The Homeland Security Act of 2002 (Section 305 of Public Law 107-296, as codified at 6 U.S.C. § 185), authorizes the Secretary of Homeland Security, acting through the Under Secretary for Science and Technology, to establish one or more FFRDCs to provide independent analysis of homeland security issues. The RAND Corporation operates the Homeland Security Operational Analysis Center (HSOAC) as an FFRDC for the U.S. Department of Homeland Security (DHS) under contract HSHQDC-16-D-00007.

The HSOAC FFRDC provides the government with independent and objective analyses and advice in core areas important to the Department in support of policy development, decisionmaking, alternative approaches, and new ideas on issues of significance. The HSOAC FFRDC also works with and supports other federal, state, local, tribal, and public- and private-sector organizations that make up the homeland security enterprise. The HSOAC FFRDC’s research is undertaken by mutual consent with DHS and is organized as a set of discrete tasks.

The information presented in this annual report does not necessarily reflect official DHS opinion or policy.

For more information on this publication, visit www.rand.org/t/CP905

Published in 2019
Letter from the Director

FY18—HSOAC’s first full, normal year of FFRDC operations—has seen us hit our pace, bringing critical research and analysis to sponsors across DHS. We’ve made great strides in developing the trust relationships with the Department that are needed to fully leverage our skills. This is evident not only in the work we’ve done for FEMA on Puerto Rico Recovery but also in dozens of high-importance projects across many of the components. With the help of the Program Management Office in the Science and Technology Directorate, we’ve also made good strides in creating the standard operating procedures needed to make using HSOAC simple for components across DHS.

As has always been the case, we judge our success by how we help DHS and its components succeed. To develop and maintain the capabilities we need to help DHS tackle its challenges, we continue to grow our research staff through targeted recruitment and hiring. These efforts have deepened our staff’s knowledge and experience of the organizations across DHS and their missions. Continued work on critical DHS challenges also helps us grow in our understanding of, and usefulness to, the Department and its Components. Ensuring that we have a broad bench of team members with security clearances allows us to respond quickly to classified task requests. And we continue to work closely with our DHS counterparts to ensure that relevant staff have fitness.

As we start FY19, we are committed to excellence in research and analysis with the clear goal of helping our DHS sponsors accomplish their goals. Deepening our trust relationships with leaders across the Department is essential to our ability to contribute, and we look forward to doing that by demonstrating our value.

In this document, we offer an overview of HSOAC capabilities and highlight how we are supporting the DHS mission and keeping the United States safe, secure, and resilient. I can confidently report that, as our relationships across the Department mature, we are fully committed to supporting DHS’s challenges through state-of-the-art research and analysis.

With best regards,

Terrence Kelly
HSOAC Director
HSOAC: OUR MISSION

To help the Department of Homeland Security (DHS) be more effective in making the nation safe, secure, and resilient.

To support DHS across its missions, the Homeland Security Operational Analysis Center (HSOAC) FFRDC, operated by RAND under contract with the Department, provides the Department and its components with independent and objective analyses and advice in core areas important to DHS (see the functional areas listed below). HSOAC also works with and supports other federal; state, local, tribal, and territorial (SLTT), and public- and private-sector organizations that make up the homeland security enterprise.

Unique Purpose and Operation

HSOAC focuses on the following seven functional areas that cut across DHS’s mission categories:

- *homeland security threat* and opportunity studies that use risk assessment and forecasting to track current threats and identify vulnerabilities and potential future risks
- *organizational studies* that use workforce analysis and performance measurement to help DHS improve unity of effort across management and planning
- *operational analysis* that uses evaluation and simulation methods to help DHS assess mission requirements, improve operational processes and procedures, and understand the impact of operations on a range of outcomes
- *regulatory, doctrine, and policy studies* that use regulatory and policy analysis to offer insight into the potential impact of changes in external regulations, policies, and doctrines on DHS missions and activities
- *acquisition studies* that use planning, program management, and test and evaluation expertise to assess DHS’s acquisition needs and apply lessons from past experience
- *research and development (R&D)* studies that use portfolio and foresight analysis to help DHS plan for the mix of projects needed to accomplish its missions and transition R&D results into technology and practice
- *innovation and technology acceleration* that uses technical analysis to promote integration and adoption of new technologies and identify barriers to adoption.

What Is an FFRDC?

Federally funded research and development centers (FFRDCs) are independent entities that act as strategic partners to help the U.S. government meet specialized research needs.
HSOAC Capabilities

HSOAC is able to draw on RAND’s research staff of approximately 1,000 researchers across disciplines, ranging from hard sciences, math, and engineering to social sciences, history, and law. HSOAC specializes in multidisciplinary teams, each of which is constructed to answer a DHS research sponsor’s questions. We can provide both quick-turn answers to pressing questions and longer studies that require new and innovative research and approaches. HSOAC’s management team is available to DHS sponsors on short notice.

Opportunities for Innovation

HSOAC projects can take advantage of the many opportunities for innovation available at RAND. For example, in RAND’s internal research program, Methods Centers, and Innovation Incubator develop and test new analytic methods and tools. In the Pardee RAND Graduate School’s new Tech and Narrative Lab, policy analysts develop and pilot new applications as potential solutions to emerging policy problems. All of these capabilities, and more, can be leveraged to help solve the Department’s most important challenges.

Although the DHS acquisition function has matured significantly since the formation of the Department in November 2002, DHS still confronts a variety of acquisition challenges. In a two-day workshop hosted by HSOAC in September 2018 (photos shown above), subject-matter experts from HSOAC and DHS met to discuss these challenges and share lessons learned and best practices. HSOAC hopes to offer this workshop on an annual basis.
HSOAC works across DHS mission areas, components, and functional areas to improve operational effectiveness.

Support provided across DHS missions

1. Prevent terrorism and enhance security
2. Secure and manage our borders
3. Enforce and administer our immigration laws
4. Safeguard and secure cyberspace
5. Ensure resilience to disasters
6. Mature and strengthen the homeland security enterprise

Support provided across HSOAC research focus areas

1. Homeland security threat and opportunity studies
2. Organizational studies
3. Operational analysis
4. Regulatory, doctrine, and policy studies
5. Acquisition studies
6. R&D studies
7. Innovation and technology acceleration

*Cumulative HSOAC contract totals as of October 3, 2018
Support provided across DHS

NOTE: CBP = Customs and Border Protection; CWMD = Countering Weapons of Mass Destruction; S&T = Science and Technology Directorate; FEMA = Federal Emergency Management Agency; HQ = Headquarters; MGMT = Directorate for Management; NPPD = National Protection and Programs Directorate; PLCY = Policy; USCIS = U.S. Citizenship and Immigration Services; USCG = U.S. Coast Guard; USSS = U.S. Secret Service.

*Cumulative HSOAC contract totals as of October 3, 2018

In response to a mandate in the 2017 National Defense Authorization Act (NDAA), the DHS Office of Infrastructure Protection asked HSOAC to analyze the costs and benefits of alternative positioning, navigation, and timing (PNT) systems that would prevent the disruption of critical sectors if the Global Positioning System (GPS) was jammed or otherwise unavailable.

What is the challenge?
GPS is an important system used in many sectors of the economy. It is critical not only for navigation and surveying but also as a timing signal to keep telecommunications networks and financial transactions synchronized.

However, the GPS signal could be disrupted by solar storms or by malicious jamming. Currently, there is no federally supported backup or complementary system for GPS should such a disruption occur.

What did HSOAC do?
HSOAC helped DHS gather possible PNT alternatives and compared the performance of those alternatives with the technical requirements of critical sectors. HSOAC also assessed the likely economic impacts of GPS outage scenarios and compared those impacts with the projected costs of implementing complementary PNT systems.

Helping DHS save time and money

PROJECT LEADERS

James Bonomo • Senior Physical Scientist
Richard Mason • Senior Engineer
Improving Legislative Branch Cybersecurity

To address critical cybersecurity vulnerabilities in U.S. legislative branch agencies, the Library of Congress (LOC) is pursuing multifactor authentication (MFA). Before acquiring a new system, however, the LOC was directed by Congress to have an FFRDC assess requirements and constraints related to implementing MFA in these agencies, as well as in the House of Representatives and the Senate. Given HSOAC’s expertise in cybersecurity, the LOC selected DHS’s studies and analysis FFRDC to undertake this study.

What is the challenge?
The legislative branch is an attractive target for malicious actors, and its information systems must be robust and secure at all times.

MFA—a best practice that makes it harder for unauthorized users to compromise information systems—could provide such cybersecurity. But the LOC needs a better understanding of available MFA technology options and market products and services.

What did HSOAC do?
HSOAC used interviews and research to assess legislative branch agency (and House and Senate) authentication requirements and preferences. In particular, the team looked at three dimensions: usability, deployability, and security.

HSOAC also developed an interactive tool that allows users to adjust preferences and view ranked identity management solutions that feature MFA.
Lessons Learned from Multiphase Shipbuilding Programs

Multiphase acquisition strategies may have the potential to control U.S. Coast Guard (USCG) program costs or induce better performance by the shipyards. The USCG has used such strategies to procure cutters in the past. HSOAC was asked to identify lessons learned from programs using similar strategies, identify what factors influence bids on follow-on contracts, and establish best practices for future multiphased surface acquisition programs.

What is the challenge?
USCG shipbuilding program managers need a better understanding of how a multiphased acquisition strategy—which splits total buys into two or more tranches—could influence competition and pricing.

Proponents argue that the additional competitive pressure imposed by recompeting production midstream can yield better outcomes than engaging in sole-source negotiations with the incumbent shipyard.

What did HSOAC do?
HSOAC conducted a literature review to establish an analytical framework for evaluating multiphase acquisition and inform the assessment of various modifications and alternatives to the multiphase approach. The team also produced case studies for practical insight into the challenges and issues associated with multiphase acquisition and to illustrate potential ways to meet those challenges.

Helping DHS improve contracting processes

PROJECT LEADERS

Jeffrey Drezner • Senior Physical Scientist

Jennifer Lamping Lewis • Senior Engineer
Health, Wellness, and Resiliency in the Customs and Border Protection Workforce

The goal of the U.S. Customs and Border Protection (CBP) National Resilience Task Force is to improve the resiliency of CBP’s workforce, with a specific focus on suicide prevention, domestic violence, substance abuse, marriage and family issues, and stress and anxiety. CBP asked HSOAC to provide analytic support and guidance in creating a national strategy and supportive services to bolster resilience.

What is the challenge?
CBP leaders observed an increase in employee suicides that they believed were caused by work-related stress, poor family dynamics, substance misuse, and domestic violence. In response, they established the National Resilience Task Force to address employee health and wellness.

What did HSOAC do?
HSOAC surveyed all 60,000 CBP employees on behavioral health, workplace stressors, other life stressors, service utilization, and barriers to seeking care. HSOAC also conducted site visits and focus groups to get a more nuanced understanding of employee health and wellness. The approach was complemented by a review of evidence-based best practices in workplace resilience.

Helping DHS improve employee resilience

PROJECT LEADERS

Jessica Saunders • Senior Policy Researcher

Rajeev Ramchand • Senior Engineer
Staffing Models for U.S. Customs and Border Protection Support Services

Approximately 80 percent of the U.S. Customs and Border Protection (CBP) workforce is covered by Workforce Staffing Models (WSMs). However, the majority of CBP support functions are not formally covered by an existing WSM. CBP Enterprise Services (ES) requested that HSOAC create a staffing model methodology and estimate staffing requirements for several specific CBP support functions.

What is the challenge?
CBP ES must maintain at least adequate customer service and must justify the staff required to do so. But CBP ES support services are often difficult to model because of their complexity and the uncertain, though anticipated, changes to workload composition, workload magnitude, and processes. Historically, most staffing requirements have not been driven by models or data.

What did HSOAC do?
HSOAC created a staffing methodology that assesses functional attributes and selects the most appropriate and beneficial model type. HSOAC applied the methodology and created models specific to six functions using process and performance metric data. The models were embedded in spreadsheets and delivered to CBP ES for ongoing use.

Helping DHS better manage its workforce

James R. Broyles • Senior Operations Researcher
Improving Fraud Risk Management at the Immigrant Investor Program Office

The employment-based fifth-preference (EB-5) visa program is an immigration program with an investment component, which means that it has fraud risks that are unique within U.S. Citizenship and Immigration Services. To understand these fraud risks and to help the Investor Program Office (IPO) comply with Government Accountability Office (GAO) recommendations, IPO asked HSOAC for analytic support to profile its fraud risks and enhance IPO’s enterprise fraud risk management.

What is the challenge?
The EB-5 program offers lawful permanent residence for immigrant investors (also known as petitioners) who invest in targeted new businesses that create or preserve ten permanent full-time jobs for qualified U.S. workers. The program also involves individuals or organizations that promote economic growth via EB-5 investments (also known as Regional Centers, or RCs).

In recent years, studies and law enforcement actions have raised concerns about fraud within the EB-5 program.

What did HSOAC do?
HSOAC applied the framework from Office of Management and Budget Circular A-123 and GAO risk management guidelines to assess and profile the fraud risks to IPO and the EB-5 immigrant visa benefit category.

HSOAC also developed an enterprise fraud risk management plan for IPO derived from best practices.

Helping DHS reduce the risk of fraud

PROJECT LEADER

Carter Price • Senior Mathematician
Options for Building an Effective and Practical National Approach to Terrorism Prevention

Terrorism prevention (formerly known as “countering violent extremism,” or “CVE”) aims to reduce the risk of terrorism using methods other than law enforcement and criminal justice approaches. The DHS Office of Policy asked HSOAC to examine the current state of terrorism prevention in the United States and to develop recommendations for this area.

► What is the challenge?
Past U.S. efforts at terrorism prevention have sometimes been controversial because of concerns about potential infringement on constitutionally protected rights and stigmatization of communities. In addition, efforts have been limited by modest resource investment and mistrust by key communities.

► What did HSOAC do?
HSOAC drew on multiple methods, including a review of published literature and threat information; interviews with terrorism prevention experts, researchers, the technology industry, and nonprofits; field visits with state, local, and nongovernmental organizations in five U.S. cities; and case studies of seven countries’ efforts.
Core Research Program

The FFRDC Program Management Office (PMO) coordinates an effort to identify and fund projects of broad applicability across DHS. Projects are identified through discussions with senior DHS officials from each of the 22 components.

Core Research aims to enhance the effectiveness of the entire homeland security enterprise by
• producing state-of-the-art solutions to complex problems
• developing game-changing improvements to enhance existing capabilities
• leveraging the work performed for individual components—including lessons learned and best practices—for the benefit of DHS more broadly.

Completed Core Research Projects

Domestic Response to Cyber-Induced Emergencies

Large-scale cyberattacks in the United States are a growing risk, with the potential to cause significant disruption and damage. While FEMA’s authorities and responsibilities are understood and well-practiced for traditional emergencies, such as hurricanes, tornadoes, and forest fires, there is less clarity regarding FEMA’s preparedness for and response to a cyber-induced emergency. To help clarify the role FEMA could play in support of a cyber-induced emergency, HSOAC conducted a study that identified the range of cyber risks and threats that might impact SLTT governments and developed goals and objectives that FEMA would need to plan for across these scenarios to help SLTT governments respond to and recover from such events. Researchers conducted a gap analysis of current FEMA-led efforts and the requirements identified in the research and reviewed draft findings with key stakeholders including SLTT governments and the Cybersecurity and Infrastructure Security Agency (CISA) to ensure that the full range of goals, objectives, and programs were identified.

Helping government agencies respond to cyber threats

PROJECT LEADERS

Andrew Lauland • Senior Policy Researcher
Daniel M. Gerstein • Senior Policy Researcher
Building an Analytic Capabilities Inventory and Store

To support its missions, DHS is establishing an analytic agenda whose primary step is a comprehensive inventory of the Department’s analytic capabilities that support strategic decisionmaking. For this study, HSOAC was asked to support the development of such an inventory, particularly in relation to the DHS-HQ integrated business process, which transforms Departmental leadership guidance and priorities into materiel or nonmateriel operational program solutions based on identified needs. This study can help advance the analytic agenda by providing a clear and functional working definition of an analytic capability; documenting the decision points at which analytic inputs are required within DHS-HQ business processes; describing the analytic tools currently used in DHS-HQ business processes; and identifying potential improvements in business processes, data analytics, and collaboration for the Department.

PROJECT LEADER

Jeffrey Wenger • Senior Policy Researcher
HELPING THE GOVERNMENT OF PUERTO RICO RECOVER FROM DISASTER

In September 2017, Puerto Rico suffered catastrophic damage as Hurricane Irma passed just north of San Juan. Hurricane Maria made a direct hit on the Island two weeks later. The hurricanes’ effects on people’s health and safety were devastating. Damage to critical infrastructure resulted in cascading failures of lifeline systems, such as energy, telecommunications, water, and transportation.

In the wake of this disaster, Congress passed the Bipartisan Budget Act of 2018 on February 9, 2018 (Public Law 115-123). This legislation required the Governor of Puerto Rico, with support from federal agencies indicated in the National Disaster Recovery Framework, to produce within 180 days an economic and disaster recovery plan that defines the priorities, goals, and outcomes of the recovery effort. In addition to federal agencies, Congress also required that Puerto Rico’s recovery plan be developed in coordination with key partners from private and nongovernmental entities and with the Financial Oversight and Management Board (FOMB) established under the Puerto Rico Oversight, Management, and Economic Stability Act, which was also required to certify the plan.

Michael Byrne, the Federal Coordinating Officer responsible for overseeing the Federal Emergency Management Agency’s (FEMA’s) response and recovery efforts in Puerto Rico, asked HSOAC to assist the government of Puerto Rico with writing its congressionally mandated economic and disaster recovery plan. HSOAC’s approach included engagement with key partners to gather infor-
Information and solicit feedback, an assessment of damage and recovery needs by sector, prioritization of goals and objectives for recovery, identification and evaluation of potential solutions (i.e., courses of action), estimation of order-of-magnitude costs for the courses of action, and identification of funding mechanisms.

On August 8, 2018, the Governor of Puerto Rico submitted the plan, *Transformation and Innovation in the Wake of Devastation: An Economic and Disaster Recovery Plan for Puerto Rico*, to Congress. And the FOMB certified the plan on August 28, 2018.

In addition to the economic and recovery plan, HSOAC is producing a series of volumes intended to support federal agencies evaluating and funding recovery actions and other stakeholders funding or implementing recovery activities in Puerto Rico. HSOAC’s support to Puerto Rico’s recovery continues in earnest. The activities associated with specific recovery projects—and their associated costs—are ramping up and will soon reach a critical mass.

In October 2017, the government of Puerto Rico elected to participate in the 428 Alternative Procedures Program for all permanent work, as stipulated in the Stafford Act. However, the increased share of costs paid by the federal government as part of this approach requires independent expert validation of estimates that exceed the FEMA-established threshold of $5 million. HSOAC was chosen to serve as the independent expert panel and, in this capacity, will review all cost estimates greater than $5 million for cost reasonableness.

**LOOKING AHEAD: ENSURING EXPERTISE AND TRANSPARENCY IN VALIDATING COSTS TO REBUILD PUERTO RICO**

Over the next three to four years, HSOAC expects to provide analysis on over $40 billion to $60 billion of work (in both Puerto Rico and the U.S. Virgin Islands). The analysis will contribute valuable insights that can be used to shape the Public Assistance Grants Management program in Puerto Rico. More significantly, the project will provide independent expertise to help balance FEMA’s fiscal responsibility with the recovery needs of Puerto Rico. In the long term, ongoing analysis and lessons learned will inform and improve FEMA’s cost-estimating methodology, potentially establishing the gold standard for validating costs for all future disaster recovery efforts.
Each year, RAND hosts a DHS Fellowship and USCG Fellowship. These fellowships support the development of leaders at DHS with the strategic analysis and planning skills needed to meet the complex challenges of their respective organizations and missions. Working at RAND provides an opportunity for fellows to study with nationally known researchers and form effective partnerships outside of their organizations, as well as explore innovations needed to more effectively and efficiently manage resources. In return, fellows offer HSOAC an operational understanding of DHS elements and how to make our research more useful to the Department.

2017–2018 Cohort

**Todd Muehlenbeck** served as the 2017–2018 DHS Fellow at RAND. Muehlenbeck is the program manager for the requirements analysis branch of Air and Marine Operations, part of CBP. He leads a team of federal agents, operations research analysts, and contract support personnel conducting operations research and other requirements analysis to inform leadership on acquisition planning, budget formulation, and operational planning.

During his fellowship at RAND, Muehlenbeck researched operational capabilities related to maritime domain awareness and southwest border threats, as well as novel analytic methods for using games for training and the value of gaming systems for training first responders and emergency managers.

**Captain Eric Cooper** served as the 2017–2018 U.S. Coast Guard Fellow at RAND. Prior to his fellowship, Cooper served most recently as deputy sector commander in San Diego. He also served at the White House as the director for maritime security and as director for Arctic region policy on the National Security Council. Cooper’s next assignment will be at USCG Pacific Area Command, where he will be responsible for planning and analysis for future Coast Guard operations.

During his fellowship, Cooper investigated damage from Hurricane Maria to Puerto Rico’s maritime transportation sector and courses of action that could be considered as part of the Puerto Rico economic and disaster recovery plan. In addition, he shared his operational insights with HSOAC researchers to help them understand support for missions to the north and south of the continental United States; potential shifts in the Coast Guard’s homeland defense role as the threat environment evolves; and the demand for new capabilities, skills, and technologies going forward.

2018–2019 Cohort

**DHS Fellows:** In the coming year, RAND will welcome three DHS fellows, representing the Transportation Security Administration, the National Protection and Programs Directorate, and the USCG.

**USCG Fellow:** RAND will also welcome the Assistant Commandant of Cadets at the Coast Guard Academy as a fellow in the coming year.
Senior Leadership

Terrence Kelly, Ph.D.: Vice President and Director, HSOAC
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How to Work with HSOAC

HSOAC’s seven functional research areas are spread across two programs. Sponsors interested in working with HSOAC should contact the relevant program director.

### Acquisition and Development Program
- Acquisition studies
- R&D studies
- Innovation and technology acceleration

### Strategy, Policy, and Operations Program
- Organizational studies
- Regulatory, doctrine, and policy studies
- Operational analysis
- Homeland security threat and opportunity studies
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