



**Part I:**

**TECHNICAL  
DIVISIONAL REQUIREMENTS**

**LONG RANGE BROAD AGENCY ANNOUNCEMENT (LRBAA)  
BAA 10-01  
FOR  
THE DEPARTMENT OF HOMELAND SECURITY  
SCIENCE AND TECHNOLOGY DIRECTORATE**

## **INTRODUCTION:**

This is a Broad Agency Announcement (BAA) as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2) and 35.016. A formal Request for Proposal (RFP) will not be issued.

The Department of Homeland Security (DHS) Science & Technology (S&T) Directorate will not issue paper copies of this Announcement. The DHS S&T reserves the right to select for award and fund all, some, or none of the Full Proposals received in response to this Announcement. No funding for direct reimbursement of proposal development costs will be allowed. Technical and cost proposals (or any other material) submitted in response to this BAA will not be returned. However, depending on the markings on the proposal, DHS S&T will adhere to FAR policy on handling source selection information and proprietary proposals. It is the policy of DHS S&T to treat all proposals as sensitive competitive information and to disclose their contents only for the purposes of evaluation.

Multiple awards are anticipated to be issued through this LRBA and will be based on an assessment of the overall best value to the government. Awards will be made based upon the proposal evaluation, funds availability, and other programmatic considerations. Awards may take the form of contracts, grants, cooperative agreements, or other transaction (OTAs) agreements. Therefore, the applicable laws and regulations governing the legal vehicle used for award will depend on the legal vehicle chosen by DHS S&T. In the event an Offeror or subcontractor is a Federally Funded Research and Development Center (FFRDC), Department of Energy (DOE) National Laboratory, or other Federally funded entity, DHS S&T will work with the appropriate sponsoring agency to issue an interagency agreement pursuant to the Economy Act (31 U.S.C. 1531) or other appropriate authority.

**Part I of this LRBA (this portion) contains the Technical Requirements, Divisional Points of Contact, and general interest areas.** *Please refer to Part I to determine if your specific area of interest is of particular interest to DHS S&T and to determine which division you should focus on. If you determine you have an idea that will be of interest, please open and print Part II, which will guide you through the requirements of the LRBA submission process. It provides details on what shall be included in your White Paper or Full Proposal, explanations of how to submit and steps in the process, as well as the evaluation Factors and elements.*

## **I. GENERAL INFORMATION**

### **1. Agency Name -**

Department of Homeland Security  
Science and Technology Directorate  
Washington DC 20528

**2. Research Opportunity Title -**

DHS S&T Long Range Broad Agency Announcement

**3. Research Opportunity Number -**

BAA 10-01

**4. Response Date -**

This announcement will remain open until December 31, 2010, 11:59 PM, Eastern Standard Time (EST). White Papers and Full Proposals may be submitted at any time during this period.

## 5. Research Opportunities of Strategic Interest -

The mission of the DHS S&T Directorate is to “support basic and applied homeland security research to promote revolutionary changes in technologies; advance the development, testing and evaluation, and deployment of critical homeland security technologies; and accelerate the prototyping and deployment of technologies that would address homeland security vulnerabilities.”

DHS S&T is interested in receiving proposals for Long Range Science and Technology Projects and innovative prototypes that offer potential for advancement and improvement of homeland security missions and operations. Readers shall note that this is an announcement to declare S&T’s broad role in competitive funding of meritorious research across a spectrum of science and engineering disciplines. The overall mission and goal of S&T is to identify revolutionary, evolving, and maturing technologies that can be demonstrated to provide significant improvement to homeland security missions and operations through proof of concept and prototyping with potential for transition to current and future DHS acquisition processes. S&T will focus on those key areas where risk inhibits mission and operation investments and where significant capability payoffs can be expected for successful efforts. Related technologies are being pursued by other elements of the US Government, and in those cases, DHS S&T will leverage and use those technology developments wherever it is practicable and efficient to do so. S&T will also facilitate access to laboratory and operationally relevant test and evaluation facilities wherever reasonably available.

This Announcement is restricted to work relating to basic and applied *research* and that portion of advanced technology development *not* related to a specific system or hardware procurement. This Announcement does **not** cover support services, such as technical services, engineering services, or other types of support services. Such submissions are considered non-compliant with this LRBA and will be rejected without further evaluation.

S&T is soliciting individuals or teams to conduct basic research, applied technology development, or the preparation of integrated prototypes for field investigations of the performance of new and innovative solutions. Contracts, grants, cooperative agreements, and other transaction agreement awards made under this BAA are for scientific study and experimentation directed towards advancing the state-of-the art or increasing knowledge or understanding.

It is incumbent of Offerors to clearly articulate the specific advances or innovations in science and technology contained in their submissions. ***It cannot be emphasized too strongly that all submissions must show future promise for one of the DHS homeland security operational environments.***

Fully developed products are not normally considered as a solution under this LRBA, unless the Offeror is proposing a totally different application for the product or a modification is needed, and some research is required to determine if it will be successful.

Below are brief treatments of the Topical Areas or major categories of Research Opportunities of Strategic Interest. Each Topical Area has a reference code. For basic scientific research, the code is simply BSR. Each division has multiple categories, and these are noted as follows: The main category for Borders and Maritime Security (BMD), for example, is BMD.0, followed by BMD.A1, BMD.A2, etc., for each topic area of strategic interest.

Topical Areas of strategic interest include:

**Border and Maritime Security** (BMD.0) focuses on tools and technologies that improve the security of our Nation's borders and waterways without impeding the flow of commerce and travelers. Concepts and prototypes of interest to the Borders and Maritime Security division include pilot testing new surveillance, monitoring, and response capabilities that cover vast expanses of remote border territories; as well as the development and evaluation of security devices, and new inspection methods to secure the large volume of cargo entering our Nation's ports daily.

There are 3 subdivisions within Border and Maritime Security:

A. Border Security

- Detection of, tracking of, classifying of, and responding to all threats along the terrestrial and maritime border (BMD.1) – in particular, technologies that can:
  - ✓ Classify humans versus animals in rugged terrain, concealing foliage, water obstacles, mountains, and other environmental constraints
  - ✓ Lower false alarm rate (Pfa) with raised probability of detection (Pd); (Pd) should be at least 90%
  - ✓ Operate at low power consumption levels (2 year battery life)
  - ✓ Detect, exploit, interrogate, and remediate subterranean border tunnels
- Improved ballistic protection via personal protective equipment in particular; a focus on increased effectiveness against a wider-range of projectile types, plus lighter weight and integrated helmet protection. (BMD.2)
- Ability to use hand held non-intrusive inspection (NII) tools that allow the inspection of hidden or closed compartments, specifically to find contraband and security threats (people) at checkpoints or during ship boardings. (BMD.3)
- Ability for law enforcement officers to assure compliance of lawful orders using non-lethal means – in particular, the ability to disable vehicles, vessels, aircraft, and temporarily incapacitate persons to prevent the infliction of damage or harm. (BMD.4)

- Ability for law enforcement personnel to quickly identify the origin of gunfire and classify the type of weapon fired. (BMD.5)
- Improved analysis and decision-making tools that aid DHS watchstanders in evaluating information and making more timely and accurate decisions. (BMD.6)
- Enabling technology for securing the Nation's borders. (BMD.7)

## B. Maritime Security

- Provide wide-area surveillance from the coast to beyond the horizon, as well as port and inland waterways, for detection, classification, tracking, and response. (BMD.8)
- Improved persistent, wide-area surveillance capabilities for guarding the U.S. coastal approaches from 12 to 120 miles offshore. (BMD.9)
- Improved situational awareness by tracking small boat activity, detecting anomalous and/or illegal behavior, and providing timely and actionable information in support of law enforcement and port security efforts. (BMD.10)
- Improved sensor performance to enable improved detection and tracking of small and large vessels by overcoming environmental clutter issues within the port/harbor as well as in coastal environments. (BMD.11)
- Advanced law enforcement capabilities, enhanced ability to protect critical infrastructure and key resources, and improved incident response and recovery management along the inland waterways, port/harbor, and coastal regions. (BMD.12)
- Concepts, methodologies, and/or technologies to more effectively track dangerous cargo being transported on inland rivers and waterways. (BMD.13)
- Improved data fusion and automated tools for command center operations – in particular, the improved ability for agencies to share information and collaborate when not co-located. (BMD.14)
- Ability for law-enforcement personnel to detect and identify narcotics, chemical warfare agents, toxic industrial chemicals, explosives, and contraband materials – in particular, the ability to identify multiple threats with one unit/one setup; operate on portable power; be wearable and self contained; and be able to sample for and detect contraband without direct contact. (BMD.15)

### C. Cargo Security

- Improved screening and examination by non-intrusive inspection - in particular, the ability to detect or identify contraband items (for example, drugs, money, illegal firearms), threat materials, or stowaways; improve penetration, resolution, throughput, contrast sensitivity, reliability, mobility, and interoperability; and integrate with future Automated Target Recognition capability. (BMD.16)
- Increased information fusion, anomaly detection, Automatic Target Recognition, and response capability – in particular, automated imagery detection capability for anomalous content (e.g., stowaways, hidden compartments, contraband), and the ability to detect anomalous patterns in shipping data. (BMD.17)
- Improved detection, and identification of WMD materials and contraband – in particular, the ability to detect chemical and biological threats, explosives, and contraband. (BMD.18)
- Capability to screen 100 percent of air cargo. (BMD.19)
- Track domestic high-threat cargo – in particular, the ability to track DHS-designated Toxic Inhalation Hazardous (TIH) cargos in domestic transit. (BMD.20)
- Detect intrusion or unauthorized access, positively identify cargo, and provide timely response – in particular, in containerized, palletized, parcel, or bulk/break-bulk maritime and air cargo. (BMD.21)

**Chemical and Biological Division** (CBD.0) analyses and countermeasures, including improved characterization and prioritization of threats, innovative or revolutionary methods for surveillance and detection for early attack warning that minimize exposure and speed treatment of victims, new forensic methods to support attribution, and novel concepts for decontamination and restoration, agrodense, and food defense. It is important to note that the division does not fund research on human clinical applications.

*Topical Areas of strategic interest include:*

#### **Chemical and Biological Research & Development**

- **Improved Informatics and Design for Biological and Chemical Analysis** (CBD.1) – (1) Bioinformatics and chemical analytics research that leads to significantly higher success rates for assay design. (2) Research to improve the depth and speed of data analysis and enhance access to (and indexing of) large datasets; particularly bioinformatics data structures as well as genotypic and phenotypic data.

- **Improved Sampling (CBD.2)** – (1) Research in the areas of biological particle capture and "real-time" analysis to support future development of technology that distinguishes between putative threat and non-threat agents; (2) research that develops fundamental understanding of sample collection to improve selectivity; (3) research that improves transfer efficiency of agents from the environment to detectors or instruments; and (4) research that improves organism collection and preservation by 70% viability or greater.
- **Sample Preparation (CBD.3)** – (1) Research that improves the ratio of analyte of interest to background contaminant (AoI:BC) for chemical and/or biological threats; and (2) research that helps to improve and define the quality of samples that emerge from sample preparation in ways that are substantive to either instrumental or assay style analysis.
- **Assays (CBD.4)** – Research to develop fundamental understanding and methodologies supporting assay chemistries that may potentially address the full spectrum of biological agents: (1) traditional threat agents; (2) agents that have been enhanced with known biological content; (3) agents that have emerged via natural selection; and (4) agents that are purely synthetic in nature. Ultimately, this research should allow comparisons against highly flexible databases of information that enable unique identification of threat agents. Research toward assay chemistries that permit reliable differentiation between environmental contaminants and chemical/biological threat agents is also of interest.
- **Instruments and Detection (CBD.5)** – Development, prototyping, and improvement of products and systems that are capable of detecting chemical and biological weapons, agents, and/or toxic industrial chemicals in aerosol, liquid, or environmental matrices, to support the following needs
  - ✓ Rapid detection and identification of an agent immediately after its release into the environment
  - ✓ Characterization and detection of novel, engineered, and emerging biological agents
  - ✓ Trace quantity detection of an agent to support decontamination efforts
  - ✓ Identification of a concealed agent or dispersal device prior to its release
- **Response and Recovery Research (CBD.6)** – Research aimed at enhanced understanding of chemical mechanisms and interactions with the environment and with operationally-relevant surfaces that will enable affordable and effective decontamination of emerging chemical threats and biological agents over wide areas.

## Threat Characterization & Attribution

- **Integrated Chem Bio Rad Nuclear Explosives (ICBRNE) Program (CBD.7)** – Prototype and pilot demonstration applications related to sharing of WMD sensor data and related information at the state, local, and federal level utilizing open standards and protocols.

- **System Studies (CBD.8)** – Research to conduct studies and analysis to identify gaps in technology and operational concepts and to support formulation of requirements for chemical and biological countermeasure development. Current specific areas of interests are food and transit system defensive architectures.
- **Bioforensics R&D Program (CBD.9)** – Supports research and development of next generation and novel technologies to characterize biological threat agents (BTAs) for source attribution in support of FBI/NBFAC requirements in a criminal investigation. These include novel applications of next generation technologies to characterize the organism or the sample matrix. Please refer to specific BAA releases for future submissions.

### **Agro Defense**

- Enhanced countermeasures for foreign animal disease (FAD) pathogens affecting domestic food animals, including molecular-based vaccines, immunotherapeutics, and novel agents with immune-based mechanism of action. (CBD.10)
- Laboratory-based and field deployable/point of care, rapid detection and diagnostic next generation technologies (e.g. arrays, nanotechnology, biosensors) to facilitate foreign animal disease outbreak prevention, response and recovery. (CBD.11)
- Efforts that address critical limitations in the current generation of foreign animal disease simulation models for high priority pathogens, including but not limited to the level of detail and parameterization required to adequately describe the diversity and complexity of the U. S. livestock system and the derived conceptual model, verification of the conceptual model versus its computer implementation, strategies for model validation versus the real world especially in a data poor environment, and the impact of data limitations at all levels of the modeling process. (CBD.12)

**Command, Control, & Interoperability (CID.0)** includes research and development that creates and deploys information resources – standards, frameworks, tools, and technologies – to enable seamless and secure interactions among homeland security stakeholders. Concepts, prototypes and other technologies that strengthen capabilities to communicate, share, visualize, analyze, and protect information.

- Research into the development of interoperable devices and systems to improve voice and data communications; information sharing; and collaboration between emergency response personnel at the federal, state, and local level. (CID.1)
- Research for advanced information assurance and other cyber security technologies to secure the Nation’s current and future cyber infrastructure. (CID.2)
- Innovative forensic technologies to increase the operational efficiency and create new capabilities for criminal and terrorist investigations. (CID.3)

- Research for advanced reconnaissance and surveillance technologies for law enforcement personnel. (CID.4)

**Explosives Countermeasures** (EXD.0) includes the detection, mitigation, and response to explosive threats including: all modes of transportation within the Transportation Systems Sector (Aviation, Maritime, Mass Transit, Highway, Freight Rail, and Pipeline), in checked and carry-on baggage, Home Made Explosives (HME), improvised explosive devices (IEDs) – vehicle borne (VBIED) and person borne (PBIED), and response and defeat technologies.

- **Standoff Detection of Explosives** (EXD.1): Technologies for the standoff detection of explosives and explosive devices related to Person and Vehicle Borne Improvised Explosive Devices. Explosives of interest include commercially available explosives (i.e. Ammonium Nitrate based), conventional military explosives (i.e. Composition C-4 and Semtex A/H) and homemade explosives (i.e., peroxide base). Standoff Detection implies that both the detection equipment and operator be located at some distance (>1 m up to tens of meters) away from the subject or object under interrogation. Subtopics include:
  - 1) Integration of both multimodal and multispectral technologies for improved detection and/or imaging metrics.
  - 2) Development of automated detection and/or identification capabilities associated with both imaging and spectroscopy based technologies.
- **Cargo Security** (EXD.2) includes detecting intrusion or unauthorized access, positively identify cargo, and provide timely response – in particular, in containerized, palletized, parcel, or bulk/break-bulk maritime, air cargo, and freight rail.
- **Test and Evaluation Expertise and Facilities for Counter-IED detection technologies** (EXD.3). Standoff, Remote, and Checkpoint based explosives detection systems, to be evaluated, most often require real explosives and local storage of said explosives. Facilities must be able to store, on-site, small amounts (< 1 pound) of various solid explosives, while achieving clean, uncontaminated facilities for equipment testing. Facilities must be able to accommodate non-eye safe laser ranges, x-ray based screening equipment, and neutron-based screening equipment. Facilities must also be able to accommodate, in certain cases, large, outdoor vehicle borne IED screening equipment.
- **Defeat of Improvised Explosive Devices** (EXD.4): Develop a means/method to attach an explosives access/neutralization charge to the external or internal surface of a vehicle or structure that is suspected of carrying or housing a terrorist explosive device. The means/method will allow for easy placement by a robotic platform, will allow for repositioning, and will support up to 100lbs. The means/method should be capable of adhering to glass, metal, wood, Fiber Reinforced Plastic (FRP), and concrete. Any means/method that proposes to use rope/ropelike items or double-sided adhesive tape is not acceptable.

Develop a tele-robotic manipulator that is capable of “fine motor” control for use in neutralizing an Improvised Explosive Device (IED). The system must be capable of precision actions such as cutting a wire, moving small components, opening small compartments, etc. The system must be mounted on or capable of being carried by a robot platform, is haptic sensitive, and weighs less than 25 lbs. The system should be self-powered, dual-armed and interoperable with the robotic platform Operator Control unit (OCU). The system should be capable of reaching up to 60”.

- **Data Fusion and Automated Detection** (EXD.5) for aviation cargo, checked baggage, carry-on baggage, personal check points and all surface intermodal concerns. Algorithms and techniques for detection fusion and automated alerting that combines a variety of detection modalities, including but not limited to X-Ray, trace chemical detection, computed tomography (CT) and video.
- **Materials Science Research for Explosives Mitigation** (EXD.6): Fundamental materials science research directed toward improved understanding of the relative importance and cumulative effect of aging, stress history, corrosion cracking, materials manufacturing variability and threats on critical infrastructure materials.
- **Advanced Detection Technologies** (EXD.7): Development of robust, enhanced explosives detection methods such as bio-inspired molecular recognition techniques and other advanced sampling technologies to improve selectivity and sensitivity capabilities. Detection methods should be easily deployed, low cost and require minimum training to operate. Special attention should be paid to determining better sensing mechanisms and signal amplification mechanisms to apply to future detection improvements.

**Human Factors/Behavioral Sciences** (HFD.0) applies the social and behavioral sciences to improve detection, analysis, and understanding of threats posed by individuals, groups, and radical movements; develops novel technologies and tools to improve the recognition of individuals; supports the preparedness, response, and recovery of communities impacted by catastrophic events; and advances national security by integrating human factors and public perceptions data into homeland security technologies.

- Methods, models and technologies to enhance community resilience in the face of human- or nature-caused catastrophes through such means as better understanding of risk perception, improved risk communication by emergency responders and public officials, programs of pre-event education and training and applied theoretical and empirical research into the properties of resilient social networks, including more effective ways of mapping and linking emergency response, longer term recovery teams and other organizations within and across the public, faith-based, NGO and private commercial sectors. (HFD.1)

- Research into metrics related to resilience, including the creation of validated metrics measuring the psychosocial impact of large-scale disasters and catastrophes on affected individuals and communities and measures of the effectiveness of societal and community resilience efforts across physical, economic, social, psychological and cultural dimensions. (HFD.2)
- Research and technology to improve skill acquisition and human and team performance in the context of the human-machine interface, including research designed to achieve this end through better understanding of the range of fundamental human processes (physiological, neurological, behavioral, physical, and cognitive) that affect individual human and team performance. (HFD.3)
- Research into terrorist motivations, intent, recruitment, mobilization, and operations in order to develop a framework for assessing threats to the homeland, including the use of IEDs. (HFD.4)
- Tools and technologies to determine when radical groups are likely to engage in violence, and what ideological, organizational, and contextual factors may influence violent action. (HFD.5)
- Methods for non-invasively identifying deceptive and suspicious behavior within a time constrained, low-base rate, screening environment, and methods for identifying interactive strategies optimal for eliciting disguise-resistant indicators of deceptive and suspicious behavior, including technologies that automate or aid in such identification. (HFD.6)
- Protocols and technologies to minimize insider threats and to identify insider threat behavior when it occurs, especially in settings like transportation security or at a border. (HFD.7)
- Improvements in biometrics, including real-time positive verification of individual identity using multiple biometrics; mobile biometrics screening capabilities, to include hand-held, wireless, and secure devices; and high-speed, high-fidelity ten-print capture. (HFD.8)
- Research into the limits and potential of biometrics, including data collections, analyses, and medical studies to evaluate the stability of biometric indicators over time, uniqueness within the human population, and potential sensor dependencies; evaluations of the cryptographic strength of biometrics in security applications when combined with passwords, PINS, public key infrastructure (PKI) and traditional data security methods; tools to create synthetic biometric data to protect privacy for research data sets used in algorithm evaluations; the assessment of techniques to spoof or obfuscate biometric technologies; and the development of standards and test/evaluation protocols. (HFD.9)

**Infrastructure and Geophysical (IGD.0):** Concepts, methodologies, algorithms, and/or technologies for identifying, understanding and mitigating all hazard vulnerabilities of the 18 critical infrastructure/key assets. Concepts, methodologies, and/or technologies for improving the preparedness and response for Federal, State, Local, Tribal governments, first responders and the private sector, to all-hazards events impacting the U.S. population, critical infrastructure, and the economy. Improved understanding of natural hazards and development of mitigation measures to protect against them.

- **Advanced Materials (IGD.1):** to renew the infrastructure of the present and construct the infrastructure of the future to be resistant to many hazards and have sustainable properties. Hazards include blast; projectiles; fire; earthquakes; wind; flooding; deterioration and aging; corrosion; and combinations of these design challenges. Sustainable properties include self-healing, self-diagnosing, self-reporting, generating or conserving energy, minimal drain on nonrenewable resources, conserving water, long life, and affordability.
- **Blast & Projectile Analysis and Design of Protective Measures (IGD.2):** Understanding the basic physics of blast effects on types of infrastructure that have not received extensive past testing and analysis (dams, levees, tunnels, bridges), improved understanding and modeling of blast effects on critical components of the infrastructure systems (towers, cables, submerged infrastructure), and design of protective measures to limit damage (i.e., articulated concrete mats installed externally to seal off damage to underwater tunnels, multilayered liners for interior protection of tunnels) or expeditious means to shore up damaged infrastructure to protect against further loss of life, such as safe entry for first responders.
- **Integrated incident management (IGD.3):** components and systems to improve public and first responder situational awareness, capability, and safety. Increased situational awareness to manage available and anticipated human and material resources, transportation capabilities, and the need for timely information to support critical decisions involving rapidly shifting priorities; geospatial data to create a seamless system between federal, state, and local first responders; and established virtual continuity of operations (COOP) capabilities to improve incident management when key infrastructures and facilities are unavailable.
- **Physics and Mitigation of Natural Hazards (IGD.4):** Improved capabilities to anticipate, prepare for and/or mitigate the impact of catastrophic geophysical phenomena. By better understanding the physics that drive the internal processes and severity of natural hazards, we are better positioned to develop innovative, effective protective measures to reduce damages from natural hazards and more quickly recover from them. Example hazards include hurricanes and the heat engine processes that control their intensity and resulting storm surge; high winds, erosion, and flooding; wildfires; and processes driven by high winds and drought, protective design and rapidly deployable protective measures, such as the “fire-proof house envelope” developed in the SAFE

**program; and earthquakes, including an ability to interpret signals from the earth to estimate the timing, location, and severity of an earthquake.**

- **Resilient and Sustainable Infrastructure (IGD.5):** Infrastructure designed in such a way that reduces the consumption of energy, consumption of clean water, and emission of pollutants, and aims at resource conservation over the life of the project. It should use high-performance green materials that are self-monitoring, are self-healing, and stand the test of time. It should resist blast, earthquake, floods, and wind. Developing infrastructure that is sustainable means thinking differently about how we build, what we build, and whether we build at all. It means designing and maintaining infrastructures that are both highly efficient and all-hazard-resistant. Enhancing security, resilience, and recovery of the 18 critical infrastructure sectors for new and retrofit applications. Critical utility components that are affordable, highly transportable, and provide robust solutions during manmade and natural disruptions.
- **First Responders (IGD.6):** Advances to improve protection of or enhance performance of responders as they carry out life-saving tasks. Technologies that will fully enable emergency managers and first responders to effectively cope with multihazard emergencies—technologies such as advanced materials for protective clothing that report on the health of the first responder; decision support systems that provide real-time logistical tracking and management of emergency supplies, equipment, and personnel; advanced 3-D tracking technologies; an integrated and simulation-based incident planning and response capability to analyze all-hazard disaster response and recovery operations, tactics, techniques, plans, and procedures for use in a real-time environment for simulation-based training.
- **Geospatial and Remote Sensing (IGD.7):** Geospatial technologies that enhance situational awareness for the protection of critical infrastructure and to improve management of incidents at federal, state and local levels.
- **Advanced Surveillance and Monitoring (IGD.8):** Integration of multiple types of sensing technologies and intelligent algorithms to interpret the sensed data and detect and report only actual anomalous activities.
- **MSA and DSS (IGD.9):** Concepts, techniques, methodologies, algorithms, and innovative tools and applications to significantly enhance the quality of system analysis and to reduce the time/cost of conducting system analyses. Modeling tools for a wide range of decision makers, from local law enforcement to governors to the White House, to evaluate alternative policies and actions to deal with emergencies and anticipate cascading effects across interdependent systems. Tools for real-time decision support in emergencies capable of integrating and assimilating multiple types of information and processing that information and presenting it in a manner useful to decision makers.
- **Cyber-physical Systems Security (IGD.10):** Cyber-physical systems (CPS), which are emerging trend across the globe, are characterized by tight coupling, coordination, and

interconnections among sensing, communications, computational, and physical resources. CPS are exhibited in many application areas, including industrial control systems, and are prevalent in almost every critical infrastructure sector, including water, gas, electricity, transportation, chemical, and healthcare. Such interconnections form a complex system of systems. It is envisioned that the complexity of the cyber-physical systems of the future will far exceed that of today. Such a complexity poses several research challenges related to resiliency, vulnerability, threat, and recovery assessment issues. There is a need for models, theories, methods, and tools to address the security of cyber-physical systems taking into account the cyber and physical components of a system in an integrated and unified way and realizing the discrete and continuous aspects of the system.

For instructions on submitting a White Paper or Full Proposal, please refer to S&T LRBA 10-01, PART II, Para. IV, APPLICATION AND SUBMISSION INFORMATION.

***DHS S&T reserves the right to select for award and fund all, some, or none of the Full Proposals received in response to this Announcement. If an award decision is made, a negotiation process will determine how much of the selected Proposal is actually funded. A Proposal may be selected, but only specific portions of it may be of interest to DHS S&T.***