A Decade of Partnership:
Department of Homeland Security and the Homeland Security Studies and Analysis Institute

Homeland Security Studies and Analysis Institute
An FFRDC operated by ANSER on behalf of DHS
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Our History

Over the last 10 years, the Homeland Security Studies and Analysis Institute (HSSAI) gathered a diverse and talented assemblage of experts in science, engineering, mathematics, operations, policy, performance measurement, and acquisitions. These experts have been dedicated and committed to assisting the department with the rapidly evolving and increasingly complex mission of homeland security. Today, that is still the charge and overarching goal.

HSSAI’s origins are firmly rooted in innovative vision as well as demonstrated need represented in the legislation that created DHS. In the late 1990s, ANSER foresaw that homeland security was emerging as a significant issue for the United States and two years before 9/11 established the ANSER Institute for Homeland Security.
The ANSER Institute for Homeland Security was established in 2000 to address that predicted need. In these early days of the homeland security enterprise, the institute demonstrated success with many significant accomplishments, including the Dark Winter and Silent Vector biodefense projects and the publication of the first weekly homeland security electronic newsletter.

The idea for a federally funded research and development center (FFRDC) that would focus on homeland security was conceived in the wake of the 9/11 terrorist attacks. As the nation came to grips with the implications of those attacks, it became clear that there was a need for robust analysis to inform decisions on securing the homeland. In its 2002 report, *Making the Nation Safer*, the National Research Council recommended creation of a not-for-profit studies and analyses institute dedicated to homeland security.

The Homeland Security Act of 2002 crystallized this concept by calling for the creation of the Department of Homeland Security (DHS) and directing the new Secretary of Homeland Security to establish an FFRDC to serve the department. From this legislation and the contract competition that followed in 2004, the Homeland Security Institute (HSI) was born, built on the foundation of the ANSER Institute for Homeland Security. Five years later, as a result of winning the 2009 DHS FFRDC contract competition, HSI evolved into the Homeland Security Studies and Analysis Institute (HSSAI).

This report chronicles HSSAI’s impact on DHS and our evolution as a studies and analysis entity. The vignettes in “Our Capabilities” (pages 15-65) recount the development of a wide array of analytical and technical products that have informed decisions across all the components of DHS.
They also describe the ongoing expansion of our spheres of work and influence and document our long-standing relationships with elements of DHS, such as the Office of Policy, Customs and Border Protection, the Federal Emergency Management Agency, the Transportation Security Administration, and the National Protection and Programs Directorate, to name only a few.

In 2015 as in 2000, our core values and commitment to our clients continue to guide the development of high-quality studies and analyses. In turn, our values, dedication, and work are a reflection of our deep and abiding commitment to the nation. As these pages demonstrate, we inform the decisions that make the nation safer.
Our Mission

HSSAI’s primary objective is to conduct research and analyses that support homeland security decision makers with results and recommendations that they can use as a basis for informed action. To do this, HSSAI employs a multidisciplinary team approach that addresses disparate stakeholders’ viewpoints and solves problems from a systems perspective—integrating policy, economic, technical, operational, and other critical factors.

HSSAI executes tasks assigned by DHS and other sponsors through a matrixed approach that utilizes a cadre of analysts with the requisite experience. To increase our responsiveness to emerging needs, we embed analysts on site across the DHS headquarters and component agencies to provide immediate analytic support to senior decision makers and to facilitate reachback into the deep base of analytic expertise resident within HSSAI.

HSSAI’s task sponsors are diverse. They originate from the federal, state, local, tribal, public, and private-sector organizations that make up the extended homeland security enterprise. The majority of HSSAI sponsors to date have come from DHS headquarters and operational components. However, we also support organizations such as the Departments of Defense, State, Education, Interior, Health and Human Services, and Justice, as well as the Office of the Director of National Intelligence.

The increasing complexity of today’s homeland security problems requires an FFRDC that is effective, agile, and innovative. Homeland security missions are multidimensional, operations are decentralized, and resources are scarce. This poses myriad questions: Which systems should be cut? What infrastructure should be protected? Where should the nation build new capabilities to meet new challenges? Are...
there better ways to use existing capabilities? How can the nation develop multipurpose capabilities? As a result, there is an urgent need for intelligent, forward-looking decisions supported by rigorous research and critical thinking. HSSAI has spent 10 years conscientiously working to meet that need.

We strengthen the homeland security enterprise by translating information into action.

Our People

**The analysts**

The increasing complexity of today’s homeland security issues requires an analytic workforce that possesses the agility conferred by a broad knowledge base and the creativity that leads to innovative solutions. Our analysts are the motive force and heart of HSSAI. They are conscientious and dedicated to DHS and the homeland security enterprise.
Our staff represents a unique collection of talent and expertise specific to the homeland security domain. Since the early days of DHS, our analysts have worked across DHS components solving diverse homeland security problems and issues. They have developed long-term relationships with DHS task sponsors, program managers, and administrative personnel. Because of this, in addition to the skills and knowledge they bring to bear, our analysts represent something intangible and unique: collective DHS experience and enduring departmental memory. The commitment of our analyst pool—in conjunction with their long-term, collective experience, institutional memory, and abiding DHS working relationships—forms a solid and unique foundation for executing useful, relevant, and cutting-edge studies and analyses.

**Experience**

On average, staff members have more than 18 years of professional experience. They bring expertise from a wide variety of homeland security domains. Their practical, field-based experience includes operational and exercise planning, crisis action planning, management of natural disasters, cyber warfare defense, and response to weapons of mass destruction attacks, to name a few. The analysts also possess applied academic skills such as performance measurement, biological threat agent and radiation detection, in-depth laboratory bench experience, and risk modeling, in addition to systems, process, and genetic engineering. To further enhance our knowledge and skills, ANSER provides HSSAI with an excellent internal resource. When needed, we can readily draw upon the knowledge and experience of more than 200 ANSER personnel.
We advance the art and science of decision making by applying systems thinking.

**Education**

Over 85 percent of our analysts have advanced academic degrees in the physical and biological sciences, engineering, mathematics, computer science, operations analysis, systems engineering, economics, law, business, finance, social and behavioral sciences, and more. Of those analysts, over 20 percent hold doctorates in a wide variety of academic disciplines. In addition, our analysts participate in many types of continuing education and professional development activities, including the pursuit of additional degrees and certifications.
Our Programs

Forward Analysts
In 2006, at the request of the DHS FFRDC Executive Agent, HSSAI began placing analysts at DHS headquarters and within departmental components to provide on-site analytic support. These analysts identify crosscutting issues and new analytical requirements, contribute to the knowledge base essential for other HSSAI tasks, and facilitate the interaction and integration of DHS components. In providing real-time analytic support to DHS decision makers, these analysts gain firsthand insight into the workings of the department that enables them to build analytical skills that are relevant to the needs of DHS.

Over the past decade, HSSAI placed analysts in a number of DHS components: Immigration and Customs Enforcement, Transportation Security Administration, Science and Technology Directorate, National Protection and Programs Directorate, and the Office of Policy.

One forward analyst worked in the U.S. Department of State’s Office of the Coordinator for Counterterrorism and another has now taken a position at the U.S. Army War College. The success of the forward analyst program is tangible: components frequently find funding to continue forward analyst placements after an initial trial period.

Distinguished Visiting Fellows
In addition to HSSAI’s organic staff, since 2009, our team of analysts has been complemented by 12 Distinguished Visiting Fellows (DVFs). The fellows possess a broad spectrum of expertise and experience in homeland security that enhances our capabilities and our work. The HSSAI DVF program enlists accomplished leaders in the field of homeland security to inform our work, mentor young analysts, and represent
HSSAI at the highest levels. The DVF's serve as strategic advisors and experts, contribute to our analytical work across the enterprise, and attend homeland security events across the country. HSSAI task teams draw heavily on expertise and other resources provided by these fellows, who also significantly expand our network. Over the years, they have participated in a broad range of project topics from cybersecurity metrics to Federal Air Marshals operations to risk-based decision making to DHS’s interdiction posture. Because they frequently call upon HSSAI’s fellows for advice, it is clear that our sponsors highly value their engagement.
Intern Programs: DHS HSI STEM and University of Chicago

HSSAI proudly hosts two intern programs, one for DHS Science, Technology, Engineering, and Mathematics (DHS HS-STEM), and one for University of Chicago summer interns. HSSAI was one of the original participants in the DHS HS-STEM intern program. The department designed the program to give students majoring in homeland security-related science, technology, engineering, and mathematics disciplines the opportunity to conduct research in areas relevant to the department’s mission and gain real-world experience. The University of Chicago intern program began in 2014, with HSSAI hosting masters-level interns from the university’s Council on International Relations (CIR) program. The goal of the CIR program is to provide graduate students with public service work experience as they consider their full-time career paths.

During their tenure at HSSAI, we assimilate each intern into the HSSAI team and provide them with a senior analyst as a mentor. We offer many enrichment experiences such as lunchtime seminars, field trips to pertinent government offices, and guest speakers. The interns also have speaking opportunities where they can gain experience by presenting their work to HSSAI and DHS staff and other groups.

Since 2005, these programs have played an invaluable role in facilitating the department’s effort to recruit and develop the nation’s next generation of leaders in the homeland security enterprise. Many interns from these programs have gone on to undertake graduate work in homeland security studies. Others have taken positions within DHS, HSSAI, other federal agencies, or related private-sector positions.

Core Research Program

Our sponsoring agreement establishes a provision for a Core Research Program (Core). This program provides a flexible
platform that HSSAI uses to build, maintain, and apply its foundational capabilities as a strategic resource for DHS. It does this by providing a vehicle for a set amount of funding that is independent of any one sponsor’s equities, allowing for crosscutting analyses. Thus, the Core confers agility and the freedom to tackle multi-owner problems that no single stakeholder can address. Because of this program, HSSAI can provide thought leadership on critical, and strategic issues. Core also enables us to take a forward-looking stance when it comes to emergent issues such as foreign fighters or the Nicaragua Canal. We have used Core funding to develop models and methods for analyzing mission requirements, performance metrics, and measures of effectiveness, and to provide forward-looking analyses for a range of diverse topics across the homeland security enterprise.
Our Capabilities

Analyses of Alternatives and Decision-based Analytics

HSSAI is committed to applying critical thinking and sound analytical methodology to support informed decision making. We have worked with DHS on multiple projects that employed analyses of alternatives (AoAs) to address challenging acquisitions and mission integration decisions. Use of a broad arsenal of proven analytic techniques and methods to provide solutions based on the decisions surrounding a given issue or acquisition has become our trademark. The vignettes in this section are selected examples of this type of work that HSSAI performed from 2005 to 2015. We have organized them by DHS component.
Domestic Nuclear Detection Office

From 2010 to the present, HSSAI has worked and continues to work with the Domestic Nuclear Detection Office (DNDO) to secure U.S. borders against the entry of radiological and nuclear threat materials. In a series of ongoing, in-depth studies, we have examined ways to detect these threat materials across a variety of settings and modes of transportation, from screening at international rail ports of entry to installation of radiation portal monitors at border crossings. As a result of this body of work, DNDO can now make sound decisions about which response technologies and concepts of operations (CONOPS) will ultimately lead to more effective threat mitigation.

HSSAI recently (2014-2015) engaged with DNDO because initial lifespan data suggested that the radiation portal monitoring (RPM) system DNDO deployed in partnership with Customs and Border Protection (CBP) is nearing the end of its useful life span. DNDO
took a due-diligence approach to the issue and enlisted HSSAI’s assistance to perform an AoA. HSSAI and DNDO worked in partnership with the end user, CBP, to evaluate cost-effective replacement systems. This included a substantial characterization of the baseline system. The team researched alternative materiel and nonmateriel solutions for nonintrusive inspection alternatives that could detect radiological and nuclear materials at ports of entry. HSSAI also created a detailed data collection and evaluation process that brought together critical information for the baseline and alternative evaluations. Using these data, we created several customized models for evaluation of the alternatives, modeling proposed alternate CONOPS.

Through this collaborative team approach, HSSAI found that the RPMs are not nearing the end of their working life span, nor is this a relevant concept given the manner in which maintenance is performed. This finding supported DNDO and CBP’s continuous process of proactively updating their RPM
program approaches and revealed potential cost savings opportunities that were previously unrecognized. In addition, our CONOPS model, which ties simulation results to an optimization algorithm, identifies the most cost-effective mix of detectors for use at over 300 potential port of entry sites. This study is a good example of HSSAI working in partnership with our DHS stakeholders to address mission needs while simultaneously enabling them to meet their financial stewardship goals.

Customs and Border Protection

In January 2010, DHS Secretary Napolitano ordered a reassessment of the Secure Border Initiative network (SBInet) program, including an independent, quantitative, science-based AoA. HSSAI was asked to perform a multiphasic AoA over two years. HSSAI developed a set of metrics for situational awareness, identified alternative solutions for providing border area surveillance (the original purpose for which
SBInet was designed), and compared both the operational effectiveness and the life cycle cost of those solutions. The analysis compared options for using sensor systems and platforms to provide situational awareness along the southwest border of the United States. The study team identified combinations of sensors and platforms that could be deployed within each of several exemplar border areas. For each such area, we estimated the 10-year life cycle cost that would be incurred. We also analyzed the operational effectiveness of the various alternatives, using such measures as persistent surveillance, dynamic surveillance, and strategic intelligence value.

Using measurable terms, HSSAI’s analyses showed how the choice of solutions depends on multiple factors such as terrain, vegetation, and infrastructure, all of which can vary from one area to another across the southwest border.

Our analysis indicated that the existing SBInet program was not the most cost-effective way to meet the nation’s border security needs. These
results directly informed the Secretary’s January 2011 decision to cancel the program. The operations analysis we performed as part of the AoA was subsequently used by CBP to design its next-generation plan for acquiring and deploying border surveillance technologies. As recommended in the report, CBP adopted an approach that uses a mix of technology solutions tailored to each individual border region. The AoA itself – DHS’s first major AoA – was cited as a model for future DHS operations analysis of this type.

Chemical and Biological Threat Division and Office of Health Affairs

Over a span of 10 years, the HSSAI biodefense portfolio team applied a systems approach to integrate five biodefense tasks to provide tools and methods that could be used to close critical gaps in U.S. biodefense and public health security. To guide each task,
we used a decision-to-action logic sequence. This resulted in a series of products that address critical issues in biodefense from wide-area restoration to biodetection to coordination of the biodefense effort across all levels of government.

Four of the projects yielded graphical frameworks that organize the decision space for these topics: the Wide Area Restoration Framework, National Biomonitoring Framework, the National Biodefense Framework, and National Capital Region Biodetection Framework. These frameworks focus stakeholder discussions on the path from incident to decision to action. In other words, they explicitly depict decisions that are generated by an incident, the information required to support decision making, and the resultant operations and activities. The frameworks also outline the primary, secondary, and tertiary consequences (both positive and negative) that flow from the decisions and activities and the interrelationships among
decisions, actions, and consequences. This approach to organizing a very complex and overlapping decision space with many stakeholders enabled diverse stakeholder groups to communicate clearly and have productive discussions about the respective issues, roles, and responsibilities. The frameworks prompted stakeholders to ask key questions:

Who makes the decision?

Do decision makers have access to the appropriate information to make the decision?

How does that information get to them?

What resources are required?

As a result of these focused discussions, consensus developed among stakeholders that significantly contributed toward the development of a shared vision and understanding of cleanup and restoration issues, as well as the biodetection and biodefense systems. In turn, the Wide
Area Restoration Framework served as the foundation for Interagency Biological Restoration Demonstration Program, a multimillion-dollar project jointly funded by the Department of Defense, Defense Threat Reduction Agency, and the Department of Homeland Security/Science and Technology Directorate. The NCR Biodetection Framework formed the basis for an interagency working group that built a CONOPS for the National Capital Region that was used for a presidential inauguration.

**Related Work**

We also consider it part of our mission as DHS’s FFRDC to encourage others in the homeland security community to discover the power of this type of analysis and employ it often. To that end, in 2013, we crafted a document titled *Analysis of Alternatives Methodologies: Considerations for DHS Acquisition Analysis*. In this publication, we drew upon our successful practical experience in applying decision analytics principles to explain the major steps and key methods that are part of a sound AoA process. We also summarized DHS guidance, promoted a common understanding of the analysis process, identified typical challenges and pitfalls, and provided recommendations for addressing these challenges. This document is now a frequently used reference at DHS.
## Operational Assessments

Operational assessment and analysis has been a key focus of HSSAI since its inception as HSI in 2004. More than 80 percent of our analysts have operational analysis experience and/or have worked on operational assessment projects at HSSAI. We have collaborated with Domestic Nuclear Detection Office, Transportation Security Administration, Immigration and Customs Enforcement, Customs and Border Protection, Federal Emergency Management Agency, and others examining the efficiency and effectiveness of their operations. As a function of our long-standing association with diverse DHS components, we have developed significant operations expertise as well as a deep understanding of the DHS operations environment. The vignettes in this section highlight selected examples of operational analyses that HSSAI performed from 2005 to 2015. We have organized them by DHS component.

### 2005

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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Feb 15</td>
<td>Michael Chertoff becomes Homeland Security Secretary</td>
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<td></td>
<td>HSI participates in DHS evaluation</td>
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<td>Jul 7</td>
<td>London Transport bombings kill 56</td>
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<tr>
<td></td>
<td>HSI models subway and stadium bombings</td>
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<tr>
<td>Aug</td>
<td>Hurricane Katrina hits Gulf Coast; 1,836 die</td>
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<tr>
<td></td>
<td>HSI examines role of NGOs in disasters</td>
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<tr>
<td></td>
<td>HSI studies terror deterrence for Coast Guard</td>
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<tr>
<td>Sep 23</td>
<td>Hurricane Rita hits Gulf Coast; 120 die</td>
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<td></td>
<td>HSI creates wide-area biological restoration framework</td>
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### 2006

<table>
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<th>Event</th>
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<tr>
<td>HSI CBRN and DHS 101 courses</td>
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<tr>
<td>Homeland security Venture Capital Concept Analysis</td>
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<tr>
<td>Apr 5 First case of bird flu</td>
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<tr>
<td>May President aims to increase Border Patrol 50%</td>
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<tr>
<td>HSI models flow of illegal immigrants</td>
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<tr>
<td>HSI creates strategic risk management methodology</td>
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<tr>
<td>Oct 4 Post-Katrina Emergency Reform Act signed</td>
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<tr>
<td>HSI analyzes screening for ferries</td>
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<tr>
<td>Oct 13 Congress passes SAFE Port Act</td>
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<tr>
<td>HSI assesses vulnerability of sensors</td>
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<tr>
<td>National Small Vessel Security Summit</td>
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<td>General Aviation Risk Assessment</td>
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DHS S&T and FEMA

We have participated in the Project Responder effort for the last eight years. Project Responder is a series of tasks that make up a systematic effort to identify and prioritize gaps between current emergency response capabilities and those required to respond to a catastrophic event. Project Responder identifies the needs of traditional response agencies (fire services, law enforcement, and emergency medical services) by obtaining inputs from nontraditional agencies (emergency management, public health, etc.). These inputs help us to determine and prioritize responder gaps that are crosscutting or beyond the abilities of a single discipline to fill. Because each emergency response group believes that its needs are most important, this type of independent, cross-disciplinary review enables federal planners to identify priorities for research and development funding. By soliciting participation from
well-respected responders across the nation, Project Responder is able to ensure that the needs of a broad spectrum of disciplines and jurisdictions are fairly represented.

Project Responder 3 (PR3) was the third iteration of the effort and the first in which HSSAI played a major role. PR3 used facilitated discussions with a diverse set of responders throughout the United States to identify existing response capability gaps. Through these discussions, participants identified 40 capabilities needed to fill existing gaps and a subset of 12 capabilities with highest importance. During the Project Responder 4 (PR4) effort, HSSAI identified a set of enduring and emerging capability needs that responders believe represent the highest priorities for improving their ability to respond to catastrophic incidents. We also assessed the state of science and technology to meet those needs and identified potential technology solutions designed to improve the capabilities of the response community.
We developed a series of technology road maps that illustrate project timelines and resource requirements. PR4 directly informed DHS Science and Technology Directorate (S&T) investment decisions. The Next Generation First Responder Apex project is based on the findings from Project Responder 4: National Technology Plan for Emergency Response to Catastrophic Incidents.

In addition, S&T developed 13 broad area announcements for solicitation of new technologies from the PR4 plan.

**U.S. Immigration and Customs Enforcement**

Over the past seven years, HSSAI has conducted seven studies that have supported U.S. Immigration and Customs Enforcement (ICE) Homeland Security Investigations (HSI). These studies have covered a wide spectrum of topics. For example, we completed large strategic studies that informed ICE operations such
as the Mexico Bulk Currency Study of 2008 that examined illicit crime trends that affect homeland security. We also performed operational assessments in direct support of ICE Special Agent in Charge (SAC) offices like Operation Green Tide (2013) and Operation Rota Caribe (2014). These studies and accompanying reports scrutinized a variety of problems including human smuggling and trafficking; illicit finance, including credit and mortgage fraud; bulk currency smuggling, and other illicit activities conducted by transnational criminal organizations. These assessments not only identified ongoing criminal trends but also served as catalysts to bring other federal, state, and local law enforcement agencies to assist ICE HSI with its investigations. Our productive and longstanding engagement with ICE has continued to the present. Currently, we are assisting ICE SAC Miami in establishing an anti-money-laundering task force in South Florida. This task force is based on the well-established, successful El Dorado Financial Crimes Task Force in the New York-New Jersey metropolitan area. Once the Miami task force is fully realized, it will significantly increase multi-agency coordination in South Florida. In turn, this coordination will enable each participating agency to focus its resources, increase investigative efficiency, promote information sharing, and set common leadership goals.
Counterterrorism and Risk Assessment

HSSAI has a long history of conducting risk and threat assessments as well as counterterrorism studies. We have worked with Transportation Security Administration, Customs and Border Protection, Immigration and Customs Enforcement, the Secret Service, U.S. Coast Guard, DHS Science and Technology Directorate, the DHS Office of Intelligence and Analysis, the Department of Education and other organizations that require this expertise. Below, we highlight only a few of these studies. Since a single task often calls for more than one general capability, other examples of risk-based work also can be found in other capability sections, such as Analyses of Alternatives and Decision-based Analytics, Operational Assessments, and Risk-informed Resource Analyses Acquisition Planning.
Transportation Security Administration

HSSAI has worked with the Transportation Security Administration (TSA) since 2005 to assess the risks facing the U.S. transportation sector and the effectiveness of potential security measures. As described below, we have built a significant body of work in this domain. Our studies have informed TSA policy makers, aviation security program managers, airport Federal Security Directors, and even U.S. Congress. For this work, we have taken a number of approaches.

In one set of studies, we examined the deterrent effect of various aviation security measures to determine how they influence adversary behavior. We collected empirical findings on how terrorist groups are likely to perceive and respond to such measures. We reviewed available literature, produced case studies on past terrorist attacks and foiled aviation terrorist plots, and undertook structured interviews with subject matter
experts. This work significantly influenced DHS operations and formed a theoretical foundation for the diverse analyses we have performed in the risk assessment domain.

In 2007, we performed a comprehensive assessment of the risks posed by general aviation aircraft in terrorist attacks against buildings. This analysis influenced TSA’s position on a new rule regarding its Large Aircraft Security Program regulation, which requires all U.S. operators of aircraft exceeding 12,500 pounds maximum take-off weight to implement security programs that would be subject to compliance audits by TSA. In 2010, after a private pilot intentionally crashed his single-engine plane into the Internal Revenue Service building in Austin, Texas, TSA asked HSSAI to revalidate its aircraft impact models and determine if its rule-making efforts were still supported by rigorous analysis.

Working with the Federal Air Marshal Service (FAMS) in 2007, 2009, and 2013, we examined how it allocates resources against threats. As part of these three projects, we asked what might be
done to improve FAMS’ risk and we helped to develop a resource allocation framework that will help decision makers implement risk reduction measures.

Millions tons of toxic chemicals are transported via rail cars each year. For more than five years, HSSAI has supported Project Jack Rabbit, an ongoing examination of the risks involved in this transport and the potential consequences of a toxic chemical spill from a rail car. This work has enabled TSA and interagency stakeholders to establish a science-based, defensible approach to chemical incident consequence assessment and to make recommendations regarding safer rail transport of chemicals. In addition, we have helped develop appropriate guidance for responding to this type of event.

Beginning in 2009, HSSAI focused considerable effort on key aspects of the risks facing commercial airports. In one effort, we supported the execution and analysis of a pilot program at seven domestic airports that were
physically screening airport employees entering secure airport areas. Recently, a follow-on effort assessed the cost and operational implications of employee screening at all domestic commercial airports. In a related effort in 2010, we catalogued and assessed best-practice security measures at commercial airports. As part of this effort, HSSAI developed the Commercial Airport Resource Allocation Tool (CARAT), which enables airport operators to examine the costs and benefits of current and potential security investments. In 2011, we expanded this work to include U.S. airlines operating at airports overseas. This successful effort was highlighted in congressional testimony.

Our TSA studies continued in 2013, when HSSAI performed an assessment of TSA’s Risk-Based Screening programs. This ongoing work is examining how TSA balances needs concerning screening efficiency, effectiveness, and passenger satisfaction though programs such as Pre-Check, Managed Inclusion, and Low-Risk
Population programs.

As a capstone to our TSA risk work, since 2010, HSSAI has continuously supported the development of TSA’s Transportation Sector Security Risk Assessment (TSSRA). The latest in these studies addresses the major threat that arises from the 700,000 flights per year that fly directly from international airports to the United States. Because of the significance of this last-point-of-departure (LPD) threat, the U.S. Congress and the Secretary of Homeland Security requested that TSA provide a threat ranking of all LPD airports. To meet this need, we developed a full-fledged LPD model that is being widely praised by high-level TSA officials and is currently being used by TSA intelligence analysts.

National Protection and Programs Directorate (NPPD)

DHS regulates the security of high-risk chemical facilities through the Chemical Facility Anti-Terrorism Standards (CFATS)
program. HSSAI has participated for three years in an independent assessment and analysis of the CFATS risk assessment methodologies used by DHS to help identify and rank chemical facilities according to their risk of significant adverse consequences if subjected to terrorist attack, compromise, infiltration, or exploitation. After a series of CFATS expert panel meetings, we produced a comprehensive report with recommendations aimed at improving the risk-tiering methodology and strengthening the overall CFATS program. This initial analysis and our management of an expert peer review panel received considerable praise for improving communication between the government, academia, and the chemical industry. This work led to several follow-on tasks in which HSSAI is further strengthening aspects of the CFATS program.
Departments of Defense, Education, and Homeland Security

Domestic terrorism and radicalization, especially the radicalization of youth, are emerging, serious issues in homeland security. Almost a decade ago, HSSAI had the foresight to recognize the importance of these problems. As a result, in a series of nine projects over three departments, we researched many interrelated aspects of radicalization and domestic terrorism. In one study, we described the basics of radicalization and how it occurs. In two others, we examined the recruitment and radicalization of school aged youth and how terrorist groups use the internet to radicalize them. For the Department of Education, we created a report titled *Understanding and Preventing Violent Extremism from an Educator’s Point of View*. Expanding our exploration of radicalization, we then studied homegrown jihadist terrorism and how to counter it. Our most recent work
builds on that study and discusses the public’s role in countering domestic terrorism plots. Taken together, these works form a significant contribution to the domestic terrorism body of knowledge and have been widely praised by educators, law enforcement, and homeland security radicalization experts.

Related work

While working with U.S. Immigration and Customs Enforcement on several operational studies related to illicit financial transactions, our analysts noted that there was a dearth of information about cryptocurrencies available to intelligence and law enforcement officials. Since bitcoin and other cryptocurrencies are known to be widely used for criminal- and terrorism-related transactions on the so-called Dark Web, our analysts determined that a comprehensive study of this new form of trade would be very useful for several DHS components. We used our Core Research Program to fund a cryptocurrency study and report entitled Risks and Threats of Cryptocurrencies. This report was the first to take an end-to-end view of cryptocurrencies as related to homeland security: how they became established, how they are used, and how they could specifically impact homeland security.
Organizational and Program Analyses

To meet the challenge of resource allocation in today’s fiscal environment, DHS decision makers need accurate, timely information about their programs and organizations and independent analyses of performance. In turn, meaningful analyses require experienced analysts who use valid and reliable performance metrics and outcome measures and understand the milieu in which the programs and organizations are operating. Program reviews are a rich source of information, a critical component of successful research management, and a useful method for ensuring return on investment. Similarly, periodic organizational reviews are an effective tool to help DHS leaders maintain mission focus, ideal staffing, and effective resource apportionment.

To assess and portray organizational and resource alternatives, we use program and organizational reviews to objectively assess inputs, outputs, authorities, responsibilities, costs, risks, and processes. The vignettes in this section highlight
selected examples of organizational
and program analyses in which HSSAI
participated from 2005 to 2015. We have
organized the summary of our studies by
DHS component.

Office of Program
Analysis and Evaluation

For the last decade, we have provided
dozens of independent assessments of
program performance that informed
resource decisions for the DHS Office of
Program Analysis and Evaluation. For one
set of projects, we worked with the DHS
Acquisition Program Management Division
and reviewed multiple acquisitions programs.
These included the National Cyber Security
and Protection System, the Student and
Exchange Visitor Information System, the
Homeland Security Information Network,
Secure Flight, the Secure Border Initiative,
the U.S. Coast Guard C4ISR System, and
several other U.S. Coast Guard systems,
platforms and approaches, to name a few. Most recently, as one of the assessments that HSSAI performed in this series of projects, a team of our analysts developed a prototype model to evaluate cost effectiveness of alternative screening and inspection tools at land ports of entry. In a second study, the team also assessed best practices for recapitalizing major investments throughout DHS, using the Transportation Security Administration’s electronic baggage screening program as a case study.

**Customs and Border Protection**

Mission integration is a priority goal because it increases efficiency and cost effectiveness, which are invaluable qualities in the present fiscal environment. Since 2010, HSSAI has worked closely with U.S. Customs and Border Protection (CBP) to facilitate unification across the directorate and help actualize its efforts to integrate
its many missions. As part of the mission integration effort, we executed four projects intended to help CBP prioritize and allocate resources across its many potential mission activities. To do this, we identified 37 recommended ways to improve integration across CBP’s missions and then helped CBP to implement these recommendations. Our continuing, long-term relationship with CBP and our institutional knowledge of DHS organizational issues were critical to our effectiveness in helping CBP prioritize, organize, plan, and implement its mission integration goals. Further, because many of the general issues related to mission integration are not unique to CBP, much of what we observed is more widely applicable across DHS components. To that end, we developed an HSSAI Core Research Program task to generalize the mission integration so that it could be used by a majority of DHS divisions and directorates.
Chemical and Biological Defense Division and HSARPA

A consistent approach to annual research and development program reviews ensures the success of research and development investments. Since 2005, HSSAI has worked with the DHS S&T Chemical and Biological Defense Division (CBD) to develop annual program reviews—the first DHS component to do so. The division has an extremely wide-ranging portfolio that includes chemical, biological, and agricultural threats. In addition, it oversees a diverse set of researchers, projects, and organizations across academia, industry, and the national laboratories. Over the years, because of HSSAI’s consistent involvement and institutional memory, we developed a highly successful formula for effective reviews. That formula included use of domain experts on HSSAI’s staff; cultivation of a cohort of impartial, external subject matter
and tracking of progress. Because of its continuing success with the CBD reviews, HSSAI was asked to develop the initial program reviews for DHS S&T’s Homeland Security Advanced Research Projects Agency (HSARPA) in 2012. We applied the same methods to develop procedure for the review program for HSARPA. That procedure is still being used by HSARPA for its program reviews.

FEMA, CBP, U.S. Coast Guard

Over the past three years, HSSAI has conducted studies and honed its experience in workforce assessments, beginning with a strategic manpower planning project completed for the Federal Emergency Management Agency. More recently, an HSSAI workforce integrity study for Customs and Border Protection (CBP) resulted in the establishment of the agency’s Integrity Interagency Planning and Coordination Committee. In August 2012, acting CBP Commissioner David Aguilar told the House Oversight and Government Reform Subcommittee on Government Organization, Efficiency, and Financial Management that he had instructed the new CBP committee to carry out the HSSAI recommendations.

HSSAI also completed a study for the U.S. Coast Guard that analyzed staffing and workload for the National Strike Force, which supports preparedness and response efforts related to oil and hazardous-material pollution incidents in the maritime domain. Using a refinement of a model of individual NSF strike teams that we developed previously, we performed an independent assessment of the existing workforce planning construct, developed a manpower model for the National Strike Force Coordination Center (NSFCC), and delivered model training to each of the three NSF strike teams and the NSFCC staff.
DHS S&T Infrastructure Protection and Disaster Management Division

HSSAI collaborated with the DHS S&T Infrastructure Protection and Disaster Management Division to optimize its research about seismic hazards and develop appropriate investments. In a series of panel discussions with representatives of various federal agencies, we facilitated a review of current seismic hazard investments and priorities to identify research opportunities. During this review, as part of analysis, we also proposed a research road map for DHS S&T to advance the science of earthquake forecasting, alerting, and warning.

Related work

As HSSAI worked on these various reviews, we observed that there was a need for a monograph that covered the basics of performance management that could be used by DHS program managers. Using funding from our Core Research Program, we created Measuring for Results: Key Concepts for Understanding the Performance of DHS Programs and Activities. This document discusses the fundamental concepts of performance measurement outcome measures. It also describes a framework that can be used by DHS program managers to determine the types of measures to use for their programs and how to apply them to judge the performance of their own programs and organizations. The document has been well received and is one of our most frequently requested publications.
Strategic Planning, Doctrine, and Policy Review

Because we are DHS’s FFRDC, we are uniquely positioned to support its efforts to validate and record doctrine, set policy priorities, and make long-term, strategic decisions. These vital activities require a solid foundation of critical thinking and analysis to enable the sound decision making required for DHS to unify its components and fully realize its mission. The vignettes in this section highlight examples of HSSAI’s involvement in strategic planning, doctrine, and policy work from 2005 to 2015. We have organized them by DHS component and type of work.
Federal Emergency Management Agency-Doctrine.

Our doctrine efforts at the Federal Emergency Management Agency (FEMA) have spanned the decade and given us the rare opportunity to significantly shape FEMA’s approach to disaster response. To do that, we are working side-by-side with FEMA’s Response and Recovery Directorate to build a new, integrated base of doctrine and guidance to ensure consistency across FEMA’s entire operation. A major goal of these unified response doctrine documents is the support of high-impact operations that meet FEMA’s mission goals along with the needs of its partners and the victims of disasters. By carrying out multiple detailed interviews and documenting requirements and needs, we are helping FEMA to integrate its fundamental principles and values with stakeholders’ viewpoints and best practices from across the agency into a comprehensive...
set of doctrine documents. From this research, interviews, and experience, we constructed a repeatable methodology that is being used to shape guidance and doctrine and to facilitate and manage FEMA working groups. Our signature processes that evolved from this task move from comprehensive literature reviews that identify the doctrine’s context to leveraging of information from working groups and focused interviews to production and final editing and refinement of the doctrine documents. Because of the intensity and breadth of this effort, the end products from these tasks—literally hundreds of documents—are being used throughout FEMA and have touched almost all areas in DHS that are related to disaster response.

**Federal Emergency Management Agency-NIMS**

The National Incident Management System (NIMS) provides the nation with
a framework for blending emergency management and incident response efforts at all levels of government. From 2008 to 2012, HSSAI worked on a series of projects that facilitated the implementation of NIMS on a nationwide basis. We analyzed proposed revisions to the NIMS doctrine, developed metrics to track NIMS implementation, and helped secure final approval of the NIMS document. We also provided a framework of functional needs, typical positions, core competencies, multiagency coordination systems, resource management, and training for all NIMS stakeholders involved in emergency management and incident response. This effort also supported the implementation of the Five-Year NIMS Training Plan. For the training plan, we constructed an evaluation system and made recommendations to improve future NIMS training. After a comprehensive review of the NIMS implementation objectives at the state, tribal, and local government levels,
we provided the findings to FEMA’s national leadership. We also developed a NIMS program guide and an assessment of the NIMS Compliance Assistance Support Tool, or NIMSCAST, to further enhance program implementation.

Office of Policy-QHSR

We are proud of our significant and highly praised involvement in both the 2010 and 2014 DHS Quadrennial Homeland Security Reviews (QHSRs).

In 2009 and 2010, one of our most important efforts involved major support to the DHS Office of Strategic Plans for implementation of DHS’s first-ever QHSR. In that effort, we helped DHS comprehensively examine the homeland security enterprise from the viewpoint of long-term resource planning, strategic decision-making challenges, and other critical issues related to improving U.S. homeland security.
We played a significant role in all the major components of the review. We advised the Office of Policy on the structure of the QHSR and assisted in the development of the 2010 QHSR Study Plan and terms of reference. We identified working group members and developed the outreach strategy for stakeholders at all levels. We also proposed areas for follow-up study following the completion of the 2010 QHSR. For all seven working groups, we participated as leaders, subject matter experts, and analysts. We performed strategic analyses and created white papers and issues papers. Ultimately, we contributed to recommendations in two critical areas: (1) homeland security strategy and priorities, and (2) ways to address the challenges facing key programs, assets, capabilities, budget, policies, and authorities of DHS.

Based on our successful involvement with the first QHSR, the DHS Office of Strategy, Planning, Analysis and Risk (SPAR), within the Office of Policy, asked HSSAI to be a major partner in the second (2014) QHSR. A key goal of 2014 QHSR was to obtain an overall picture of the homeland security strategic environment, both now and in the future, and to identify areas where the department must shift its strategies to address changes in that environment. Our participation spanned the preparatory, execution, and decisions phases of the QHSR. We worked with the QHSR team itself, along with the study and outreach teams.

As part of that effort, we assisted SPAR with strategic and analytical efforts that formed the foundation for the key QHSR documents such as the chief policy and strategy document that was ultimately released. Our analyses helped SPAR assess the homeland security strategic environment and provided a baseline of DHS’s major undertakings since the previous QHSR. HSSAI’s efforts included the system mapping pilot initiative, the QHSR mission area base, a compilation
and analysis of homeland security statistics, and a global survey of cyber security. SPAR leadership lauded HSSAI’s engagement and the quality of our work as a major contribution to the 2014 QHSR.

**Office of Policy-Cyber**

Most recently, our cyber security policy work has enabled DHS to outline its role and chart a clear path forward in meeting this insidious new threat. As early as 2010, HSSAI recognized the importance of the cybersecurity mission for DHS. One of our first efforts in this domain examined the primary authorities—legislation and executive orders—that support or govern the department’s cybersecurity efforts. We explored the clarity and sufficiency of the stated authorities. The team identified the primary authorities of greatest relevance to DHS’s role, examined their language, and explored the ambiguities, conflicts, and gaps that appeared to exist. We found that the authorities’ lack of clarity presents certain implications for the department’s cybersecurity activities, such as information sharing and incident response.
Risk-informed Resource Analysis Acquisition Planning

In parallel with the evolution of its acquisitions programs, we have closely collaborated with DHS to provide analytic support to the development of its risk-informed acquisitions process. To that end, we have played a major role in all DHS’s component-wide efforts, including the Requirements Planning Team and Integrated Planning Team processes, the Integrated Investment Life Cycle Model system, and the current Joint Requirements Council effort. In addition, as described below and in the “Analysis of Alternatives” section, we have worked or are working with individual components to apply acquisitions best practices to their programs, including the Office of Program Accountability and Risk Management, Transportation Security Administration, the U.S. Secret Service, Domestic Nuclear Detection Office, Customs and Border Protection, DHS Science and Technology Directorate, and U.S. Citizenship and Immigration Services. The vignettes in this

2014

Mar  HSSAI provides Dept of State with EXBS model
May  HSSAI concludes USCIS Transformation Program Assessment
Apr 2  Second Ft. Hood shooting kills 3
Sept  HSSAI supports DHS’s JRC effort
Oct 1  HSSAI report on measuring performance of DHS programs
Sept  HSSAI studies SEVIS program
Nov  HSSAI concludes risk based assessment of TSA’s low risk traveler program
HSSAI reports on unmanned aerial systems
HSSAI completes IV&V of international airport threat model
Dec 28 NATO ends combat operations in Afghanistan
HSSAI reports on cryptocurrency effects on homeland security

2015

Jan 7  Charlie Hebdo shooting in Paris kills 12
Feb  HSSAI completes update of Border Condition Index
HSSAI analyzes airport employee screening operations
HSSAI studies the link between human trafficking and terrorism
Mar 20 Mosque bombings in Yemen kill 142
Apr  HSSAI began second phase of support to Wireless Broadband Technology Demonstrator
Jun 17 Charleston, SC, church shooting kills 9
HSSAI concludes radiation portal monitoring analysis of alternatives
Jun 26 Ramadan attacks kill 403 in France, Africa, Near East
Aug  HSSAI examines the impact of the Nicaragua Canal on U.S. homeland security
section are only a selection of examples of acquisitions work that HSSAI performed from 2005 to 2015. We have organized them by DHS component.

**DHS S&T and National Protection and Programs Directorates**

In developing department-wide, risk-based acquisition policies, two of our earliest endeavors were implementation of the Integrated Product Team (IPT) process for DHS Science and Technology Directorate (S&T) and participation in the pilot test of the Strategic Requirements Planning Team (RPT). The IPT process was intended to engage DHS operating elements and balance the DHS S&T portfolio in terms of program requirements, risk, cost, impact, and time-to-deliver capability. We played an integral part in the underlying analytical work that was needed to run the 12 Capstone IPTs. The RPT process was intended to determine
strategic, cross-component requirements for all DHS activities. The pilot focused on an RPT that covered the nuclear response and short-term recovery area of interest. During this effort, we refined our Risk Assessment Process for Informed Decision Making (RAPID) prototype to provide a way to incorporate risk analysis principles into DHS’s planning and resource allocation efforts and determine the risk reduction impact of programs.

**DHS S&T Directorate, Office of Program Analysis and Evaluation, National Protection and Programs Directorate, Office of Strategy and Policy**

HSSAI was a key partner with DHS as it developed an approach to making investment decisions by linking strategy, capabilities, and resources across the organization through the Integrated Investment Life Cycle Model (IILCM) process. In 2013, the
Secretary of Homeland Security mandated use of the IILCM framework to promote departmental efficiency by managing the budgeting and investment processes and guiding strategic and resource allocation decisions. The IILCM is an end-to-end process composed of four phases: creation of strategy that defines priorities and goals, development of capabilities to execute that strategy, allocation of resources to fund those capabilities, and oversight of the program. As analytical support for the IILCM system, we worked with DHS to refine, document, and implement the system. Our analyses described the process in detail and strongly influenced the reengineering of the IILCM-related decision processes across DHS. Our analytical work was essential to the stakeholder coordination effort across DHS. HSSAI has continued to develop, refine, and finalize the IILCM process and its related endeavors as it evolved into the Joint Requirements Council (JRC) process described below.

**Integrated Management of Strategic Investments and Resource Decisions**

**Process Flow Diagram**
Office of the Secretary

Because of our long track record of successful acquisitions work across multiple components and our productive effort on the IILCM, we were asked to help with the 2015 JRC effort. The new component-led JRC is formulating recommendations to DHS leadership on options that will enable it to meet the capability needs of DHS operators and provide a vital link between strategic guidance and investments. With the support of HSSAI, the JRC has started the process by examining cross-component requirements. We will use the information we gather to develop recommendations for investment, as well as changes to training, organization, and operational processes and procedures. Our work will help DHS link department-wide strategies with investments. In doing so, it is hoped that the JRC effort will enable DHS to increase operational efficiencies by achieving economies of scale and eliminating unnecessary duplication. Additionally, one desirable outcome of the JRC effort should be improved traceability and defensibility of DHS resource decision making to the DHS components and congressional committees.
Office of Program Accountability and Risk Management

Since 2008, we have executed multiple acquisitions studies for the Office of Program Accountability and Risk Management (PARM). Several were aimed at helping PARM review acquisition programs and assess their readiness for portfolio reviews and acquisition review boards. We also developed a model for PARM to provide program management offices with staffing guidance for acquisition programs and a prototype implementation plan to accompany the guidance.

These PARM studies included a review of the BioWatch Generation 3 acquisition to assist PARM with determining the location of the program in DHS’s acquisition life cycle framework. In another effort, collaboration with Lincoln Laboratories, we developed a capability information framework to support analyses aimed at discovering duplications and redundancies in DHS programs. In a follow-up study, we developed a prototype of that information framework to support the development of an operational requirements document for PARM that it could use to acquire this capability.
Transportation Security Administration

We have worked with the Mission Analysis Division of the Transportation Security Administration (TSA) Office of Security Capability since 2009. During that time, we developed a capability gap identification and prioritization process to generate TSA’s inputs into the DHS S&T IPT-based research agenda development process. As part of the Aviation Security Enhancement Partnership Systems Analysis Working Group, we developed a metrics and measures framework for assessing TSA performance. The framework was applied to operational testing and pilot projects for the first Risk-Based Approach to Operations (RBAO) initiatives. Those initiatives provided performance assessments that could be used in making deployment decisions. We also performed an independent verification and validation on initiatives that are part of the RBAO. All of these studies have played a critical role in shaping TSA’s development and deployment of new capabilities. We continue to work with TSA in these areas, particularly the study of RBAO initiatives.
U.S. Citizenship and Immigration Services

We have engaged with the U.S. Citizenship and Immigration Services (USCIS) to construct a CONOPS in support of modification of the Verification Information System (the engine behind E-Verify and SAVE). In addition, we developed an acquisition governance process for USCIS. By providing greater visibility into USCIS activities, the process will enable USCIS to make investment decisions that address needs and requirements. This governance process was well received and is being implemented at USCIS headquarters.
U.S. Secret Service

Apex STORE, the first Apex initiative, was a two-year collaborative effort comprising a large multidisciplinary team (including DHS S&T personnel, component personnel, HSSAI analysts, and contractors). This project was geared toward providing the Secret Service with a durable methodology and framework from which to analyze technology needed to improve its remote protective operations. During this collaborative effort, HSSAI traveled with the Secret Service, gaining hands-on experience with protective operations and insights about Secret Service needs and requirements. The methodology and framework that we developed for this award-winning project enabled the Secret Service to efficiently and consistently assess its objectives and capabilities. As a result, the results could be used to identify areas for enhancement and develop acquisition strategies that will enhance current abilities and enable Secret Service to meet its projected requirements.
Our Perspective

The homeland security enterprise is at a crossroads. As the grim spectre of 9-11 dims, fundamental issues of threat, risk, public risk perception and expectation, and the protection of civil liberties and privacy are being viewed in new ways that reflect evolving realities. Across the country, there is a call to step back, assess what has been accomplished, and intelligently strategize the path forward. But the adjusted path and revisited goals must be accomplished with less funding, more oversight, and greater public scrutiny.

Keeping the homeland secure in a time of fiscal constraints demands that, more than ever before, homeland security decisions be based on valid information, critical thinking, and credible, practical analyses. This analysis-based approach applies to the spectrum of homeland security issues and decisions, from policy, strategy, threat assessment, planning, and acquisitions to operations. Just as well-executed analyses are essential to good decision making, the required analytical capabilities can only come from broad and deep skills, knowledge, and experience.
For the past year – indeed, for the past 10 years–HSSAI has worked to build that capability. We have improved and perfected our approaches, assessments, and analyses. Our products have informed high-impact decisions and yielded valuable knowledge and insights about the nation’s security and its ability to respond and recover from catastrophe. In addition to being analysts for the department, we have become its dedicated historians and forecasters. Building on the insight and understanding we have developed in our past work with DHS, we are bringing our expertise to bear in ways that are uniquely tailored to the challenges of the present and future. As threats evolve, public attitudes shift, and funding becomes increasingly scarce, only careful analysis rooted in long-standing relationships and solid expertise can yield the kind of effective and efficient solutions that will make the nation safer.