

Field Purposing Technologies: Placing Forensic Tools into the Hands of Field Practitioners for Timely Intelligence

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Abstract

As the military, law enforcement and homeland security communities are called to meet challenges such as narco-terrorism, border incursions and terrorist threats, the need for rapid analysis of forensic evidence becomes increasingly important. To provide field personnel with the forensic intelligence to conduct investigations and aid missions, agencies are equipping first responders and military service members with portable forensic analysis tools. These technologies allow complex analyses to be conducted outside of the conventional laboratory environment. This capability not only serves to expedite the rapid development of intelligence to lead the investigation, but also promises to dramatically reduce the volume of evidence submitted to already backlogged laboratories.

However, providing practitioners with deployable technologies is only part of the solution. Ensuring practitioners also have the knowledge, skills and support to properly apply these tools to analyze compounds and gather vital forensic data is equally important.

The National Forensic Science Technology Center (NFSTC) has assisted agencies in this effort by assessing the needs of field forensic practitioners, evaluating and disseminating information on available and emerging forensic technologies, developing programs of instruction and providing reachback assistance. Our forensic scientists evaluate emerging technologies for manufactures to determine the performance and applicability of new tools. These evaluations provide both the manufactures and agencies with impartial data to assist in improving and selecting the most appropriate technologies for meeting their operational objectives. These efforts hold the potential to produce dramatic gains in

This combination of technology, quality assurance and support to practitioners at the point of need provides field personnel with the ability to conduct examinations and quickly develop actionable intelligence. In addition, by utilizing proper protocols, practitioners can run tests while maintaining the integrity of the evidence for follow-up laboratory analysis as needed.

Introduction

Not all forensic analyses can be conducted *in situ*. However by field purposing technologies typically found only in laboratories, practices such as identifying explosive compounds, narcotics, hazardous materials and DNA can be performed anywhere—from the battlefield to the border. Field purposing technology puts the ability for timely collection and processing of forensic intelligence in the hands of deployed field personnel to enhance their ability to develop and disseminate actionable intelligence.

Portable, Reliable Forensic Tools in the Field

Military personnel, homeland security agents, police officers and other field practitioners need forensic intelligence-gathering technology that is portable, easy-to-use and rugged enough to meet the demanding conditions often present in the field. In addition, field personnel require equipment that covers the range of potential evidence they may encounter, including fingerprints, explosive compounds and narcotics, and biological material containing DNA. By deploying forensic technologies and knowledge into the field, agencies can increase their capability to predict and prevent events rather than react to them.

Bringing technology forward to the point of need allows investigators to expedite aecision-making and quickly convey critical information to those who need it.

Mission Space

The groups that use forensic technology traverse many operational areas, but the requirements and the desired outcomes are the same: develop forensic intelligence in order to make decisions that protect the homeland and support the criminal justice system.

Department of Defense

- Identify friend or foe on the battlefield
- Identify and communicate international threats to U.S. security
- Prevent terrorist activities through identification and apprehension of suspects
- Protect U.S. interests abroad, including those representing the U.S. in official capacities



DNA evidence, like sweat or blood, can be collected from the wires of an unexploded IED to identify and apprehend terrorist suspects.

Department of **Homeland Security**

- Control the flow of undocumented immigrants • Identify potential threats to
- U.S. security at the borders Identify and seize illegal or dangerous international
- cargo at U.S. ports Identify and prevent international criminals/ fugitives from entering the



Field-portable technology allows border control agents to conduct confirmatory tests on an unknown substance in a matter of seconds. This hand-held spectrometer can test for narcotics, explosives, drugs and other chemicals.

Criminal Justice and Law Enforcement Agencies

- Gather timely crime scene information to support the criminal justice system
- Implement predictive policing—using forensic intelligence to prevent crimes
- Identify and prevent domestic threats to U.S. security



Laboratories

presumptive tests

Collaborative work and

Reduce quantity of incoming

Increase relevant samples for

communication with the field

samples requiring testing

Reducing backlog in the laboratories requires more than just funding. A white unknown substance is just that an unknown. Police officers utilizing lab Conducting presumptive or confirmatory tests in the field will quality equipment in the field can identify and seize narcotics quickly without eliminate excessive evidence being sent to the laboratory for analysis. waiting for lab processing.

Field Technology Requirements Process

Step 1: Identify Requirements

NFSTC meets with decision makers, end users and vendors to identify needs, gaps or deficiencies in available forensic tools and capabilities in the field.

Requirements emerge from the Joint Capability Technology Demonstrations (JCTD) process which seek to identify, demonstrate and transition the best operational tools and technology solutions for the battlefield.

Step 2: Identify Potential Technologies

NFSTC works with representatives from the government and other members of the greater forensic service community to identify the need for a performance assessment of an instrument, product or technique for a forensic application.

Step 3: Test and Evaluate Tools

NFSTC scientists perform testing and evaluation of currently available forensic technologies to aid decision makers in selecting the most appropriate tools for their application.

Evaluations of emerging technologies furnish unbiased information regarding their performance and usability.

The process includes:

- An evaluation plan, designed and submitted for review and approval
- Evaluation details, results, report and any associated data, submitted for review of technical content and experimental soundness

When applicable the evaluations are available on NFSTC's website in a standard report format.

Step 4: Solicit End User Feedback

NFSTC invites end users to participate in hands-on demonstrations of new technology.

NFSTC uses panel participants to test the instruments on actual samples and in real scenarios.

Surveys and questionnaires are completed by end users and demonstration participants and the gathered feedback is recorded and analyzed.

Step 5: Refine and Adapt Technology

Through evaluations and feedback from end users, NFSTC scientists define specific areas for improvement and develop recommendations for implementing those improvements.

An open line of communication with manufacturers allows NFSTC to share ideas for improvements and possible expansions to the range of services the instruments can provide.

NFSTC helps to adapt existing technology by suggesting to agencies and manufacturers means of repurposing existing instruments and technology for a forensic application.

Step 6: Develop Field-Training Materials

NFSTC works with stakeholders to analyze the needs of the end-users including the means of applying the technology, environments encountered and the desired outcomes of both training and instrument results.

NFSTC instructional design experts collaborate with technology subject matter experts and end users to develop specific training methods and materials, which may include:

- Online learning modules incorporating integrated self-assessment components
- Instructor-led courses
- Scenario-based and/or practical application exercise sessions
- Blended learning solutions that combine online theoretical learning modules and on-site practical application
- Scripted videos of hands-on demonstrations, simulations and/or animations
- Portable job aids featuring equipment details and/or processes
- Mentoring

Step 7: Support and Reachback

NFSTC, under contract, offers ongoing technical and reachback support to end users through the availability of subject matter experts who provide:

- Expert support for technical questions
- Instrument maintenance support
- Sample analysis assistance
- Sample preparation guidance for chemical detection and identification technologies
- Interpretation and data review of rapid DNA, colorimetric, IMS, Raman, FTIR and/or GC/MSbased technology
- Chemical characterization support
- Report writing and data integration assistance
- Report and case file review

Transitioning Technology from the Lab to the Field

Rapid DNA



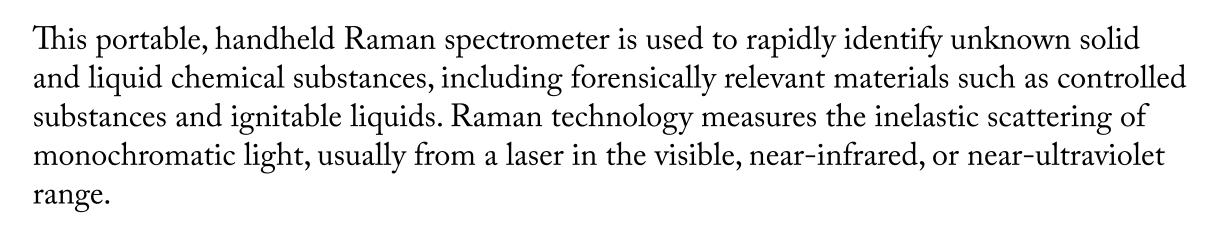
Rapid DNA technology provides samples between five and 24 loci in less than two hours. As of December 1, 2014, the FBI approved this technology with an addendum to the QAS for databasing laboratories. This technology can confirm presence of DNA with easy-to-understand "swab in-profile out" process designed for the use by the non-scientist.

Griffin™ 460 GC/MS

The GriffinTM 460 gas chromatography mass spectrometry (GC/MS) chemical analyzer is used to analyze and identify forensically relevant chemical compounds in the field including narcotics, ignitable liquids and explosives. This device, unlike other GC/MS devices typically found in the laboratory due to size and power source, has been optimized and ruggedized for field use.



Thermo Scientific™ FirstDefender™ RMX



Smiths Detection HazMatID™ Portable Fourier Transform Infrared (FTIR) System

The HazMatIDTM is a small, portable chemical analyzer that uses infrared spectroscopy to identify forensically relevant chemical compounds including narcotics, ignitable liquids, explosives and common household materials. This system allows for non-destructive analysis of samples without the need for specialized sample preparation equipment.



Field-Presumptive Narcotic Screening Tests



These single-use test ampoules use colorimetric technology to screen substances for the presence of classes of narcotics. Each test kit contains a proprietary reagent-granulate (liquid and crystals) and a band of color to indicate a positive result. The tests are optimized for field use and allow law enforcement officers to presumptively test for narcotics including cocaine and crack cocaine, heroin and

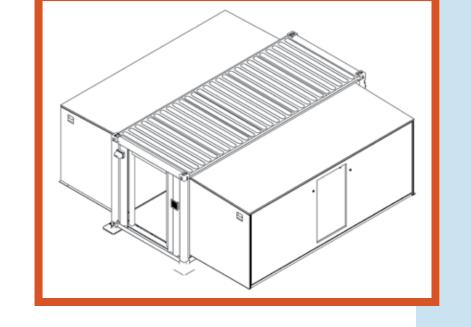
Deployable Forensic Laboratory

Rapid Response to Urgent International and Domestic Needs

Deployable forensic laboratories are an effective way to provide forensic capabilities in emergency or combat situations. Each expandable module is seated on a standard transport trailer for ease of movement and, once folded out, provides a maximum of 400 square feet of usable laboratory space.

Each shelter is self-supporting and can be used separately or connected to other shelters to expand services. Full set-up of a single laboratory can be accomplished in less than one hour. Each unit features:

- Reachback capability
- Full data sharing
- Dust- and light-resistant enclosure
- Backup generator on board - Minimum of 33 hours on a single tank of diesel fuel
- Remote start and uninterruptible power supply (UPS) systems eliminate data loss
- Air conditioning and heat
- Access-controlled entryway





Impacts and Implications for the Future

- Increased integration between technology selection, training and feedback from end users boosts the effectiveness and value of the forensic tools deployed in the field
- Mobile devices could lead to easy-to-use field enabled equipment, lowering costs without lowering quality and standards of quantitative analysis
- Integrated approach helps those in the field use tools and information expediently and creates a thorough understanding of the benefits and limitations of on-site forensic analysis
- Deployable forensic capabilities expand the available options for gathering actionable intelligence and disseminating it proactively to protect public safety and the homeland
- Evaluated technology can be repurposed to expand the capabilities and long-term value of individual instruments, processes and applications, resulting in cost savings and improved forensic capabilities across the
- Integrated evaluation and training for new technology could help standardize equipment selection and education across all deployable groups, saving time and reducing the costs involved with acquiring new
- Technology developed for the battlefield is refined for use by State and local law enforcement, allowing for more confirmative analysis in the field and reducing stress on overburdened crime laboratories
- Field-purposed technology could directly support the growing trend toward prioritizing evidence through the use of confirmative field tests and improved capabilities to analyze discovered materials in-situ
- Field-purposed technology, and the methods used to identify, evaluate, implement and educate, will lead to greater integration between the organizations charged with protecting U.S. citizens at home and abroad, which will support intelligence sharing, predictive policing and stronger national security



References

www.nfstc.org

www.disa.mil/Mission-Support/Enterprise-Engineering/JCTD

Study Contact and Author Affiliations

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