system for a compact lidar.
- Fabrication of a high voltage (20,000 Volts) electrostatic particle charger for IR extinction measurements.
- Design and assembly of a 4-point probe for thin film resistance measurements.
- Design of digital-to-analog interface electronics and stepper motor control fabrication for an iso-kinetic air sampler.
- Development of an Automatic Gain Control (AGC) program that was used to design an AGC circuit on a PCI computer card (for which a patent was issued).

STC has also contributed its expertise in other areas of biodefense. In several laboratories spanning two teams at ECBC, STC personnel have participated in the development and optimization of nucleic acid-based assays. These assays were optimized for several biological threat and stimulant agents using Smart Cycler, Ruggedized Advanced Pathogen Identification Device, and ABI 7900 HT biosensors. Assay development has been performed for numerous customers including the U.S. Department of Homeland Security, the Department of Agriculture, the Stations of Robotic Monitoring Team, the Joint Program Office for Biological Defense, the Joint Biological Point Detection System, the Theater Army Medical Laboratory, and many other government agencies. In addition to refining classical assay formats, STC continues to develop emerging gene chip, microarray, and High Throughput Screening assay formats.

After September 11, 2001, environmental sample analysis became very important. STC personnel have played an integral role in the development and optimization of front-end sample clean up of swipe samples using immunomagnetic separation techniques. As a result, STC was recruited to author training modules and provide training to U.S. Army Technical Escort Unit personnel on biological sample

collection and detection methods, and provide technical support (to include assay development, sample preparation, sample testing and reagent support) on a critical post-September 11 environmental sample analysis mission. STC also developed a protocol that preserves the integrity of

implementing an ISO 9000 based Quality Management System across the CB detection group, in addition to supporting individual projects that require a quality system. Additional accomplishments include assisting with ISO 17025 internal audits, creating Quality Manuals and Data Protection

Plans, as well as participating in quality teams to create procedures for ECBC.

Our Quality Managers and quality assurance coordinators have established compliance to U.S. Food and Drug Administration Good Laboratory Practices and American Society for Quality E4 regulations by developing document control systems, equipment monitoring and maintenance programs, raw materials control systems, testing and validation procedures, and continuous improvement programs.

STC has recently identified two new key areas in which it may contribute its expertise to the biodefense community. In the area of immunology, STC is supporting a Research and Development consortium for the development and production of monoclonal antibody reagents for specific recognition of biodefense targets. The antibody development program aims to field novel antibody reagents to support existing bioagent detector systems.

Over the past two years, the antibody program has established a new immunology-focused laboratory and initiated development of antibodies to numerous antigens.

Another key area in which STC has contributed its expertise has been the development of bio-agent Fourier Transform Infrared Spectroscopy (FTIR) based signatures. STC is working with ECBC to differentiate between species and strains of biothreat agents by infrared spectroscopy in high containment laboratories.

STC is also assisting in the area of differentiation of biothreat agents. STC is working with the Point Detection team to support the Research and Technology Directorate's efforts to design and develop

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Mark Karavis loading test sample in preparation for current project.



Bruce Voelker checking volume of sample before evaluating under microscope.



Amber Prugh and Saumil Shah preparing materials for an upcoming experiment.



Melissa Tis evaluating test cells for the next immunization plan for mice.



Dr. Bonnie Woffenden assuring that test samples are in proper casings before returning them to storage.



Vanessa Funk returning agents to refrigerator after analyzing blood samples.

DNA in environmental samples being processed for polymerase chain reaction analysis. STC's development of the new protocol helped its ECBC laboratory gain accreditation by the American Association for Laboratory Accreditation (A2LA) in the area of biological sample analysis.

As our scientists were facilitating the A2LA accreditation of its biosensors sampling laboratory, other STC personnel were implementing quality systems in ECBC BioDefense laboratories.

STC was chosen (and continues) to provide Quality Managers (QMs) for ECBC Research and Technology Directorate lab operations for BioSciences and Chemical Biological (CB) Detection programs. STC responsibilities include

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algorithms, chemical databases and software applications for the purpose of detecting and identifying chemical and biological threat agents. The software facilitates rapid identification of biological agents such as bacteria, viruses, and toxins through mass spectrometry. The system takes approximately twenty minutes to go from receiving the sample to identification. It can identify peptide patterns and match those to theoretical ones obtained by analysis of proteomic databases, as well as identify multiple agents simultaneously. In the biodefense area, STC has 14 years of software analysis, design, and development experience, and the work has been recognized in 25 presentations, 5 publications, and 3 technical reports.

STC works in analysis with the CB Detection team. STC's focus has been on signal processing, algorithm development, and analysis of passive (lidar) and active (FTIR) remote sensing data, including hyperspectral image analysis. STC is also involved in the evaluation, modeling, and simulation of remote sensing systems and their physical environment and has also supported data collection and analysis during field tests. STC's major accomplishments include demonstrating chemical vapor detection in an urban environment, introducing a new method of data analysis to the lidar community, and aiding the development of a novel radiative transfer model that includes aerosol scattering effects.

STC has also been involved in the development of automated methods for generating surface reflectance spectra from NASA's Lewis spacecraft hyperspectral imagery. Currently, STC's focus is on hyperspectral image processing, detection algorithm performance evaluation, characterization of atmospheric and topographic backgrounds, and interferences with field data and physical models. STC is also interested in sensor modeling, signal and image processing, and other areas of research for the development of the next generation passive standoff chemical and biological sensors.

In response to the Department of Defense's growing need for personnel

capable of handling potential biothreat organisms, STC scientists participate in ECBC's Biological Personnel Reliability Program (BPRP). STC BPRP scientists provide expertise in basic and applied research and development in bacterial and viral microbiology. Our scientists also are experts in molecular biology (DNA fingerprinting, PCR, microchip/

played key roles in validating decontamination methods, in evaluating building material decontamination technologies (after a potential biowarfare attack), and in assessing the survivability of bacteria and viruses in municipal landfills and water treatment facilities.

Other large government clients rely on STC employees to validate commercially available field detection kits (detection of biological agents and toxins in unknown samples) that provide first responders with an onsite analysis of agents or toxins that may be present.

Finally, STC personnel have produced and purified organophosphorus degrading enzymes for the creation of the Advanced Catalytic Enzyme System (ACES), a system for the bioremediation of nerve agents. The ACES formulation has served as a foundation for a new patentable technology that ECBC is developing in collaboration with a large industry client.

In addition to ECBC, STC's support for Biodefense is not exclusively provided at ECBC. Support is also provided at the Army's Chemical Agent Munitions Disposal System Directorate

(Tooele, Utah). STC® personnel develop and apply methods of detecting fugitive compounds entering the air, soil, and water in the proximity of the demilitarization site. STC scientists provide the overall depot perimeter monitoring on a 24/7 basis for the United States' largest chemical stockpile destruction program. In addition, STC has

developed several methods for detection of non-traditional agents and have had these approved by the EPA and State of Utah for permit compliance.

At Dugway Proving Ground's West Desert Test Center, STC is a core team member supporting the Department of Defense's premier test center for evaluation of chemical and biological protection and detection systems. STC personnel work with live chemical and biological agents in chemical surety and BL 3 level laboratories and facilities in support of this most important test mission. New chemical and biological detectors are tested for field readiness. Innovative analytical methods and assays

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Jennifer Minter filling test tube for upcoming bacteria evaluation for FTIR work.



Samir Deshpande, Programmer Analyst, entering data for recently completed software enhancement.



Michelle Ziemski gathering supplies required for the next upcoming AOAC project.



Paul Clark returning samples to refrigerator after completion of cell experiment.



Michael Young, Quality Manager for CB Detection, reviewing a recently taken audit of DSH S&T sample preparations.



Drs. Charles Davidson and Daryoush Razi preparing the MIDAC FTIR Spectrometer.

microfluidic DNA characterization) in BioSafety laboratories. STC scientists have experience in handling potential biowarfare agents and their simulants and surrogates. In ECBC non-surety labs, STC personnel have developed and optimized enhanced electro-chemiluminescence (ECL) based assays targeting biological threat and simulate agents on commercial off-the-shelf biological point detection platforms. In addition, STC's ECL experts have developed lyophilized assays specific for an assortment of biological threat agents and simulants to be used for the aforementioned ECL applications.

As part of several collaborative efforts between ECBC and the U.S. Environmental Protection Agency, STC personnel

Honors and Awards (continued)

Edgewood Employees Recognized by ECBC

Amber Prugh, Research Microbiologist, received commendation for outstanding support of three high-profile Government programs: DTRA sponsored T&E; EPA sponsored Test Method Development; and Ricin/BI Decontamination. Pictured with Amber are Dr. Vipin Rastogi, acting Government Team Lead for ECBC Biodefense Team; **Jennifer Minter**, STC Team Supervisor, Biodefense Team; and **Jim Gilbert**, Vice President and Program Manager for STC Chem Bio Programs.



From left to right: Dr. Vipin Rastogi, Jennifer Minter, Amber Prugh, and Jim Gilbert.

Michelle Ziemski, Lab Technician received an award for outstanding support in processing of sensitive samples required by the FBI from Jim Gilbert and Jennifer Minter.



Left to right: Jim Gilbert, Michelle Ziemski, and Jennifer Minter.

Dr. Bonnie Woffenden, Sr. Research Microbiologist, received outstanding service award in support of Chem/Bio Defense projects from Jim Gilbert.



Jim Gilbert and Bonnie Woffenden

Vanessa Funk, Research Scientist, received outstanding service award in support of Chem/Bio Defense projects from Jim Gilbert.



Jim Gilbert and Vanessa Funk

Melissa Tis, Microbiologist, received outstanding service award in support of Chem/Bio Defense projects from Jim Gilbert.□



Jim Gilbert and Melissa Tis

Clark and Minter Receive Biodefense Best in Show Awards

Paul Clark received first place award for the Biodefense Team, R&T Directorate, ECBC Best in Show notebook contest. Presenting Paul's award are **Jim Gilbert**, Vice President, STC Chem Bio Defense Group and Dr. Peter Emanuel, Director of the Biodefense Team.□



From left to right: Paul Clark, Jim Gilbert, and Peter Emanuel.

Jennifer Minter received recognition award for outstanding work in judging and directing the Biodefense Team, R&T Directorate, ECBC Best in Show notebook contest. Presenting Jennifer's award, is Jim Gilbert, Vice President, STC Chem Bio Defense Group and Dr. Peter Emanuel, Director of the Biodefense Team.□



From left to right: Jennifer Minter, Jim Gilbert, and Peter Emanuel.

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are developed to support the increasing importance for low level detection of chemical and biological agents, and the newest military equipment is tested to ensure that those that fight for our nation have the best protection available. Training support is also provided for special warfare personnel as well as civilian agencies first responders.

STC has also developed and tested the newest assays and performed biosensor evaluation at Dugway Proving Ground (DPG) during Joint Field Trials (now technical readiness evaluations/assessments) I, II, III, V, and VI.

At Newport Chemical Destruction Facility, STC is assisting the laboratory services to destroy the storage of VX chemical agent. STC personnel provide monitoring expertise to respond to agent alarms, schedule monitoring activities, and trouble shoot problems for Minicams VX near-real-time air monitoring, Depot Agent Air Monitoring System, mobile perimeter monitoring and life support air monitoring. STC performs analysis using both DAAMS GC-FPD and GC-MDS methods of analysis, as well as perform methods of analysis for GC-CI-MS-MS or HPLC-ESI-MS-MS. Preparation and certification of

chemical agent standards and analysis of waste samples such as VX in Hydrolysate and other complex waste samples is performed, as well as analytical methods development for other special analysis.

STC® is a dynamic, high-technology, certified Small Disadvantaged Business with many integrated talents and resources ready to meet the varied needs of its customers. Our Chemical-Biological Defense Competency has evolved over a number of years, as an embedded, essential, integral part of our science and engineering contracts.□